

Co-creation of OER by teachers and teacher educators in Colombia

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Summary

This chapter, based on research conducted by members of the Collaborative Co-Creation of Open Educational Resources by Teachers and Teacher Educators in Colombia (coKREA) project, assesses whether and how a contextually based, bottom-up approach to the promotion and advocacy of Open Educational Resources (OER) – in which teachers are encouraged to collaboratively co-create resources – supports the adoption of OER in Colombian schools.

The study, conducted with public school teachers in southwestern Colombia, used a Participatory Action Research approach, in which the object of study is not external to the researchers, as the social practices under study are performed by the same subjects who are conducting the investigation. This allows teachers to identify possibilities of OER in their own educational practices, as well as the conditions required for their adoption, based on collective thinking processes immersed in their own sociocultural contexts.

A call for research participation was issued to teachers who were experienced in using information and communication technologies (ICT) in their teaching. The data collection process was undertaken through administration of a series of online questionnaires (completed by 19 teachers), a survey (completed by 248 teachers), webinars (in which 28 teachers connected and 14 participated actively), unstructured telephone interviews (with 30 teachers) and a series of focus group discussions (with a cohort of 49 teacher educators, teachers and students). A face-to-face workshop was also conducted with teachers to provide an introduction to OER, after which they identified challenges to incorporating OER into their pedagogical practices and discussed their own OER-related activities. ►

Data analysis followed a rigorous Grounded Theory process and involved an “approach stage” to identify key teacher practices; a “deepening stage” to uncover relationships and affinities; and a “condensation phase” to surface a theory of change.

The main finding in this study is that teachers create and use OER more effectively when they receive flexible and continuous pedagogical support that: (1) fosters pedagogical practices drawing upon constructivist models, so that teachers and students have an active role in the creation and recreation of knowledge; (2) promotes open licensing that respects authors’ rights, but allows for legal reuse and adaptation; and (3) facilitates the use of ICT available in schools and at home to access, create and share OER. Similarly, it was found that this pedagogical support generated better outcomes when teacher teams work around a project in their schools instead of attending general training sessions on OER.

The key recommendation is that pedagogical support be provided to encourage team-based teacher OER development projects within schools.

Acronyms and abbreviations

CA	Axial Category (from Spanish acronym)
CN	Core Category (from Spanish acronym)
coKREA	Collaborative Co-Creation of Open Educational Resources by Teachers and Teacher Educators in Colombia
CS	Selective Category (from Spanish acronym)
FOSS	Free and Open Source Software
ieRed	Educational Research Network comprised of schoolteachers, university professors and others professionals related to the education sector. Teacher educators associated with this study belonged to this network.
ICT	information and communication technologies (<i>Tecnologías de la Información y las Comunicaciones</i> [TIC] in Spanish)
OEP	Open Educational Practices (<i>Prácticas Educativas Abiertas</i> [PEA] in Spanish)
OER	Open Educational Resources (<i>Recursos Educativos Abiertos</i> [REA] or <i>Recursos Educativos Digitales Abiertos</i> [REDA] in Spanish)
PAR	Participatory Action Research (<i>Investigación – Acción Participación</i> [IAP] in Spanish)
ROER4D	Research on Open Educational Resources for Development project
UNESCO	United Nations Educational, Scientific and Cultural Organization

Introduction

The 21st century has been marked by deep social changes associated with the rise of a new knowledge-based economy which requires that individuals and organisations be capable of mastering technologies in order to innovate and constantly adapt to a rapidly changing

global environment (Castells, 2000). There is a global commitment to develop these new social skills in order to achieve effective and efficient management of knowledge through information and communication technologies (ICT).

In the field of education, particularly in Latin America, ICT-related policies have been proposed from three perspectives: (1) economic: to be competitive as a nation to achieve greater prosperity and quality of life; (2) social: closing digital gaps to reduce social divides, and expanding the possibilities of participation in an interconnected world; and (3) educational: changing teaching practices to help students develop skills in line with the needs of emerging markets (Sunkel, Trucco & Möller, 2011; Valdivia, 2008).

The Colombian case has not been different. Since 2000, economic and social policies have promoted access to ICT and quality education as strategic priorities for national development (Colombia Departamento Nacional de Planeación, 2000). In fact, the government's projection is that by 2019, "all Colombians [will be] connected and informed, making efficient use of ICTs to improve social inclusion and competitiveness" [author translation] (Colombia Ministerio de Comunicaciones, 2008, p.4). Thus, activities in the education sector have focused on providing technological infrastructure; digital literacy and the appropriation of ICT for teaching and school management; and the creation of educational content and access thereto through online portals (Colombia Ministerio de Educación Nacional, 2013). In terms of the challenges that have been experienced in Colombia, Open Educational Resources (OER) are also recognised as an important part of addressing the access and quality challenges in education experienced by countries transitioning from developing to developed status, as reflected in Daniel, Kanwar and Uvalic-Trumbic's (2006) analysis of the future of higher education.

By opening access to resources created globally, as well as providing opportunities for revision and reuse of those resources, OER are seen as a potential mechanism to address existing quality concerns. Apart from impacting the quality of learning materials, it is claimed that the quality of teaching practices and the quality of learning outcomes can also be improved by opening up the content creation process for formal peer review and informal public scrutiny (Petrides, Jimes, Middleton-Dezner & Howell, 2010). Moreover, Wiley, Hilton III, Ellington and Hall (2012) suggest that the utilisation of open textbooks can reduce the overall cost of curricular resources by over 50% in middle and high school sectors. The development and use of OER and their potential to expand access, decrease costs and improve the quality of education is therefore one of the emerging issues in educational discourse today, particularly in developing countries where there is a dearth of quality materials (Kanwar, Kodhandaraman & Umar, 2010).

Current adoption of OER by teachers and institutions in the Global South does, however, seem to be marginal. Hatakka comments that while "OER initiatives are very commendable and needed, open content is not being used by educational organizations in developing countries (or rather the usage of the free resources is low)" (2009, p.1). There is therefore a need to understand the factors that impact upon the adoption of OER in the Global South along sociocultural, educational and technosocial dimensions.

Sociocultural context

The global OER movement is located predominantly in the geopolitical North and most OER programmes, as well as OER websites, portals and delivery channels, are located

in Northern institutions (Zancanaro, Todesco & Ramos, 2015). Given that educational systems in the North have an advantage in terms of institutional maturity and the methods and processes employed in curricular resource design and development, their resources may *prima facie* appear superior. OER-based educational approaches have the potential to further strengthen the hegemony of the North in the global educational sphere by expanding the diffusion and reach of Northern OER (Cobo, 2013).

Another important consideration for local content stems from the diverse backgrounds of learners. Learner characteristics in the Global South are likely to be quite different from those of learners in the North, reflecting, among other things, the diversity in their prior learning contexts and learning experiences as well as their sociocultural backgrounds (Gun, 2003). This situation is reinforced in the Colombian context – a country with wide cultural diversity, which creates considerable challenges for the recognition and strengthening of local ethnic identities from a content and methodological perspective.

