

Review

Challenges for Open Education with Educational Innovation: A Systematic Literature Review

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Received: 1 July 2020; Accepted: 25 August 2020; Published: 29 August 2020



Abstract: Open education can enrich learning environments and support the processes of educational innovation. The objective of this article is to analyze the evidence published about open education in the period 2014–2019 to identify future challenges. We performed a Systematic Literature Review (SLR), identifying 245 articles on the topic of open education in the databases, Web of Science (WOS), and Scopus, from January 2014 to June 2019. We filtered to obtain the most relevant data by applying inclusion, exclusion, and quality criteria. The results yield information on (1) the characteristics of the publications; (2) the methodological trends; (3) the central and transversal dimensions of the topic; and (4) the innovative educational practices that have been implemented. The article concludes with a presentation of the challenges that are linked to coverage, empirical evidence, co-creation, and innovation. The contribution of this research is to add value to the body of knowledge available to trainers, researchers, and decision-makers interested in open education and educational innovation.

Keywords: open education; systematic literature review; challenges; environmental education; educational innovation; higher education

1. Introduction

In times of change, when new needs emerge suddenly from unexpected causes, such as the COVID-19 pandemic, educational processes face both unanticipated challenges and sprouting areas of opportunity. In such situations, educational innovation can lead to the generation of new products (technology, instruments, devices, prototypes), services (care, assistance, dependence, benefits), or solutions (transformation, models, systems, methods). The changing needs might involve integrating a novelty into an existing reality, modifying a product, or improving educational operations, services, or logistics. In the field of educational innovation, delimiting and narrowing the scope of the innovation require identifying problematic situations, analyzing their contexts, and critically assessing the changes that contribute to an improvement in education [1]. Educational innovation can be defined as any adaptation (organizational, administrative, pedagogical, or formative) that enhances or improves students' learning [2]. Innovation in education involves a constant and intentional transformation of vision and actions to improve the components, actors, structure, and management of education. Innovation is the heartbeat of educational fact and educational science.

All studies of educational innovation involve the identification of challenges. On one hand, the actors and the institutions in charge of implementing educational innovations must prepare for the needs imposed by the new challenges; they must develop a response that is both inclusive and transformative [3]. However, one impediment is traditional thinking that educational innovation exists within formal educational institutions (e.g., schools, institutes, universities) and not in other formal or informal environments. Moving beyond this thinking presents a niche of opportunity to generate lines of research and publications related to the processes of formal and informal learning within networks, considering multiple relationships with educational institutions and other sectors [4].

Another challenge of great incidence is “openness,” the capacity to bring together diverse sectors (educational, social, enterprise, cultural) for collaboration and dissemination [5]. In this landscape, the field of open education is fertile, both for training in educational innovation [6] and for promoting innovations within the framework of the open educational movement with practices of production, use, dissemination, and mobilization [7]. Here, the open education movement is visualized as a dynamic phenomenon, in constant evolution, that starts from the simplest idea of taking advantage of resources to share a common good, namely, knowledge. However, open education can also mean something more complex: developing educational practices that contribute to the necessary improvements in education, management, and research [8] required by external changes. The open educational movement, itself, can become an object for research analysis.

How can open education be well defined? Open education is designing, realizing, and evaluating learning opportunities with visionary, operational, and legal openness to improve the quality of learning for the learners [9]. In a mapping of the keywords that appear in the literature of the Scopus database between 2015 and 2020, a search for “open education” and “educational innovation” yielded 110 publications, where the web tool Scival [10] identified the growing number of themes of educational resources and online courses (Figure 1). Open education issues a challenge to make innovation an adopted attitude and continuous practice.

Top 50 keyphrases by relevance, based on 110 publications | [Learn about keyphrase calculations](#) »



Figure 1. Open education and educational innovation (2015–2020) [10].

What are the references available for institutions and decision-makers in the field of open education? Several frameworks have contributed to open education. For example, in the European community [11], the Opening up Education framework for higher-education institutions provides ten dimensions for open education divided into two categories: (a) central dimensions (access, content, pedagogy, recognition, collaboration, and research); and (b) transversal dimensions (strategy, technology, quality, and leadership). The central dimensions represent the “what” of open education, and the transversal dimensions indicate “how” to achieve it. Concerning the quality aspects [12], the Quality Reference Framework (QRF) places open education on a platform of high-quality content encompassing its operational, legal, and visionary dimensions through the analysis, design, implementation, and evaluation of experiences. Another framework presented by authors [13] invites analyzing the difference between openness and open, in which they differentiate that openness covers more areas (transparency, access, participation, and democracy) and tends to generate experiences and

participation. The need to innovate in open education includes contemplating the improvement in how one learns, forms, and encompasses the educational process as a whole.

Open education processes linked to educational innovations present different types of challenges. One challenge is the need to consider parameters like new ways of sharing educational content on the web, making improvements to meet training and retraining needs to acquire knowledge, resolving the lack of library resources, accessing materials in non-English languages, and envisioning knowledge philosophically as a collective social product. [14]. Credibility and reputation in open education challenge us to work on common standards and quality, with processes that guarantee equality in the different forms of education [15]. Other challenges include making academic research more accessible, making the best use of resources, formulating open access policies, and getting the government to intensify its efforts to promote and nurture the open access publishing model [16].

Open education processes challenge educators to change their practices [17] fundamentally to favor educational innovation. In MOOCs, there is a challenge for content production to become more creative, both in educational institutions and in corporate environments [18]. Many communities face difficulties in using open resources because of a lack of access to the internet and technology [19]. There are limited opportunities for inclusive education in science [20]. China addresses some of its challenges by introducing more universities to open education to improve its educational system [21]. How educational innovations are studied also presents a challenge; some methodologies broaden the scope of the subject matter to identify the results of educational innovation, which can include new processes, products, services, or knowledge [22]. The challenges in the area of open education are broad, as are the possibilities for analyzing its contributions.

In our analysis of systematic reviews of open-education literature, we find important contributions in specific contexts, thematic areas, and thematic issues. For example, to address quality in open education, the OpenEd Quality Framework provided a three-dimensional framework applied to the macro, intermediate, and micro levels. It integrates the different perspectives of quality in a holistic approach to the design, learning processes, and results of learning [9]. A mapping identified eight different sub-themes within open education over the last four decades, highlighting open access, OER, MOOCs, open educational practice, social media, e-learning, open education in schools, and distance education [23].

Other SLR contributions have led to the knowledge of open education practices in China [24] and Latin America [25]. The Government of India also has innovative programs and plans such as SHAKSHAT, NMEICT, NPTEL, OSCAR, and E-grid, all related to the development and dissemination of open educational resources [26]. Studies have been carried out to promote open educational practices that benefit from innovation in the classroom for students [27]. Other studies looked at open educational practices themselves, which included open pedagogy and the use of open educational resources for the analyses of collaboration, Wikipedia editing, open networked courses, virtual networking, public scholarships, and student-created resources [28]. Other studies devoted to the analysis of open education practices look at innovative models and technologies as well as methodological approaches and current best practices in the field of open learning and open education. Some of these methodologies facilitate personal growth, social inclusion, open innovation, and sustainable economic development [29] as well as open science and knowledge sharing, open-access practices, technologies, and education [30]. Open education inputs help support practices that provide empirical evidence of the value of open access practices (e.g., competencies for production, search, dissemination, and mobilization of open educational resources [31], self-motivation [32], and open design [33]).

Studies in open education have become references for the continuous building of bridges for the democratization of knowledge. The work of the global academic community in open education has led to an awareness of this type of education. Consequently, global recommendations adopted by UNESCO [34] have been issued that encourage capacity building, policy development, inclusive and equitable access, sustainability models, and the promotion of international cooperation. Our study notes all this. The objective of this article is to review the literature on open education to provide

new knowledge that can support actions on these international recommendations and shed light on challenges in times of crisis, such as that of COVID-19. The contributions of this paper may be of value to trainers, researchers, and decision-makers interested in open education and educational innovation.

2. Materials and Methods

The Systematic Literature Review (SLR) is the method that guided this study. The process included the formulation of questions, search for literature, delimitation of criteria, and establishment of an analysis protocol [35–37]. The SLR identifies, analyzes, and interprets the research results of pieces available in a specific period related to the subject of interest, which was open education in this case. Five phases were followed in the study (Figure 2).

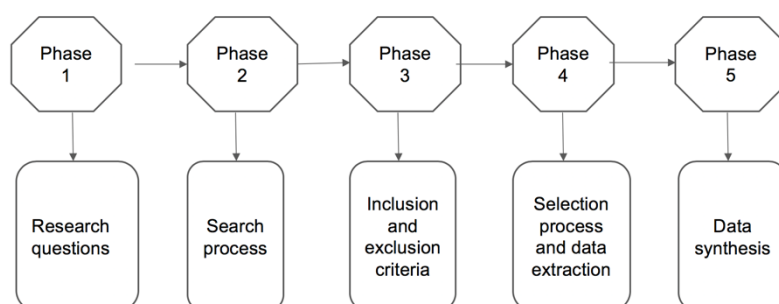


Figure 2. The SLR Phases.

2.1. Phase 1: Research Questions

To find relevant publications between 2014 and 2019 about open education linked to global recommendations and educational innovation, the authors posed six research questions (see Table 1). Four major themes arose from these six research questions. The themes and questions emerged from the gaps in knowledge identified in studies carried out by the author, analyses with colleagues who specialize in open education (especially with the UNESCO and ICDE Chairs in open education), opportunities detected as a result of participating in various conferences, and workshops to make recommendations that promote the open educational resources (OER) of UNESCO. Also, the authors' experience with challenges used in academic practices and educational innovation in training activities with students, academicians, and research groups helped with the development of the questions. The possible answers arose from the theoretical support on which the study is based. The opportunity to provide new contributions to open education research, in particular, was a motivation for the themes and research questions.

Table 1. Topics and research questions.

Topics	Research Questions (RQs)	Possible Answers
Characteristics of the studies of open education that have been published in recent years	RQ1. Where are the authors of the studies located?	Location of the first author of the articles
	RQ2. What are the most cited articles?	Identification of the items with the highest number of citations
	RQ3. In which journals have open education items been published more, and what are the Q levels of the journals?	Journals that have published more about Open Education Q level of the journal
Methodological trends in the publications of Open Education	RQ4. What are the methodological trends, strategies, and instruments used in the studies of open education?	Methodological trends, nodes, strategies, and instruments [38,39].

Table 1. Cont.

Topics	Research Questions (RQs)	Possible Answers
Core and transversal dimensions in Open Education publications	RQ5. What are the core and transversal dimensions identified in the practices of open education?	Core [11]: Content Pedagogy Recognition Collaboration Research Access <hr/> Transversal [11]: Strategy Leadership Technology Quality
Educational innovation practices in the open education movement	RQ6. What are the core and transversal dimensions identified in the articles, and what practice of the open educational movement is being executed?	Open educational movement [7]: Use Production Dissemination Mobilization

2.2. Phase 2: Search Process

The search for articles was carried out in the two databases with the greatest coverage and scope, that is, Scopus and Web of Science (WoS). The keywords (open education), period (2014–2019), and type of document (article) were the delimiters. The search process carried out with WoS or Scopus is presented in Table 2, in which both databases appear with the different search patterns.

Table 2. Search patterns.

Scopus	Web of Science (WoS)
TITLE-ABS-KEY ("Open education") AND DOCTYPE (ar) AND PUBYEAR > 2014	You searched for: TOPIC: ("open education") Refined by: DOCUMENT TYPES: (ARTICLE) Timespan: 2014-2019. Indexes: SCI-EXPANDED, SSCI, A&HCI.

2.3. Phase 3: Inclusion and Exclusion Criteria

The field of open education has many topic possibilities, for example, Open Educational Resources (OER), Massive Open Online Courses (MOOCs), Open Access (O.A.), Open Data, Open Science, Open Education Technology, and Open Practices among others. In order not to leave out terms that could be included, the term "open education" was searched globally and delimited within a designated time. The terms of inclusion stipulated that they be articles, that they include "open education" in their title, summary, or keywords and that they were published between January 2014 and June 2019.

The exclusion terms (not exhaustive) were open education items identified as papers, book chapters, books, and reviews published before January 2014 or after July 2019.

2.4. Phase 4: Selection Process and Data Extraction

The number of articles in both databases (WoS and Scopus) was 364. A total of 110 duplicates were eliminated, removing them from the Scopus record. Quality criteria were applied to identify that the articles, which were found in education and social studies areas, integrated open education in their titles, abstracts, and keywords. This ensured that they located open education practices (the central focus of the study). Nine that did not focus on open education or were book publications (not articles) were eliminated. Finally, 245 articles (145 Scopus and 100 WoS) were selected for the SLR, and the following data were extracted: Authors, Title, DOI, Summary, and Country.

A form was used for the analysis to locate the answers to the questions. A three-peer review validated the identification of the answers. In the event of discrepancies, the peer reviewers discussed

their reasoning and reached agreements on the selection of responses, thus, approaching 100% verification of the data.