Most openly licensed educational resources are in English (Krelja Kurelovic, 2016), but only 1% of the Colombian population is considered bilingual, and only 6.5% of higher education students have a good level of oral and written English comprehension (Sánchez, 2013). In the case of Colombia, the dearth of Spanish-language OER may therefore hinder the adoption of OER.

Furthermore, previous research in the Global South has noted the existence of socioeconomic, cultural, institutional and national issues that inhibit the realisation of OER (Ngimwa, 2010). Hence, there is a need to explore how these issues could be addressed to overcome the challenges inherent in the adoption of OER in Southern contexts in general and in Colombia in particular.

Educational context

The relatively modern educational philosophy of constructivism argues that learning is social in nature, so it is appropriate for teaching processes to promote constant interaction among individuals. The goal is to seek methodologies that promote learning through social exchange and use teaching content strongly related to the local culture (Coll et al., 2007). This perspective argues that curricular resources need to be revised for local needs and contexts, as there are no universal benchmarks of quality (Moreno, Anaya, Benavides, Hernandez & Hernández, 2011).

In a South African study, Sapire and Reed (2011) explored whether collaborative design and redesign of materials can enhance quality while containing time and resource costs, and whether such collaboration encourages uptake of OER as well as further redesign to accommodate the needs of particular teachers and students. They concluded that effective collaborative design and redesign of existing materials contributes to solving these challenges, while allowing these materials to be used in a wide range of contexts (Sapire & Reed, 2011).

In their study of the Community College Open Textbook Project, Petrides, Jimes, Middleton-Detzner, Walling and Weiss (2011) found that access to OER and the possibility of collaborative creation using these resources encourages teachers to interact with each other and improve their educational practices. Furthermore, these interactions between teachers and students contribute to breaking existing educational paradigms in which teaching is done in a class to transmit the knowledge of the teacher to the students, learning

is achieved through memorisation of data by the student, and the validity of the knowledge is determined by the hierarchy of the teacher. In light of these results, there is a need to examine the factors and processes that would determine whether a similar impact could be obtained in a Global South country such as Colombia, given the differences in overall institutional and learning contexts.

In Colombia there is a long-standing tradition in education that the use of existing resources – as opposed to the production or creation of resources by teachers – is paramount, resulting in ongoing requests that students purchase textbooks (Torres & Moreno, 2008). Until recently, neither the government nor educational institutions had thought of utilising incentives to encourage teachers to create and share their own materials. In this regard, it is worth noting that in 2014 and 2015 a national initiative was developed to involve teachers in the creation of digital educational resources for public access.¹

Within this context, it is an important consideration that Colombia is a country with a strong oral tradition which favours knowledge-sharing through personal interaction over formal and academic writing (Hernandez, 2015). This predominance of oral culture can hinder teachers' processes of planning, structuring and producing educational resources (Castro, Catebiel & Hernandez, 2005a; Lieberman, 2013).

Another noteworthy feature of the Colombian environment is that educational policies (or any new innovation, such as OER) are generally received with suspicion, resulting in multiple forms of resistance to prevent or delay their implementation. An example of this is the pronouncement against the policies of the Ministry of National Education presented in July 2016 by ASOINCA, one of the teacher unions in the region, in which ideas such as "ICT are a tool that the State comes implementing to displace teachers with programs such as *telesecundaria* where a teacher is no longer needed but a system operator" [author translation] (p.2) are being used as an argument for teachers to "not attend meetings and trainings that are initiated [by the state] to impose these programmes when we clearly know that they threaten public education, our acquired rights and job stability" [author translation] (p.3).

Traditionally, educational policies are not developed in consultation with stakeholders in the schooling system, meaning that teachers' expectations, needs and knowledge of local realities are largely ignored (Fullan, 2002). This lack of recognition of the teachers' role in decision-making processes, among other things, keeps them tied to their traditional forms of instruction, even when they engage in training and other processes of professional development led by the government (Benavides, 2015). It is therefore important to promote bottom-up approaches for the adoption of OER in schools through projects that take into account local realities as well as teachers' expectations and contextual needs.

Technosocial context

Since 2000, there have been a series of government programmes providing Colombian schools with computers, digital devices and teacher training. Impact studies of these programmes evaluating their influence on education quality have yielded conflicting results (Barrera & Linden, 2009; Rodríguez, Sánchez & Márquez, 2011). For example,

1 <http://www.colombiaaprende.edu.co/html/micrositios/1752/w3-propertyname-3020.html>

the Colombian teacher training programmes in ICT, though important in terms of teacher exposure to multiple approaches towards utilising technology in the classroom, have failed to make an impact on teaching practices (Hernández, 2015; Hernandez & Benavides, 2012; Narváez & Calderón, 2016) This results in a situation in which ICT is reserved exclusively for information transmission in the classroom rather than stimulating information-creation processes and fostering student creativity (Sáenz, Hernandez & Hernández, 2014).

The situation suggests that a complex set of techno-pedagogic skills (Harris, Mishra & Koehler, 2009) are needed to advance teaching practice and that there is a need for research to understand the influence of ICT in the adoption of OER by teachers. Within this context, there is not only an imperative to ensure availability and access to technological infrastructure and educational content, but also a need for teachers to identify the advantages and learning possibilities of new platforms and open resources (Kaplún, 2005; Moreno et al., 2011; Watson, 2001).

With regards to connectivity, public government reports reveal positive internet access statistics,² but different parts of the country are still struggling to receive optimal, continuous service. This is particularly a factor in rural areas, which may also suffer from unreliable electricity supply (Hernandez & Benavides, 2012; Narváez & Calderón, 2016). In this respect, even though an increasing number of users are connecting to the internet using mobile devices, this does not necessarily mean that sufficient infrastructure is in place in schools to ensure uninterrupted access to virtual environments and online platforms for accessing educational resources.

Conceptual and theoretical framework

This study draws upon the United Nations Educational, Scientific and Cultural Organization (UNESCO) definition of OER as “teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and distribution by others with no or limited restrictions” (UNESCO, 2012, p.1). Within the context of this definition, it is important to emphasise two aspects that differentiate OER from other resources: (1) the explicit permission of use and redistribution at no cost (Lozano, Ramírez & Celaya, 2010); and (2) the ability to use or adapt them as components of other resources (Gértrudix, Álvarez, Galisteo del Valle, Gálvez de la Cuesta & Gértrudix, 2007; Moreno et al., 2011).

While content published on the internet may be publicly available, meaning that anyone has the right to see or hear the information (Botero, 2011; Butcher, 2015), copyright restrictions impose limitations in terms of third-party copying, adaptation and distribution. In order to conduct activities of this kind without the express permission of the author or copyright holder, an open licence is required – the terms of which will determine the extent and nature of possible reuse (Schmitz, 2009).

The ability to adapt resources is central to the idea of OER. When teachers take an OER and modify it, they compare the content, methodologies and cultural aspects implicit in the resource, appraising it in light of their educational needs. This process allows teachers

² <http://www.mintic.gov.co/portal/604/w3-article-11345.html>

to analyse and improve their pedagogical practices (De los Arcos, Farrow, Pitt, Weller & McAndrew, 2016; Petrides et al., 2011). OER are also, in some instances, adapted and distributed by students (Grinsztajn, Steiznberg, Córdoba & Miguez, 2015). We thus see a move towards an educational paradigm in which teachers and students can both operate as agents in creating knowledge in a more equal fashion – a principle which forms the basis of Open Educational Practices (OEP) (Hegarty, 2015; Stagg, 2014).

A review of approximately 150 academic journal articles on the subject³ shows that most teachers working on OER in the Latin American context are located in Spanish and Mexican universities, and few resources are being produced for the basic (K–12) education sector. In this review, it is noteworthy that users assume OER to be any publicly available online educational resources, usually without being explicit or clear about the concept of legal or technical openness (Cedillo, Romero, Peralta, Toledo & Reyes, 2010; Pinzón, Poveda & Pérez, 2015; Rodríguez, Tellez & Vértiz, 2010). The word “open” is used as a synonym for “free access”, ignoring the legal permission for others to adapt, remix and share these resources through open licensing provisions, even though this is the key aspect of UNESCO’s definition of OER.

Key issues of concern raised in the OER research studies reviewed include: search and selection criteria, quality assessment criteria, technical compatibility and financial sustainability associated with the production of these type of resources (Contreras, 2010; Glasserman & Ramírez, 2014). The issue of public access to OER through repositories and the creation of indexing mechanisms is also a matter of keen interest (Gértrudix et al., 2007; Sanz, Sánchez & Doderó, 2011).

In Colombia, two government initiatives to promote OER uptake have been implemented. The first was a programme called *Recursos Educativos Digitales Abiertos* (REDA) (Open Educational Digital Resources) which was active until 2016 and which aimed to strengthen and bolster the production, management and use of OER in higher education institutions. For this purpose, a platform was created to support institutional repositories and a metadata standard was adapted for OER publication (Colombia Ministerio de Educación Nacional, 2012). Secondly, between 2014 and 2016, national government financed the development of digital OER for K–12 through Regional Educational Innovation Centers.⁴ However, the idea of openness in these cases is limited to producing resources which are free to the user rather than integrating open licensing and, by extension, promoting other characteristics of OER such as modifying or remixing.

Despite these efforts on the part of government, it is unusual to find Colombian teachers integrating OER in their educational practices. In cases where OER are used, it is generally only as an additional information source and not as a medium to generate new interactions in the classroom in terms of content selection, revision and creation (Anaya, Hernandez & Hernández, 2010). In this sense, teachers’ use of any supplementary resources seems to be replicating the usual instructivist mode they adopt when using school textbooks (Glasserman & Ramírez, 2014).

It must be taken into account that the relevance of OER for education goes beyond the ability to legally access, share and distribute content. Its principal value lies in the affordance

3 Articles were retrieved from the following repositories: <http://redalyc.org>, <https://dialnet.unirioja.es> and <http://www.scielo.org>.

4 <http://www.colombiaaprende.edu.co/html/micrositios/1752/w3-propertyname-3020.html>

for anyone to take advantage of open licensing characteristics – encapsulated in Wiley’s 5Rs (retain, reuse, revise, remix and redistribute)⁵ – to stimulate learning processes through collaboratively creating and recreating information in the classroom. Within this context, OER can become a mechanism for engaging with and recording the traditions and characteristics of a local context, and are not merely closed, unidirectional products for delivering information (Sáenz et al., 2014). As such, pedagogical practices that create, reuse, revise, remix, retain and redistribute OER are understood in the context of this study as OEP.

The Open Educational Quality Initiative, an international network in which UNESCO was a participant, defined OEP and its relation with OER as “practices which support the (re) use and production of OER through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning path” (OPAL, 2011, p.12). Accordingly, DeRosa and Robison (2017) argue that in addition to free access to content, one of the affordances provided by OER is that students can assume the role of producers of the ideas which are circulating around the world. Therefore, in the context of this study, the adoption of OER is seen as part of a more encompassing set of OEP, as it enables reflection and transformation of teachers’ pedagogical practices.

OER adoption and the new kinds of pedagogical approaches it enables rely on a complex set of legal mechanisms that facilitate open content sharing. In Colombia, copyright legislation is framed in the tradition of European continental law, meaning that legal protection in intellectual creation lies with the author. There is also no legal doctrine of “fair use” – a feature of the American legal system which makes provision for educational use of copyrighted materials – making provision for use of copyright-protected content in a classroom setting. Domestic copyright law does establish a list of limitations and exceptions to copyright under certain conditions pertaining to time, manner and specific place (usually associated with non-profit use), but few exceptions refer to the educational process (Colombia Congreso de la República, 1982). The exceptions allowed currently refer to quoting fragments of a work; photocopying elements of a work for teaching or evaluation; or communicating a work in an educational institution to the educational community (Comunidad Andina de Naciones, 1993).

Current copyright exceptions in Colombian copyright law do not address scenarios such as downloading images or videos from the internet and incorporating these into educational resources which are designed to be freely reused and redistributed. Neither do they address everyday practices such as electronic document sharing through online platforms such as blogs, or the modification and publication of a work as part of a learning exercise. Strengthening and promoting the global knowledge commons through alternative copyright approaches such as Creative Commons licensing is, therefore, essential (Lessig, 2004), particularly in the promotion of educational models focused on collaboration and the use of new technologies for the creation and recreation of contextualised knowledge (Hernández, Hernandez & Sáenz, 2014).

Studies like the ones conducted by Antúnez (1999), Castro, Catebiel and Hernandez (2005b) and Montero (2011) have found that daily teaching work is usually performed individually, showing that collaboration with other teachers in materials production is very unusual and that the engagement of teachers in communities of practice is rare.

5 <https://opencontent.org/blog/archives/3221>

Although multiple factors shape the nature of the teaching process, it is important to recognise that the isolated approach is promoted by an education system with a hierarchical and rigid organisational structure that does not give space, time or incentive to develop collaborative teaching practices (Castro et al., 2005b). Moreover, some teachers may also utilise the isolation factor to avoid questions about their knowledge, pedagogical approaches and teaching methods (Antúnez, 1999; Montero, 2011).

Learning and collaborative work among teachers commonly generates difficulties and resistance. However, when it is possible for teachers to work with others, conditions can be improved in order to ensure the continuity of any transformation processes affecting their teaching practices. According to Antúnez (1999), this occurs when a group provides emotional support and collective recognition, and contributes to the resolution of questions and problems in a timely fashion, providing an incentive to persist with the collaboration despite the difficulties encountered.

According to the literature review by Collazos, Muñoz and Hernández (2014), the essential components required for successful collaborative work are: positive interdependence, meaning that what affects one member also affects the rest of the group; personal responsibility, in which everyone in the group knows what their role is; interpersonal skills necessary to negotiate and resolve conflicts; and ongoing group evaluation.

This collaborative way of working is underpinned by Coll et al.'s (2007) constructivist conception of learning and teaching, based on the ideas of Vygotsky, Piaget and Ausubel. From this perspective, it is clear that learning is not an individual action, limited to the act of copying or reproducing concepts; teaching should therefore not focus on transmitting information, but on developing activities to enable people to reconstruct concepts through their previous knowledge and interaction with others. In this sense, learning leads to the creation of personal conceptions of knowledge, which makes it meaningful.