2.5. Phase 5: Data Synthesis

A data extraction form specifically related to the six SLR study questions was used to support the content analysis of the articles based on the study questions. Content analysis is a qualitative technique for making inferences from a focal text in a social context in an objective manner [40]. Two components were considered, one mechanical and one interpretative [41], the first involving organizing the data into the study topics, and the second involving determining which data were significant in terms of the research questions. We also worked with source triangulation [22], where the data were validated in a peer review to check the identification of the answers. Three peer reviewers clarified the information on the topics and questions. They reviewed the information and, in case of discrepancies, reached agreements on answer selections and approached 100% verification of the data.

To synthesize the answers, we developed classifications for the possible graphic representations to be presented in this report. We analyzed the terms, keywords, networks of co-terms, clusters, and concatenation of categories and subcategories to locate the intersections that could be interesting. The data of the analyses are presented in this integrated excel sheet: (Link: tiny.cc/SLR-OpenEducation).

3. Results

This section presents the results related to the research questions. The tools used for the graphs were Vosviewer and Tableau.

3.1. RQ1. Where Are the Authors of the Studies Located?

The first author of the articles was the one used in the analysis to locate geographically the authors who publish items on open education. Figure 3 shows that the United States and Spain are where the topic of open education has been most published in the period considered for this study. It also highlights the low production in the continents of Africa and Latin America.



Figure 3. The geographical location of the first author in open education articles.

The analysis of the author's locations indicates areas of opportunity for training and research in the regions of the global south, specifically in open education publications. It is precisely in these regions

where the increase in open education work could lead to other paths for education. For example, with the recent crisis of the COVID-19 pandemic, millions of students were left without training opportunities, and the lack of platforms, technological mediation, and infrastructure for sharing content became evident. To help with this, open education, with its downloadable content, quality, open books, open courses, and open practices, could be of value in offering new services in education.

3.2. RQ2. What Are the Most Cited Articles?

The publications were analyzed by the number of citations, and the articles with the highest number of citations were located [42–47]. The ID is the article identifier number in the database of this study (Table 3).

Table 3. Most cited articles.

ID	Authors	Title	Cited by
30	[42]	Refining success and dropout in massive open online courses based on the intention–behavior gap	19
32	[43]	Crowdsourcing the curriculum: Redefining e-learning practices through peer-generated approaches	12
44	[44]	MOOC-making and open educational practices	13
53	[45]	From Higher Education to Open Education: Challenges in the Transformation of an Online Traditional Course	12
58	[46]	Openness and praxis: Exploring the use of open educational practices in higher education	16
95	[47]	How educators build knowledge and expand their practice: The case of open education resources	13

What relationship can be found between the most cited articles on open education and educational innovation? The article contents provide evidence of critical factors that favor working in open education. Examples include (a) dropout rates vs. possibilities of success [42]; (b) educational innovation data that point to new strategies, such as the creation of open virtual communities and the functioning of open crowds online [43]; (c) changes in teachers' perspectives, such as occurred in open practices in Africa, where teachers' transformation as MOOC designers resulted in changes in attitudes and motivations that were studied [44]; (d) changes in students' perceptions of open courses (moving from an online course to an open course generated greater motivation because of the open resources used [45]). Educational innovation calls for changes that improve outcomes as a result of integrating something new. The most frequently cited articles deal with these value-added changes and provide an opportunity to study the outcomes of these educational innovations: are they new processes, new products, new services, or new knowledge?

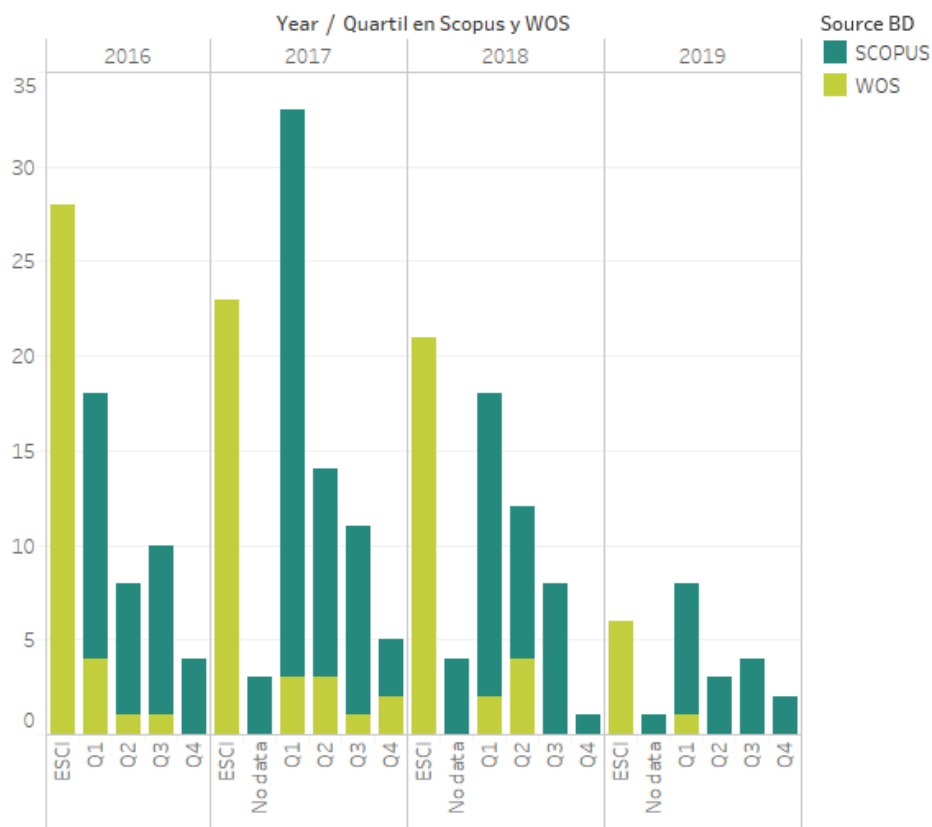
3.3. RQ3. In Which Journals Has Open Education Been Published More, and What Are the Q-Levels of the Journals?

The review also analyzed the journals that have published the most on the subject of open education (Table 4), the articles are placed in the database (DB), with the identification numbers (ID). Highlighting the International Review of Research in Open and Distance Learning and the journal Open Praxis.

Other data considered relevant were the Q-level of the journals and the number of publications in recent years, where 2017 stands out with the highest number of writings on the subject (Figure 4). The Emerging Sources Citation Index (ESCI) shows the high-quality, peer-reviewed articles indexed in WoS.

Table 4. Journals with the highest number of articles.