Developing pedagogical practices from a constructivist approach raises the need for educational resources with a licence that allows for adaptation and use with other resources, and which does not discriminate in terms of teacher or student activity. Therefore, OER can be seen as mediation tools aligned with the constructivist approach, facilitating the processes of creation and recreation of knowledge amongst multiple individuals.

Despite an increased focus on collaboration in the learning process, the existence of pedagogical perspectives such as constructivism, and government programmes in Colombia supporting the production of OER, most everyday educational processes focus on the idea of the unidirectional transmission of information. In the process of teacher training, it is actually quite typical that the curriculum is centred on developing individual competences rather than collaborative strategies, even though this procedure generates a lesser impact (Barrera & Linden, 2009; Benavides, 2015).

Getting teachers to align themselves with this constructivist approach implies not only providing training on technological, pedagogical and legal aspects, but also on offering continuous pedagogical support based on teachers' personal interests and promoting collaborative work between colleagues (Benavides, 2015). Pedagogical support constitutes a mentoring methodology in which a teacher or a professional with teaching experience undertakes a series of in-school meetings with other teachers or with a small group of teachers around a project or particular experience (Mogollón & Solano, 2011). The meetings are intended to provide advice on the design, planning, execution and recording

of teaching and learning activities to be conducted by a teacher or group, so that the project or teaching experience not only achieves the expected outcome, but also constitutes a source of learning for other teachers (Huayta, Gómez, Atencio & Arias, 2008).

When working with teachers from the perspective of pedagogical support, there is mutual recognition and dialogue, providing possibilities for the exchange of views, experiences, beliefs, expectations and aspirations that come into play in educational practices, even though they are not necessarily consciously acknowledged by teachers (Restrepo, 2004). This approach implies that teacher facilitators need to acknowledge that teachers have tacit knowledge arising from their own experiences, which is valuable in the educational context in which they work and which may not directly match codified educational theories and methodologies. It also requires a dialogical encounter, which is the recognition from teachers that teacher facilitators can contribute to their teaching practices based on their knowledge and experiences (Martínez & González, 2010).

Pedagogical support is intended to broaden the perspective of teachers' pedagogical practice, offering theoretical and methodological perspectives through which to recognise the limits of their current teaching practices and identify possible ways to enhance them. In order to achieve this, the support process should consider the following activities, as proposed by Huayta et al. (2008): design and development together with teaching practices; design instruments for collecting and analysing information to assess outcomes and impacts achieved; provide emotional and educational support for teachers in order to assist them in persevering despite difficulties; and encourage review of their progress, outcomes and lessons learned through teaching events or academic publications.

The provision of pedagogical support to foster collaborative work among teachers and to promote teaching and learning from a constructivist approach using OER constituted the methodological basis of this research study. Therefore, the assumed principles are:

1. All content (both educational and other) contains in itself the values and ideologies of the society in which it is created. Therefore, in order to minimise the cultural influence of the North where the production of OER is currently focused, it is necessary that teachers in the Global South transform themselves from being educational content consumers to creators of these resources, incorporating the particularities of their sociocultural context.
2. Production of educational content is commonly carried out by teams of experts, which is not only insufficient to meet the demands of the education sector, but also means that resources typically have a universal perspective, which usually does not respond to the requirements and educational needs of teachers in particular local contexts. Therefore, in order to achieve a model of continuous, relevant and sustainable production of OER, teachers need to be introduced to collaborative processes of co-creation and publication.
3. To take optimal advantage of the potential of OER in education requires that teachers not only use these resources, but also undertake processes of contextualising, curating and co-creating educational resources as part of their usual pedagogical practice.

Bearing in mind the problems and context of the Colombian education system, as well as the general assumptions raised above, the broad objectives of this study are:

1. To study how a collaborative and local OER model can be embedded within the ecosystem of a teacher community in Colombia.
2. To understand how an “adaptation-curation-creation” OER model can contribute to effective use of OER for teacher development.

The primary research question that guided the study is: Whether and how does a contextual, bottom-up approach, in which teachers collaboratively and actively co-create resources, support the adoption of OER in Colombian schools?

In order to deepen and analyse the key dimensions raised in this study, the following research sub-questions were identified as key points of study and analysis:

1. What kind of processes would support a community of teachers in actively engaging with the creation and adaptation of a contextually situated and collaborative OER model?
2. What enabling conditions would encourage wider adoption by peers of contextually created OER within the community?
3. What new skills are required among teachers and teacher educators to adopt a new learning culture with OER?
4. How do local needs and contexts (local language, local culture, social issues, geographies, ecology, needs, aspirations, priorities, etc.) impact upon the universal (mostly defined through normative systems of the Global North) versus local notions of meaningfulness/quality of OER?
5. How do institutional and systemic factors in a public system, which are perceived as compartmentalised and hierarchical, interact with and influence the building of a participatory OER model within the government/public system?

The research presented in this study was undertaken under the auspices of the Collaborative Co-Creation of Open Educational Resources by Teachers and Teacher Educators in Colombia (coKREA) project,⁶ hosted by the Karisma Foundation of Colombia. The name “coKREA” combines “co” (the Colombian country code which also functions as an abbreviation for “collaboration”), while the “K” stands for the Karisma Foundation, and the “REA” represents the Spanish acronym for OER. The project name was also chosen because “KREA” references the term “to create”.

Methodology

Given the primary aim of establishing whether and how a contextual, bottom-up approach, in which teachers collaboratively and actively co-create resources, supports the adoption of OER in Colombian schools, it was necessary to adopt a methodology which supported a “bottom-up” investigation process that took place alongside teachers, rather than them being mere subjects of the research process (Restrepo, 2002). Participatory Action Research (PAR) (Kemmis & McTaggart, 2005) was therefore deemed to be the most appropriate methodology.

6 CoKREA project website: <http://karisma.org.co/cokrea>

The object of study in PAR focuses on human actions that are considered problematic or unacceptable for a social group, and which require a practical solution (Kemmis & McTaggart, 2005). Unlike other research methodologies, the object of study is not external to the researchers because the social practices under study are performed by the same subjects who are conducting the investigation (Elliott, 2000). Kemmis and McTaggart argue that “Three particular attributes are often used to distinguish participatory research from conventional research: shared ownership of research projects, community-based analysis of social problems, and an orientation toward community action” (2005, p.273). In other words, PAR provides “opportunities for co-developing processes *with* people rather than *for* people” (McIntyre, 2008, p.xii).

According to Elliott (2000), the theoretical construction of PAR implies that the participants involved in the research process deepen their understanding of the common sense guiding their actions. Elliott acknowledges that common sense is imprecise and vague when confronted with scientific theories, but the apparent imprecision is favourable in that it allows participants to identify the contradictions and complexities of the social practices under investigation, allowing them to make decisions conducive to more coherent action, which is the aim of this research process.

In PAR, the aim is not to produce models that can objectively predict the behavioural characteristics of the phenomena studied, as many scientific theories do. PAR is instead a substantive or a human action theory that is validated in conversation with participants and not directed to the deduction and verification of theoretical categories (Elliott, 2000).

PAR proposes a model of reflection and action iteratively determined with the participants, through the following phases (Elliott, 2000; Kemmis & McTaggart, 2005):

1. Diagnosis of the problem situation in the educational practice.
2. Formulation of action strategies to solve the problem.
3. Implementation and evaluation of strategies.
4. Diagnosis of new problem situations.

Finally, this methodology is founded on the recognition that collaborative work has more impact on human actions than individual work (Kemmis & McTaggart, 2005).

Addressing this research study through a PAR approach allowed teachers to identify possibilities of OER in their own educational practices, as well as the conditions required for their adoption, based on collective thinking processes immersed in their own contexts. In this way, it was intended that teachers approach and adopt OER-related concepts based on personal interest – not as a means to fulfil the requirement of a possible Colombian government policy or other in-house school policies. It is important to consider that, as proposed by Fullan (2002), processes of educational change require a deep commitment from people, which can be achieved by involving them in the definition and implementation of policies and programmes designed to achieve this objective.

Involving teachers as researchers of their own practices did, however, pose a challenge for the study design. First of all, because the rules governing a school teacher’s work in Colombia do not include the allocation of time for research activities or strong incentives to be included in this type of process, it was difficult to find teacher-researchers at this education level. On the other hand, as evidenced by previous research on training processes for pedagogical appropriation of ICTs in southwest Colombia (Hernandez & Benavides,

2012), teachers are more interested in receiving training on ICT usage than pondering pedagogical views regarding these technologies. However, in this same research study it was also found that offering ICT training contributes to engaging teachers in reflexive processes relating to their own practice. This perspective, also proposed by Kaplún (2005), informed the processes adopted in this study.

Research site

This study was conducted with a group of teachers from public schools in southwestern Colombia, which includes the departments⁷ of Valle del Cauca, Cauca, Nariño and Putumayo. This is a region of great geographical, cultural and socioeconomic diversity, where there are few cities, high levels of unsatisfied basic needs, and the main focus of economic activity is agriculture, livestock farming and mining.

The region was selected as the site for this study for the following reasons:

1. It is representative of the socioeconomic, cultural and technological conditions in large parts of Latin America.
2. It had the support of the Educational Research Network (ieRed) – a network of school and university teachers, researchers and teacher trainers involved in various teacher training programmes and projects in ICT – which facilitated the call for participation amongst teachers who are leaders in incorporating ICT in K–12 education.

Research participant selection process

As noted, subjects in a PAR process are the same individuals who are conducting the study to address their own practice. For this reason, the call for research participation was undertaken among school teachers in southwestern Colombia who were experienced in using ICT in their teaching practice. The call for participation was made through ieRed and was directed at teachers who had already attended government ICT training processes, thereby ensuring that they had some expertise in computer use and classroom teaching experience with technology.

To participate, teachers had to form groups of at least three individuals from the same school. In order to minimise resistance to teamwork, there were no restrictions placed on the collaborative teacher groups in terms of subject area or level of ICT expertise. However, some teachers opted not to participate in the study due to the condition of collaborative work.

Research process

The phases of the research process were as follows:

Phase 0: Call for participation and establishment of teacher teams.

⁷ Colombia is divided into 32 departments. These are in turn divided into municipalities.

Phase 1: Implementation of seven virtual seminars and a workshop with teacher educators in the city of Popayán aimed at providing an introduction to OER for the adoption, curation and development of these types of resources within educational practices; the objective of the PAR study; pedagogical approaches; Creative Commons licensing and Free and Open Source Software (FOSS).

Phase 2: Identification, along with the teachers, of the educational problems related to their pedagogical practices in response to which they could adopt, curate and create OER collaboratively and configure OEP with each group of teachers.

Phase 3: Collection of information (with teachers) about their own OER-related activities from the beginning and analysis thereof in light of the study's sub-questions. This phase occurred alongside each of the other phases and included meetings at the end of the research process to analyse and determine the conclusions drawn throughout the investigation.

Finally, another way in which teachers' reflections and learnings were collected throughout the research process was through coKREA's Audiovisual Memory sharing strategy, conceived to highlight ideas regarding processes, results and learnings through the voices of the teachers themselves, making it possible to expand the dialogue around Open Education. This strategy includes a series of videos that were circulated via social networks in the second half of 2016.⁸

Data collection

Considering the non-allocation of time for research activities of school teachers and the low initial interest in being researchers of their own pedagogical practice, the project coordination team developed and applied data collection instruments and carried out their initial processing. The intention was to reduce the number of meetings dedicated to reflection upon the actions taken to appropriate OER, and to optimise the short time that teachers voluntarily dedicated to this study; this was done in an attempt to sustain their interest in the process.

The following data collection instruments were used:

- Questionnaires: While questionnaires are commonly seen as an instrument administered to a sample of people to collect information on a specific topic and to analyse it in a quantitative way (Corral, 2010), in this research study questionnaires were designed with open questions to inquire about previous ideas from the virtual seminars and analyse this information in a qualitative way.
- Chat records: Chats allow one to examine what people say in written form during informal conversations. The recording of these conversations generates texts through which one can analyse the ideas expressed by people and the relationship they establish with others (Orellana & Sánchez, 2006).
- Interviews: Interviews are intentional conversations of limited duration which are specialised or focused on an issue of common interest (Deslauriers, 2004). In this

⁸ The audiovisual memory of the coKREA project can be found at <https://karisma.org.co/cokrea/?p=1290>.

study, interviews were used as a means to uncover the relationship between teachers' initial expectations about the project and their perceptions after their participation in the first research phase.

- Focus groups: Focus groups are interviews with a group of people. Their value lies in the fact that collective dialogue helps people to remember their actions, specify their judgements and identify shared behaviours and social values (Deslauriers, 2004). In this study, focus groups were undertaken to explore activities associated with the research and comment on the analysis of the data.

Table 1 provides an overview of the data collection instruments and the research phase with which each is associated.

Table 1: Overview of instruments used in data collection process

Instrument	Description	Phase
Questionnaires	Seven questionnaires: Teachers' responses to a set of online questionnaires with open questions about their ideas and opinions gathered from the topics of virtual sessions. Questionnaires were completed voluntarily by an average of 19 teachers before each session. These data are available in Spanish: https://goo.gl/9zpW0V https://goo.gl/9zpW0V https://goo.gl/9zpW0V	1
	One survey: Teachers' responses to the online survey on access to ICT and access to and creation of OER. This questionnaire was a Spanish translation of the instrument designed collectively by the ROER4D researcher network. It was completed by 248 school teachers, 16 of whom were part of the coKREA project. These data are available in Spanish: https://goo.gl/Sm3TXd	3
Chat record	Seven webinars: An Internet Relay Chat session was established as an interactive channel during the "Introduction to OER" webinar, through which teachers' comments, questions and concerns were collected. On average, 28 teachers were connected per session, of whom 14 on average participated actively throughout with comments, opinions and questions. These data are available in Spanish: https://goo.gl/3QnGFK https://goo.gl/3QnGFK https://goo.gl/3QnGFK	1
Interview	Thirty unstructured telephone interviews: Notes were taken by the research team on telephone conversations conducted with teachers to assess Phase 1. Phone calls were made to 30 teachers associated with the project. These data are available in Spanish: https://goo.gl/O758r4 https://goo.gl/O758r4 https://goo.gl/O758r4	1