Source DB	#	Journal	ID
SCOPUS	26	International Review of Research in Open and Distance Learning	(4, 6, 27, 28, 33, 34, 36, 40, 50, 58, 59, 81, 87, 92, 94, 98, 102, 103, 105, 119, 120, 125, 128, 130, 131, 132)
WOS	23	Open Praxis	(147, 151, 161, 162, 163, 164, 165, 168, 172, 188, 194, 211, 213, 220, 223, 227, 232, 233, 234, 240, 246, 250)
WOS	6	Information Technologies and Learning Tools	(169, 196, 198, 199, 212, 226)
SCOPUS	5	Distance Education	(30, 41, 145, 175, 235)
SCOPUS	5	Journal of Computing in Higher Education	(44, 64, 97, 139, 182)
SCOPUS	5	Turkish Online Journal of Distance Education	(37, 79, 80, 108, 110)
WOS	4	ALSIC-Apprentissage des Langues et Systems d Information et de Communication	(148, 157, 186)
WOS	4	BRAIN-Broad Research in Artificial Intelligence and Neuroscience	(149, 167, 201, 248)

**Figure 4.** Q-level of the journal and year of publication.

Identifying the journals that have published the most on the subject of open education and the level of impact that their publications have had helps the academic community to find media that are disseminating the subject. This supports academicians, researchers, and decision-makers in configuring theoretical and empirical frameworks that support open practices. From a critical standpoint, the limited accessibility of this knowledge of open education in languages other than English stands out as an opportunity to bring it to emerging world communities where the English language is not the dominant one, as is the case in the countries of the Global South.

3.4. RQ4. What Are the Methodological Trends, Strategies, and Instruments Used in the Studies of Open Education?

A very important aspect when analyzing open education publications is to assess the methodological trend to detect the methods of study of the subject. We categorized the methodologies into three dimensions: (a) qualitative research methods (theoretical, narratives, phenomenological studies, grounded theory, ethnographies, case studies); (b) quantitative research methods (experimental design, quasi-experimental designs, pre-experimental, ex-post-facto trans-sectional designs, ex-post-facto longitudinal designs); and (c) mixed methods (sequential explanatory design, sequential exploratory design, sequential transformative design, concurrent triangulation design, concurrent nested design) [38,39].

The articles were analyzed by the methods and instruments used in the different themes of open education. Some examples using quantitative methodologies with case studies included open university programs with online chat analysis (ID 1), OpenCourseWare with Google Analytics (ID 4), and analysis of the adoption of open resources (ID 45). Qualitative studies with quasi-experimental designs used open educational resources (OER) in online learning and their in-course achievements were measured with surveys (ID 132). These also employed open cloud services and Web 2.0 to implement certain educational and managerial tasks of the school with experimental designs (ID 198), and other experimental designs utilized open-systems-network technologies with analysis (ID 199). Some mixed studies explored OpenText through an online survey (ID 6), open educational resources in K-12 with a focus group and survey (ID 9), and meanings of the open movement with Twitter data (ID 34).

Figure 5 (using the Vosviewer tool) shows the nodes of the methodological trends and the links with the strategies in those methodologies. Quantitative and qualitative studies stand out, and there is an incipient area of mixed methods.

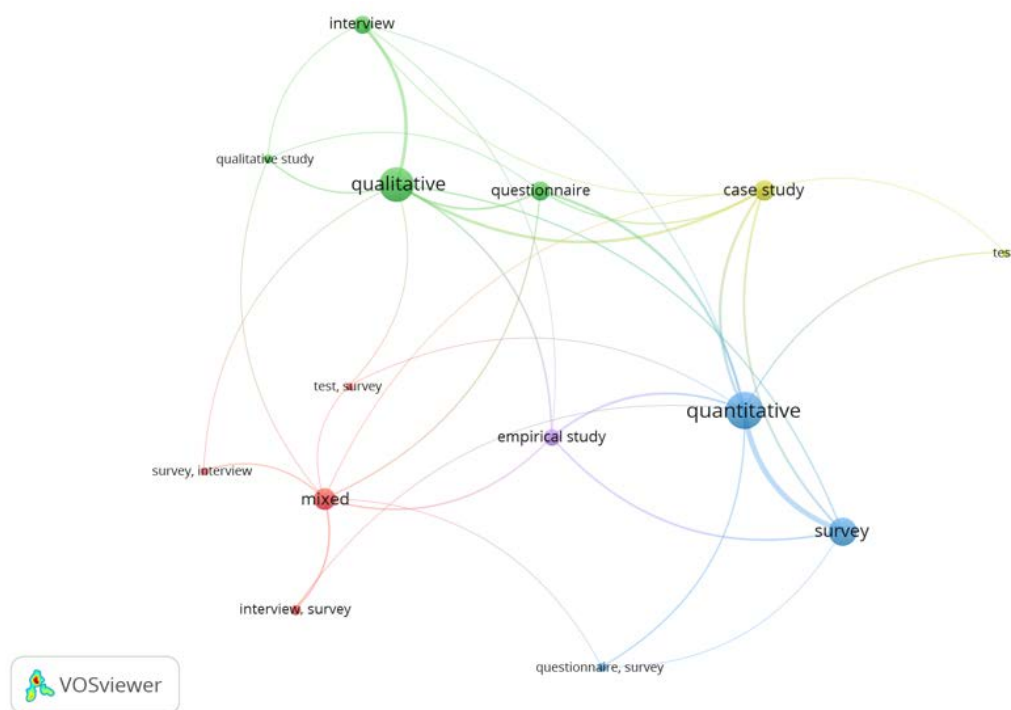


Figure 5. Methodological trends and instruments.

These facts highlight an area of opportunity to work on the issue of open education using a combination of strategies. However, one could ask what value would be added by studying open education using mixed methodologies, and in what ways could this contribute to research on educational innovation? A view with mixed methods supports the possibility of better knowledge

of complex phenomena, such as in the studies of education, the humanities, and the social sciences, where it is necessary to delve deeper and broaden scope. Providing new solutions requires in-depth looks at complex realities.

3.5. RQ5. What Core Dimensions Are Identified in the Practices of Open Education?

The articles were analyzed and located to identify the dimensions and their intersections. For example, the Leadership Dimensions crossed with Pedagogy were located in one of the most sensitive areas of open education, namely, work with special-needs communities, specifically with speech and language impairments. There, great success has been achieved using learning algorithms that are derived from the field of applied computer science in human biology: using the concept of spaced repetition provides a novel increase in the process of memorization among students in special-needs education in a global open education environment (ID 90).

An open learning management study aimed at providing a set of tools to assess the quality of online training activities supported by these platforms; it was classified at the crossing of Quality and Research (ID 214). At the crossroads of Strategies and Content, the experience of a MOOC on “Physical Culture: Theory” was placed on the national platform “Open Education” and attracted a large audience of listeners. The content motivated the students to study the theory of physical culture (ID 86). In the Technology dimension crossed with Research, an article was placed that analyzed the support of information technology to open science in promoting responsible research and innovation with analysis of Open Science, Open Access, Cloud Computing, and Open Educational Resources (ID 236).

The results in Figure 6 highlight the open education practices that are being worked on the most in open education. The analysis of the purposes of the practices (the what) vs. the transversal practices (the how) identifies the highest intersection to be that of Pedagogical Approaches and Technology. The least intersections are Content and Research crossed with the transversal practice of Quality.

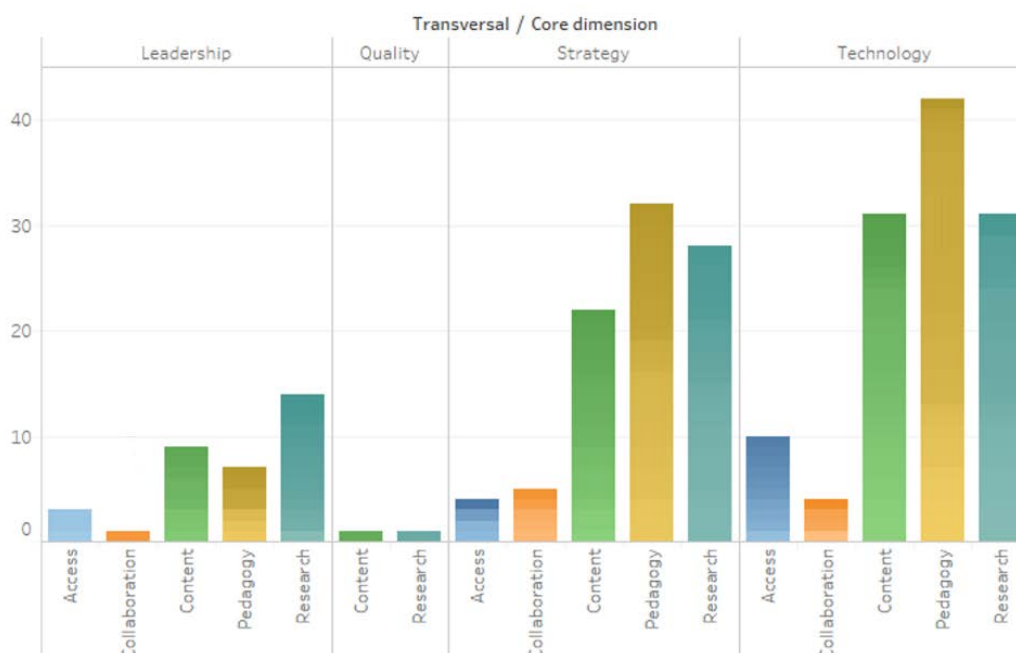


Figure 6. Core and transversal dimensions of open education.

These results reveal that open education has unfinished business in key areas for its consolidation and growth. In the cross-sectional area, the dimensions of Leadership and Quality require strategies that make it possible to influence more strategic work to get more people involved in decision-making. Likewise, quality work must be directed towards standards that are credible to potential users.

Other areas of opportunity for open education are found in the central themes of access, collaboration, content, and research. The COVID-19 pandemic is leaving many areas uncovered, especially in emerging countries. The lack of internet access and content is related to the lack of infrastructure, but equally critical is the lack of knowledge about open resources, open courses, and open education practices.

3.6. RQ6. What Transversal Dimensions Are Identified in the Articles, and What Practices of the Open Educational Movement Are Being Implemented?

The open educational movement understood as the set of practices, resources, and open-access technologies that involve the processes of production, use, dissemination, and mobilization of training, is linked to educational innovation through the seeking of a constant and intentional transformation of education. In this study, the educational innovations of the open education movement were analyzed to identify the open education practices that had the greatest impact. This was done through the selection of keywords and the formation of meanings for a similar understanding by the peer evaluators.

Some examples of the Production classification were given by a study of language teachers who designed teaching activities to promote the production of open educational resources (ID 157). This study was classified in the Technology and Pedagogy dimensions. The Use classification was given in a study that analyzed dropouts as a major concern in networked learning practices and where students used OER in a MOOC (openEDMOOC) (ID 165); this study fell into the Leadership and Content dimensions. An article classified in Dissemination studied the potential of open educational resources and open educational practices (OEP) to empower the developing world, with data from 7700 educators and formal and informal students from 175 countries. The findings were that OER and OEP could give women a voice, access to information and education, and the opportunity to connect with peers and train others (ID 232). This article fell in the Leadership and Research dimensions. Mobilization was the classification in the academic field for a presentation made at the 31st Annual Conference of NASIG by Heather Joseph. She offered an evaluation of the open access movement in all senses, that is, open education and open data as a public good. She explored the implications of the use of open education as an enabling strategy for researchers, academic publishers, policymakers, and the academic community in general. This study was crossed with the Strategy and Access dimensions (ID 21).

The preponderance of Dissemination puts it on the first level, followed by Production; the low incidence of Mobilization stands out. These practices were analyzed in the light of the central and transversal dimensions in order to locate where work is being done, targeting Strategy and Technology and the low-level Quality transversal dimensions (Figure 7).

The study researchers considered it interesting to cross the core/transverse dimensions [11] with the open education movement [7] because of the potential for educational practice, training, research, and decision-making. The question in this regard is what opportunities do these data suggest for educational innovation in open education? The results highlight again the areas of Leadership and Quality as the transversal dimensions needing work on new ideas, practices, or projects that facilitate the consolidation of open education. The opportunities, specifically, are to influence practices that enable access to information, open contents, collaboration for the co-creation of new products, services, and knowledge, and the mobilization of open practices in disadvantaged environments. These are strategic areas where the open education movement is challenged to draw attention to inclusion and diversity.