Focus groups	One focus group with teacher teams: Discussion to establish how teachers were engaging with the coKREA project and their views on the “Introduction to OER” phase. A face-to-face focus group with five teacher educators and a virtual interview with one additional teacher was undertaken. These data are available in Spanish: https://goo.gl/lbY92Z https://goo.gl/lbY92Z https://goo.gl/lbY92Z	1
	Two focus groups with team leader teachers: Meetings with teachers to discuss data analysis and the experience of creating OER. The first meeting was held virtually to discuss preliminary findings from data collected in Phase 1 of the project (nine teachers participated). The second meeting was conducted in person with a teacher educator living near Popayán in order to assess her experience. These data are available in Spanish: https://goo.gl/aHYyZn https://goo.gl/aHYyZn https://goo.gl/aHYyZn	2
	Six focus groups with teacher teams: Interviews with teams to share their views and experiences regarding the adoption of OER (four on average per focus group). These data are available in Spanish: https://goo.gl/X72qHW https://goo.gl/X72qHW https://goo.gl/X72qHW	3
	Two focus groups with students: Meetings with groups of students who participated in teacher-led activities on the use and creation of OER, aimed at better understanding their opinions and experiences (10 students participated). These data are available in Spanish: https://goo.gl/HXytfah https://goo.gl/HXytfah https://goo.gl/HXytfah	3

Data collected at each phase of the investigation were de-identified and published via the coKREA website under Creative Commons Attribution (CC BY) licences so that any interested parties (particularly teachers participating in the project) could undertake their own analysis of the data.⁹ The dataset is comprised of eight separate files, seven of which contain interview transcripts, and answers to open questions in questionnaires or chat logs; the other file is a spreadsheet with statistics from a survey with closed questions about OER. All data are in Spanish, the mother tongue of the participants. The collected data, the form of processing and its publication have the consent of the participants.

The data de-identification process entailed assigning codes for each instrument and establishing an encryption system for teachers' names (Table 2).

Table 2: Explanation of codes used in the data de-identification process

Explanation of codes	Options (In parentheses, the word in Spanish)	Example
Research phase	E1: Phase 1 (<i>Etapa 1</i>) E2: Phase 2 (<i>Etapa 2</i>) E3: Phase 3 (<i>Etapa 3</i>)	E3 E3.2ED.R2.59.ALS
Number of data collection instruments	The number at the beginning of each phase	2
Instrument type	C: Questionnaire (<i>Cuestionario</i>) R: Chat record (<i>Registro</i>) E: Interviews and focus groups (<i>Entrevista</i>)	E

⁹ The open data arising from this study are available (in Spanish) at <https://karisma.org.co/cokrea/?p=1007>.

Person with whom the instrument is associated	D: Teacher (<i>Docente</i>) E: Student (<i>Estudiante</i>)	D
Type of activity and sequence	R: Meeting (<i>Reunión</i>) S: Session (<i>Sesión</i>) P: Question (<i>Pregunta</i>)	R2
Number assigned to the paragraph of the transcript	The sequence restarts in each file	59
Initial assigned to each teacher	A random combination of unique letters assigned for each teacher	ALS

When referring to an instrument, it is identified by its code (for instance, E3.2ED), and when transcript fragments are used to illustrate a concept or category of analysis, an alphanumeric sequence is associated with them (as in the case of E3.2ED.R2.59.ALS). This coding system means that the instrument can be identified, as well as the associated session, meeting or specific question and paragraph from where it was extracted.

Data analysis

Collaborative reflection and action processes on the studied phenomenon are an important feature of data analysis in the PAR approach (Elliott, 2000). PAR does not, however, specify methods for analysing the reflection process. For this reason, it was decided to use Grounded Theory, which provides a series of procedures and techniques for analysing unstructured information, enabling the extraction of elements to understand and act on the social realities of research interest (Strauss & Corbin, 2002).

In the development of each of the phases, the project coordination team compiled and coded the records. This prior organisation of the information was undertaken to facilitate and expedite the process of analysis with the teachers in the small amount of time they had for this work. The information was processed utilising LibreOffice and CmapTools concept mapping software, both FOSS products. These activities were beneficial to the participant teachers, in that they facilitated the establishment of a collective analysis process in just a few meetings. This provided a means of circumventing the challenges associated with the limited amount of time available and the teachers' low levels of willingness to engage with research activities.

The Grounded Theory approach was undertaken in three principal stages, allowing for progressive data analysis developed in line with the research:

1. **Approach stage (research phases 1 and 2):** The initial stage was focused on creating various opportunities for conversation in order to identify, through teachers' observation of their own actions and those of others, the differences between ICT-supported teaching practices in general and teaching practices utilising OER through webinars, virtual meetings, interviews and focus groups. Open coding was used to group teachers' ideas into Open Categories.
2. **Deepening stage (research phases 2 and 3):** The Open Categories were then organised and classified according to their relationships and affinity with the research sub-questions, using axial coding to synthesise recurring themes. Later, these Axial

Categories were validated in conversation with teachers, establishing how these themes resonated with their experience and grouping them through Selective Categories, which constituted the substantive research theory.

3. **Condensation stage (research phase 3):** This is the stage in which the conversation between substantive theory and formal theory occurs. This was carried out with teachers, allowing the emergence of the Core Category (CN in Spanish), which provides an explanation of the social phenomenon studied.

Figure 1 provides a graphic representation of the data analysis process.

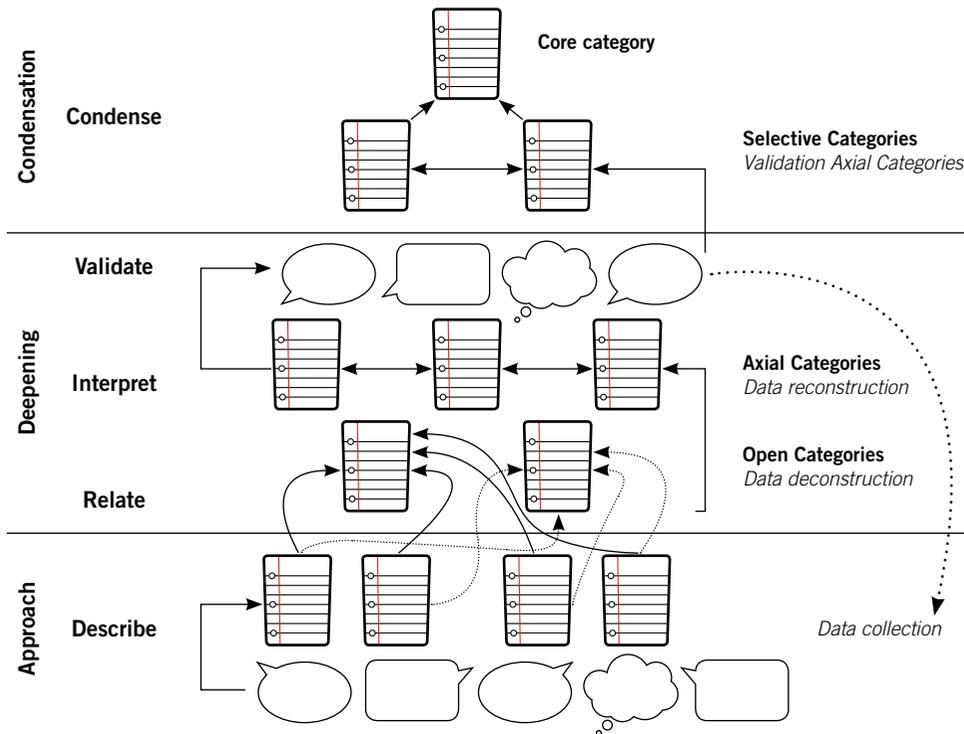


Figure 1: Qualitative data analysis process based on the Grounded Theory approach

In the Findings section, the categories are coded for easy tracking. In the case of Axial Categories, this code has four elements: the first two letters indicate the Axial Categories (CA in Spanish), followed by the question associated with it, and finally a letter listing the different dimensions of the answer to the question (e.g. CA1A, CA1B).

In the case of the Selective Categories, the code has only two parts: the first two letters indicate that it is a Selective Category (CS in Spanish) and then a sequential number (e.g. CS1, CS2).

Findings

In keeping with the PAR approach, research stages included some activities aimed at the adaptation-curation-creation of OER by teachers, while other activities were specifically designed to respond to the research question and sub-questions.

In Phase 0 (comprising the call for participation and establishment of teacher teams), 11 groups, comprised of 48 teachers, were formed in 11 schools in four departments of southwest Colombia: one in Risaralda, two in Valle del Cauca, seven in Cauca and one in Putumayo.¹⁰ Of the 48 teachers participating in the study, 20 were women and 28 were men.

Of the 11 groups, 10 were comprised of high school teachers and one was composed of primary school teachers. Ten of the groups included teachers from different disciplines working on cross-cutting projects, and one group consisted of mathematics teachers only. The groups' composition showed that teachers decided to team up with people with whom they had a personal affinity based on their work style, rather than with colleagues with whom they shared the same disciplinary area.

Not all groups were involved in the entire investigation. Of the 11 groups, six developed OER under an OEP framework. The remaining five groups withdrew their participation at different stages of the investigation. The study coordination team noted that the dropout was due in large part to the teachers' lack of interest in moving from oral discourse to written production, which is necessary for the development, adaptation and curation of OER. Likewise, there was a greater willingness to participate in workshops on the use of technological tools than in the activities of pedagogical reflection on Open Education. Another factor that discouraged involvement was the difficulty teachers experienced with group work, since project activities were group oriented. Ultimately, 22 teachers from six groups actively participated in the project.

In Phase 1, seven virtual seminars were held, which were offered openly so that others could contribute to topics under discussion. Sessions were recorded and published on the project's website.¹¹ In the seven virtual seminars, there was an average attendance of 17 teachers involved with the project and 14 unrelated participants.

In the course of conducting these online introductions to OER seminars, the research team was able to identify three consecutive reactions that each teacher had in order to recognise the implications of the Colombian copyright regime and the application of open licensing in their daily practice of accessing, producing and exchanging content in the classroom (described in more detail in Sáenz et al., 2014):

1. Resistance and anger at copyright limitations in terms of reproducing and adapting works, where the general feeling expressed by teachers can be summarised in two phrases: "It's not fair" and "I have my hands tied in terms of trying to do my work".
2. Interest in understanding the alternatives provided by open licensing, beginning to express statements like: "What if ...?" and "How do I search with open licences?"
3. The decision to share. In all cases, teachers expressed the importance of conveying issues around copyright limitation to principals, students and colleagues. In several cases, this became a direct action or invitation to support activities in their educational institutions or to incorporate the subject of Creative Commons licensing in their curriculum.

¹⁰ A map with the location of schools is available at https://karisma.org.co/cokrea/?page_id=622.

¹¹ https://karisma.org.co/cokrea/?page_id=46

Phase 2 focused on the design and development of experiences around the adaptation-creation of OER in relation to various kinds of OEP. A total of 16 OER were published, three of which were blogs, one was a workshop exercise and 12 were virtual learning objects. Of the 16 OER, six were created by several authors together to be used transversally in their respective school areas, and 10 were created by individual authors.¹² Regardless of whether OER were generated individually or collectively, the teachers in each group supported each other in the design, revision and evaluation of their resources, with the assistance of the research team.

In analysing the OER created by teachers, the research team identified five dimensions regarding the advantages of these types of resources in education:

1. **OER as content-systematising teaching strategies.**¹³ This finding is consistent with other research which found that innovations in teaching strategies by school teachers generally have a limited range because there is no practice of documenting or publishing them (Castro et al., 2005b; Lieberman, 2013). Similar to the findings of Anaya and Hernandez (2008), this study found that the learning objects published as OER not only contain the content taught, but also reflect how teachers were conducting their classroom work.
2. **Content creation and experiences related to the local sociocultural context.**¹⁴ Events in small towns or rural areas are rarely reported upon in the media. It is also uncommon to find information such as photos and videos about local news on the internet, and even less common to find openly licensed content. Consistent with the findings of Anaya and Hernandez (2008), this study found that the ability to create and adapt OER informed by teachers' own classroom realities serves as a recognition of the importance of local context, fostering the creation and publication of information based on their environment. This not only serves to make the region more visible, but also influences the way it is perceived by teachers and students, which is vital in the process of identity construction.
3. **Adaptation and reuse of openly licensed content.**¹⁵ Being able to modify or adapt a work was one of the most exciting benefits of open content mentioned by the teachers. It was also found that it helps in that it saves time and money because it leverages content produced by other authors. This supports findings from a study by Wiley et al. (2012) in the United States. Most of the openly licensed content reused by the teachers in this study was comprised of Wikipedia articles, as well as photos and videos obtained from Flickr, YouTube and Wikimedia Commons.
4. **Incorporation of Creative Commons licensing in the curricula.**¹⁶ Several teachers began to engage peers and students on issues around copyright and open

12 The OER created by teachers are available at https://karisma.org.co/cokrea/?page_id=1079.

13 An example of the OER dimension as content-systematising teaching strategies is the OER "*Conociendo la dinámica de mi ciudad*" ("Knowing the dynamics of my city"): https://karisma.org.co/cokrea/?page_id=1130

14 An example of the dimension of "Content creation and experiences related to the local sociocultural context" is the OER "*La minería ¿Una enfermedad o solución para el Quilichagüeño?*" ("Mining: A disease or solution for the Quilichagüeño?"): <https://karisma.org.co/cokrea/?p=724>

15 An example of the dimension "Adaptation and reuse of openly licensed content" is the OER "*Estadística en contexto*" ("Statistics in context"): <https://karisma.org.co/cokrea/?p=716>

16 An example of the dimension "Incorporation of Creative Commons licensing in the curricula" is the OER "*Aprendiendo sobre licencias Creative Commons*" ("Learning about Creative Commons licenses"): <https://karisma.org.co/cokrea/?p=711>

licensing based on their experience in this research process. They explained this action based on the fact that recognising the rights and duties to their own works and those of others is part of the comprehensive training that should be provided by the school, and that teachers have a responsibility to know and set a good example on the subject. They also had an interest in spreading open licensing practice, recognising that licensing content in this way promotes an atmosphere of cooperation and interaction underpinned by mutual recognition, as well as more conscious participation in content creation from a legal perspective (see further detail in Hernández et al., 2014).