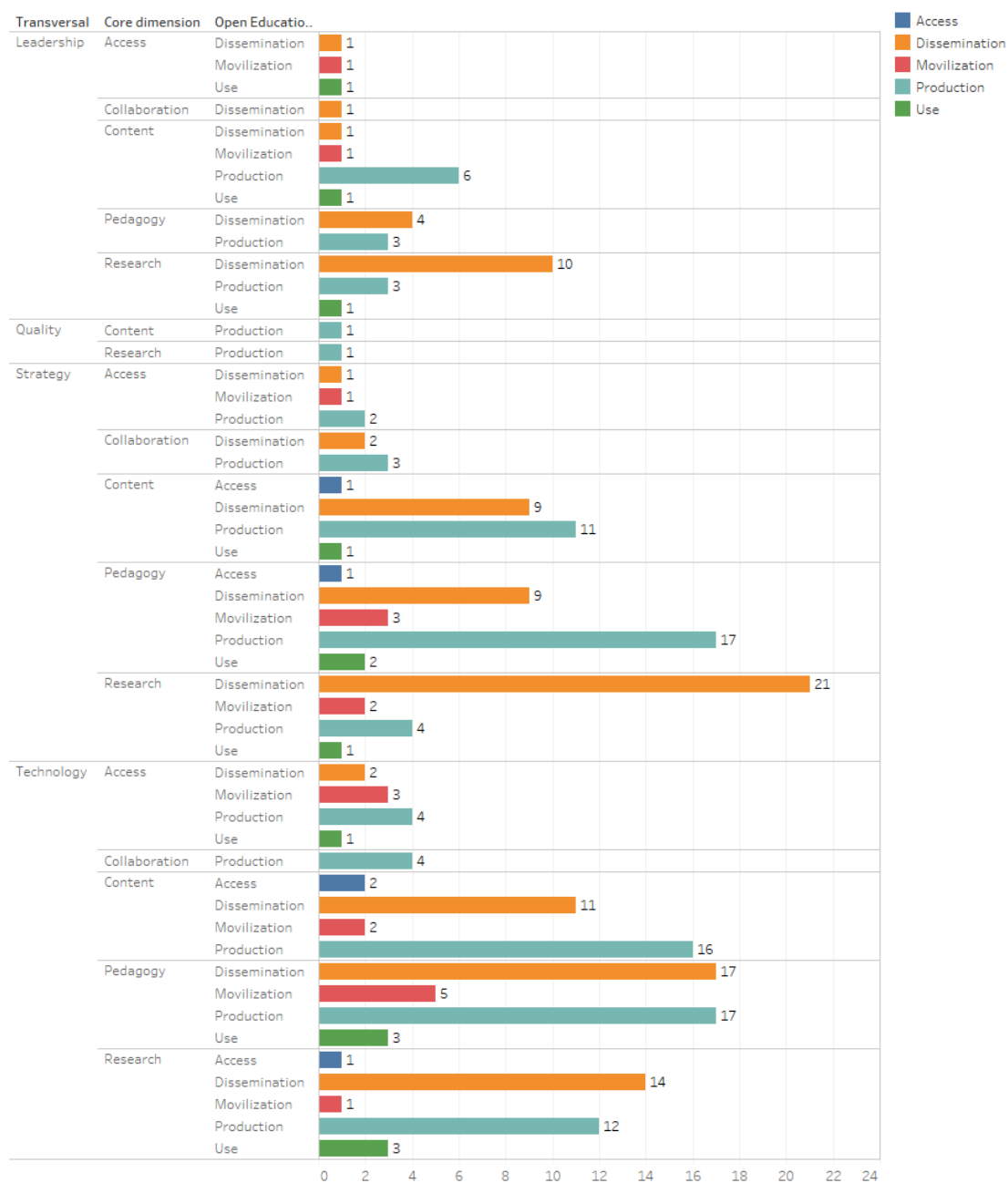


Figure 7. Cross-referencing the core/transversal dimensions [6] with the open education movement [3].

4. Discussion

The study presented does not intend to be exhaustive on the publications about open education. This review was directed only to publications indexed in two databases, which, although they are the ones with the greatest coverage, leave aside other databases with articles that have also contributed to the area. The methodology and the results provided in this study reflect the intention to contribute to research in the area of open education, crossing theoretical issues with educational innovation to identify the challenges that are discussed below. These perspectives are not frequently combined. The structure chosen to discuss the data is as follows: it starts with “Challenges” to highlight the main ideas that are desired to facilitate the utilization of open education. Next, the findings of the study are presented, followed by evidence for the results, the contrast with the theoretical framework on which the study was based, and the closing paragraphs that discuss the implications for educational practice.

Challenge 1. Open education for all. Studies on open education published in recent years show not only quantitative but also qualitative growth, mainly in developed countries. Figures 3 and 4 illustrate the growth in publications, while Tables 3 and 4 list the most frequently cited articles and the most widely published journals, which are distinguished by their levels of visibility and use. These presentations support the statement that open education is based on a form of high-quality content [12] and makes visible the challenge of access to materials in languages other than English and the philosophical vision of knowledge as a collective social product [14]. An important opportunity is opening up in emerging countries where this type of open education can contribute to access to quality knowledge.

Challenge 2. Open education with mixed empirical evidence. The methodological trends, strategies, and instruments that accompany studies of open education mark a quantitative and qualitative trend. Figure 3 presents the nodes of the methodological trends where an incipient area of mixed methods is evident. Working with mixed methods gives the possibility to approach the knowledge of complex entities [22]. Open education faces the challenge of a holistic and interdisciplinary understanding that implies changing the way research is done in the educational field.

Challenge 3. Open education of co-creation and quality. Open education practices have advanced in their pedagogical and technological dimensions and are challenged by aspects of collaboration and quality. Figure 6 shows the advances in the dimensions having to do with developing the practices and the means to do so. However, it also highlights the absence of writings in the dimensions of Quality, Collaboration, and Research. These findings relate to the need to make academic research more easily accessible [16], and that assessment supports the identification of changes that contribute to improving educational processes [1]. Working collaboratively and creatively will help the field of open education to provide broader enrichment based on quality practices for education.

Challenge 4. Open education for innovation in mobilization, inclusion, and diversity. The open education movement has promoted production and dissemination practices and is challenged to innovate mobilization practices that impact learning environments. Figure 7 highlights the advances in the practices of the open educational movement and shows the need to work more on aspects of mobilization where open practices are integrated into education. UNESCO's recommendations call for inclusive and equitable access and the promotion of international cooperation [34]. The challenges brought by global crises such as the COVID-19 contingency require the collaboration of all to construct innovative environments that are inclusive (with open resources and practices that support education for people with special needs or disadvantaged populations) and diverse (with open materials in different languages that address cultural and gender characteristics).

5. Conclusions

In times of contingency, such as that of COVID-19, educators, students, educational administrators, parents, decision-makers from ministries of education, and society in general need to expand the paths for education. In these difficulties, open education can support the continuation of training processes with more open educational resources so that, from home, students can continue learning on open platforms with courses taught by teachers trained to provide good practices in distance education and who mobilize academic networks to generate spaces for construction and containment. All open pedagogies, research, co-creation, innovation, texts, tools, courses, access, data, science, technologies, and practices within the framework of open education require commitment and collaboration.

The topic of open education carries with it a sense of the democratization of knowledge. It must be accessible to all, supportive, with actions that facilitate the social appropriation of knowledge. This is where educational innovation can generate improvements that lead to more just and equitable training, with academic and scientific practices that are accessible to all. The challenges are as broad as the possibilities.

This article provides an overview of publications that have been produced in recent years on the subject of open education. It aims to be of value to trainers by locating the thematic areas where less work

has been done on the subject (access, use, collaboration, and mobilization). For researchers, this work highlights the opportunity to increase studies with mixed methods that support the understanding of educational phenomena and encourages open research, open science, open innovation, and locating areas of opportunity. For decision-makers, this work highlights the necessity to locate strategies and lines of action, both transversal and central, that address the recommendations of UNESCO.

More studies of open education in disadvantaged environments are needed, where working with open resources, collaborative practices, and open platforms can contribute to quality training instances. There is also a need for studies in crises, such as the current health pandemic that has made visible the critical gaps in education. Research must also focus on good practices that address the results of new processes, products, services, and knowledge that support innovation in educational environments that lead to change and improvements. This document is an invitation for continuing contributions that expand knowledge in education and educational innovation.

Funding: This research was funded by the project “OpenSocialLab: linking experiential learning to scale levels of mastery in social entrepreneurship skills”, with funding from NOVUS 2019 Fund. The support of Tecnológico de Monterrey for educational innovation projects is appreciated (Agreement: Novus 2019).

Acknowledgments: The authors acknowledge the technical support of Writing Lab, TecLabs, Tecnológico de Monterrey, in the production of this work.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Valenzuela-González, J.R. La innovación como objeto de investigación: Problemas, tensiones y experiencias. In *Innovación Educativa. Investigación, Formación, Vinculación Y Visibilidad*; Ramírez-Montoya, M.S., Valenzuela-González, J.R., Eds.; Síntesis: Madrid, Spain, 2017; pp. 29–51.
2. Gallardo-Córdova, K.E.; Lozano Rodríguez, A.; Elizondo García, J. Innovación educativa en estudios de psicología educativa: Un mapeo sistemático. In *Innovación Educativa: Tendencias Globales De Investigación E Implicaciones Prácticas*; Ramírez-Montoya, M.S., Valenzuela González, J.R., Eds.; Octaedro: Barcelona, Spain, 2019; pp. 23–40.
3. Gómez-Zermeño, M.G.; Alemán de la Garza, L.; Portuguese, M.I.; Medina-Labrador, M.I. Innovación educativa en estudios sobre el desarrollo y uso de tecnologías: Una revisión sistemática de literatura. In *Innovación Educativa: Tendencias Globales De Investigación E Implicaciones Prácticas*; Ramírez-Montoya, M.S., Valenzuela González, J.R., Eds.; Octaedro: Barcelona, Spain, 2019; pp. 197–222.
4. Fernández-Cárdenas, J.M.; Reynaga-Peña, C.G.; González Nieto, N.A.; Reyes-Angona, S. Innovación educativa en estudios socioculturales: Un mapeo sistemático. In *Innovación Educativa: Tendencias Globales De Investigación E Implicaciones Prácticas*; Ramírez-Montoya, M.S., Valenzuela González, J.R., Eds.; Octaedro: Barcelona, Spain, 2019; pp. 99–120.
5. Ramírez-Montoya, M.S.; García-Peñalvo, F. Co-creation and open innovation: Systematic literature review. *Comunicar* **2018**, *54*. [[CrossRef](#)]
6. Ramírez-Montoya, M.S. Promoción de una cultura de innovación en instituciones educativas. In *Innovación Educativa. Investigación, Formación, Vinculación Y Visibilidad*; Ramírez-Montoya, M.S., Valenzuela-González, J.R., Eds.; Síntesis: Madrid, Spain, 2017; pp. 135–156.
7. Ramírez-Montoya, M.S. MOOCs and OER: Developments and contributions for open education and open science. In *Radical Solutions & Open Science An Open Approach to Boost Higher Education*; Burgos, D., Ed.; EEUU: Springer, NM, USA, 2019.
8. Ramírez-Montoya, M.S. Acceso abierto y su repercusión en la Sociedad del Conocimiento: Reflexiones de casos prácticos en Latinoamérica. *Educ. Knowl. Soc. (EKS)* **2015**, *16*, 103–118. [[CrossRef](#)]
9. Stracke, C.M. Quality Frameworks and Learning Design for Open Education. *Int. Rev. Res. Open Distrib. Learn.* **2019**, *20*, 180–203. [[CrossRef](#)]
10. Scival. Elsevier Tool. 2020. Available online: www.scival.com (accessed on 15 May 2020).
11. Dos Santos, A.I.; Punie, Y.; Castaño, J. Opening Up Education: A Support Framework for Higher Education Institutions. No. JRC101436. Joint Research Centre (Seville site). 2016. Available online: <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101436/jrc101436.pdf> (accessed on 15 March 2020).

12. Stracke, C.M. The Quality Reference Framework for MOOC Design. In *Transforming Learning with Meaningful Technologies, EC-TEL 2019. Lecture Notes in Computer Science*; Scheffel, M., Broisin, J., Pammer-Schindler, V., Ioannou, A., Schneider, J., Eds.; Springer: Cham, Switzerland, 2019; Volume 11722.
13. Schlagwein, D.; Conboy, K.; Feller, J.; Leimeister, J.; Morgan, L. "Openness" with and without Information Technology: A framework and a brief history. *J. Inf. Technol.* **2017**, *32*, 297–305. [[CrossRef](#)]
14. Brahim, H.B.; Khribi, M.K.; Jemni, M. Towards accessible open educational resources: Overview and challenges. In *Proceedings of the 6th International Conference on Information and Communication Technology and Accessibility (ICTA)*, Muscat, Oman, 19–21 December 2017. [[CrossRef](#)]
15. Gaskell, A.; Mills, R. The quality and reputation of open, distance, and e-learning: What are the challenges? *Open Learn.* **2014**, *29*, 190–205. [[CrossRef](#)]
16. Govindarajan, R.; Dhanavandan, S. Open Access Publishing Model: Preferences, Opportunities, and Challenges—An Opinion Survey Among Teaching Staff in Higher Education Institutions in Tamil Nadu. 2019. Available online: <https://digitalcommons.unl.edu/libphilprac/2613> (accessed on 15 March 2020).
17. Kaatrakoski, H.; Littlejohn, A.; Hood, N. Learning challenges in higher education: An analysis of contradictions within open educational practice. *High. Educ.* **2017**, *74*, 599–615. [[CrossRef](#)]
18. LeCounte, J.F.; Johnson, D. The MOOCs: Characteristics, benefits, and challenges to both industry and higher education. In *Handbook of Research on Innovative Technology Integration in Higher Education*; IGI Global: Hershey, PA, USA, 2015; pp. 228–247. [[CrossRef](#)]
19. Mishra, S. Open educational resources: Removing barriers from within. *Distance Educ.* **2017**, *38*, 369–380. [[CrossRef](#)]
20. Rodríguez, A.I.; González, Y.M. Scientific production in inclusive education: Progress and challenges [A produção científica na educação inclusiva: Avanços e desafios] [La producción científica en educación inclusiva: Avances y desafíos]. *Rev. Colomb de Educ.* **2020**, *1*, 383–418.
21. Weiyuan, Z.; Wei, L. Transformation from RTVUs to Open Universities in China: Current State and Challenges. *Int. Rev. Res. Open Distrib. Learn.* **2019**, *20*, 2–20. [[CrossRef](#)]
22. Ramírez-Montoya, M.S.; Lugo-Ocando, J. Systematic review of mixed methods in the framework of educational innovation. [Revisión sistemática de métodos mixtos en el marco de la innovación educativa]. *Comunicar* **2020**, *65*, 111349. [[CrossRef](#)]
23. Weller, M.; Jordan, K.; DeVries, I.; Rolfe, V. Mapping the open education landscape: Citation network analysis of historical open and distance education research. *Open Prax.* **2018**, *10*, 109–126. [[CrossRef](#)]
24. Tlili, A.; Huang, R.; Chang, T.; Nascimbeni, F.; Burgos, D. Open educational resources and practices in China: A systematic literature review. *Sustainability* **2019**, *11*, 4867. [[CrossRef](#)]
25. Ramírez-Montoya, M.S. Digital competences and open education in Latin America: Systematic Literature Review. *IEEE-RITA* **2020**, in press.
26. Dutta, I. Open Educational resources (OER): Opportunities and challenges for Indian higher education. *Turk. Online J. Distance Educ.* **2016**, *17*, 110–121. [[CrossRef](#)]
27. Seraphin, S.B.; Grizzell, J.A.; Kerr-German, A.; Perkins, M.A.; Grzanka, P.R.; Hardin, E.E. A conceptual framework for non-disposable assignments: Inspiring implementation, innovation, and research. *Psychol. Learn. Teach.* **2019**, *18*, 84–97. [[CrossRef](#)]
28. Bali, M.; Cronin, C.; Jhangiani, R.S. Framing open educational practices from a social justice perspective. *J. Interact. Media Educ.* **2020**, *10*. [[CrossRef](#)]
29. Benlamri, R.; Klett, F.; Wang, M. Models, technologies, and approaches toward widening the open access to learning and education. *Knowl. Manag. E-Learn. Int. J.* **2016**, *8*, 1–9.
30. Ramírez-Montoya, M.S.; McGreal, R.; García-Peñalvo, F.J. Ciencia y saberes compartidos, Acceso abierto, tecnologías y educación (shared science and knowledge. open access, technology and education). *Rev. Comun.* **2018**, *26*, 1–4.
31. García-López, R.I.; Salazar, O.C.; Ramírez-Montoya, M.S.; Tenorio-Sepúlveda, G.C. Competencies for production, search, diffusion and mobilization of open educational resources. *Int. Educ. Stud.* **2017**, *10*, 78. [[CrossRef](#)]
32. García, B.J.; Tenorio, G.C.; Ramírez-Montoya, M.S. Self-motivation challenges for student involvement in the open educational movement with MOOC. *Int. J. Educ. Technol. High. Educ.* **2015**, *12*, 91–104. [[CrossRef](#)]
33. Glasserman, M.; Leonardo, D. Ramírez-Montoya, M.S. Formación de investigadores educativos mediante el diseño de recursos educativos abiertos y móviles. *Rev. Investig. Educ. Esc. Grad. Educ.* **2015**, *5*, 36–42.

34. UNESCO. Recommendation on Open Educational Resources (OER). *Legal Instruments*. 2019. Available online: http://portal.unesco.org/en/ev.php-URL_ID=49556&URL_DO=DO_TOPIC&URL_SECTION=201.html (accessed on 15 March 2020).
35. Kitchenham, B.; Charters, S. *Guidelines for Performing Systematic Literature Reviews in Software Engineering*; Keele University & the University of Durham: Newcastle-under-Lyme, UK, 2007.
36. Verner, J.M.; Brereton, O.P.; Kitchenham, B.A.; Turner, M.; Niazi, M. Risk Mitigation Advice for Global Software Development from Systematic Literature Reviews. 2012. Available online: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.467.2122&rep=rep1&type=pdf> (accessed on 15 March 2020).
37. University of York, Systematic review. CRD, University of York. 2009. Available online: <https://bit.ly/2zJzE0E> (accessed on 15 March 2020).
38. Harwell, M. Research design in qualitative/quantitative/mixed methods. In *The SAGE Handbook for Research in Education: Pursuing Ideas as the Keystone of Exemplary Inquiry*; Conrad, C., Serlin, R., Eds.; SAGE Publications: Thousand Oaks, CA, USA, 2014. [CrossRef]
39. González, J.R.V.; Fahara, M.F. *Fundamentos De Investigación Educativa*; Editorial Digital Tecnológico de Monterrey: Monterrey, Mexico, 2013.
40. Bauer, M. Classical content analysis: A review. In *Qualitative Researching with Text, Image, and Sound*; Bauer, M.W., Gaskell, G., Eds.; Sage: London, UK, 2000; pp. 132–151. [CrossRef]
41. Brewerton, P.M.; Millward, L.J. *Organizational Research Methods*; Sage: London, UK, 2001. [CrossRef]
42. Henderikx, M.A.; Kreijns, K.; Kalz, M. Refining success and dropout in massive open online courses based on the intention–behavior gap. *Distance Educ.* **2017**, *38*, 353–368. [CrossRef]
43. Paulin, D.; Haythornthwaite, C. Crowdsourcing the curriculum: Redefining e-learning practices through peer-generated approaches. *Inf. Soc.* **2016**, *32*, 130–142. [CrossRef]
44. Czerniewicz, L.; Deacon, A.; Glover, M.; Walji, S. MOOC-making, and Open Educational Practices. *J. Comput. High. Educ.* **2017**, *29*, 81–97. [CrossRef]
45. Nunez, J.L.M.; Caro, E.T.; Gonzalez, J.R.H. From higher education to open education: Challenges in the transformation of an online traditional course. *IEEE Trans. Educ.* **2017**, *60*, 134–142. [CrossRef]
46. Cronin, C. Openness and praxis: Exploring the use of open educational practices in higher education. *Int. Rev. Res. Open Distance Learn.* **2017**, *18*, 15–34. [CrossRef]
47. Littlejohn, A.; Hood, N. How educators build knowledge and expand their practice: The case of open education resources. *Br. J. Educ. Technol.* **2017**, *48*, 499–510. [CrossRef]



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