5. **FOSS to support educational processes.**¹⁷ In the adaptation, curation and creation of OER produced by the teachers, the use of free and/or open software (eXeLearning, LibreOffice, Audacity) was encouraged to promote greater coherence between the technologies used and the open licensing approach to promote social values within an open culture framework, as suggested by Lessig (2004). The use of these types of tools also facilitated expansion of the functionality of teachers' computers with programmes intended to offer web services in the school's local network environment (Moodle, Etherpad, MediaWiki). These strategies were particularly important in order to avoid the usual issues associated with limited internet bandwidth (as reported in more detail in Ortiz, Caldón & Hernandez, 2015).

These dimensions demonstrate the study's influence in terms of supporting a group of teachers in identifying the potential of OER for their educational practice, as well as generating an interest in copyright and Creative Commons licensing as a cross-cutting issue, implicit in all aspects of their work with their students as well as their fellow teachers. Some educators have become Open Education ambassadors within and outside of their educational institutions, not only by setting an example through publishing their OER, but also through implementing changes to their curricula, incorporating open licensing as a criterion for the delivery of school assignments, organising lectures and institutional workshops, and sharing their experiences at local academic events.¹⁸

Phase 3 was comprised of both the collection and processing of data, which was done alongside the activities in Phases 1 and 2, as well as the collective analysis and reflection based on the main question and sub-questions of this research. The findings of the study are presented according to the three stages associated with Grounded Theory: approach, deepening and condensation.

It is noteworthy that as part of the PAR process, teachers were encouraged to share the results of the analysis of their pedagogical experiences with OER at different events. Consequently, when teachers communicated their reflections on their classroom practices, they could learn from their own pedagogical experiences, teach others and improve their teaching and learning processes with OER. Specifically, participant teachers developed 22 presentations and two posters for academic events in 2015 and 2016, and six groups of teachers produced reflection texts about their experience with OER. The outcome of this

17 An example of FOSS to support educational processes is the OER "*Taller no. 1: Razonamiento lógico*" ("Workshop no. 1: Logical reasoning"): https://karisma.org.co/cokreal/?page_id=1132

18 A list of the academic events in which the teachers presented their experience around OER is available at https://karisma.org.co/cokreal/?page_id=997.

written production was considered a particular achievement, as school teachers in Colombia largely subscribe to an oral tradition from which it is difficult to undertake systematisation and writing processes (even when based on their own experiences).

Approach stage: Opening the reality of creation, adoption and curation of OER in Colombian schools

In order to relate the Open Categories to the five sub-questions that support the primary research question, the Axial Categories occur as dimensions of the answers given to each sub-question. The analysis of the relationships and hierarchies found between Axial Categories is synthesised in the Selective Categories. In the tables and figures which follow, the abbreviation CA is used for the axial categories and CS for the selective categories (based on the Spanish acronym).

As an extension of this analysis, this section shows only the Axial Categories with a representative quotation from all the categories. Each quotation is presented as an excerpt with the Axial Category it represents. It is presented in this way to facilitate reading in Spanish (the mother tongue of the teachers and researchers in this study) and translation into English. At the end of the section, a table summarising the relationships between these categories and the Selective Categories is shared.

Sub-question 1: What kinds of processes would support a community of teachers in actively engaging with the creation and adaptation of a contextually situated and collaborative OER model?

The study revealed that any teacher training process conceived to promote the appropriation of OER should consider the following four principles:

Principle 1: Teacher training should be focused on continuous pedagogical support rather than just training (CA1A).¹⁹

Spanish (original)	English (translation)
<p><i>“Yo lo que recomiendo es que las próximas capacitaciones que nos de la Secretaría de Educación pues sean así como la que ustedes nos están haciendo. Que no es venir y dar una charla e irse, es con seguimiento, nos están acompañando, nos corrigen, nos dan alternativas de solución a las problemáticas que nosotros planteamos, y pues nos ha parecido muy interesante. Yo pienso que el resto de compañeros, si tienen ese mismo acompañamiento que ustedes nos están brindando a nosotros, pues van a sentir más interés por capacitarse y cambiar la forma como están trabajando actualmente.”</i> (E3-2ED.R2.63.ANI)</p>	<p><i>“I hope that the next training undertaken by the Secretariat of Education will be like the one you’re doing. It is not to come and give a lecture and leave, but also to follow up what we do; to accompany us, correct us, give us alternative solutions to [educational] issues that we raised, as that was very interesting. I think if other teachers have that same kind of support, they will be more interested in receiving training and change how they are currently working.”</i> (E3-2ED.R2.63.ANI)</p>

¹⁹ In Colombia, the Education Secretariats are administrative offices attached to the municipal authorities or departmental governments. They aim to coordinate and verify compliance with national policies in the educational institutions under their charge. One of their duties is to offer teacher training courses.

Principle 2: OER should be created and used within constructivist pedagogical models (CA1B).

Spanish (original)	English (translation)
<i>“Pienso que los REA son herramientas necesarias para que los niños construyan, modifiquen y compartan conocimientos. Además de fomentar la comunicación.”</i> (E1-2RD.S6.20.AUA)	<i>“I think OER are necessary tools for kids to build, modify and share knowledge, in addition to fostering communication.”</i> (E1-2RD.S6.20.AUA)

Principle 3: Collaboration among teachers for creating OER should be promoted (CA1C).

Spanish (original)	English (translation)
<i>“Los maestros trabajamos muy aislados, como que cada quien hace lo suyo y ya. Nos falta eso de saber trabajar en equipo, de planear cosas juntos. Porque uno sí se colabora, pero en cosas puntuales, no es una colaboración en el sentido de trabajar las clases de forma articulada ... hacer proyectos interdisciplinarios o esto, es complejo por eso.”</i> (E3-2ED.R1.5.ALI)	<i>“Teachers work in a very isolated manner, and everyone does his/her thing and that’s all. We lack that knowledge of how to undertake teamwork, planning things together. Because we collaborate but in specific things; it is not a partnership in the sense of teaching together ... doing interdisciplinary projects. It is so complex.”</i> (E3-2ED.R1.5.ALI)

Principle 4: Opportunities to share and publish educational experiences as OER should be encouraged (CA1D).

Spanish (original)	English (translation)
<i>“Estoy muy emocionado con el tema ... las personas se asustan al principio porque no saben cómo es, pero es de explicar. Yo quiero hablarle a todo el mundo de esto.”</i> (E2-1RD.S1.16.LRE)	<i>“I am excited about the subject ... people are scared at first because they do not know what OER are, but it is easy to do, they only need someone to explain it. That’s why I want to tell everyone about this.”</i> (E2-1RD.S1.16.LRE)

Sub-question 2: What enabling conditions would encourage wider adoption by peers of contextually created OER within the community?

The findings of this research indicate that the following three conditions are required to foster greater contextualisation and creation of OER by teachers in Colombia:

Condition 1: The existence of policy and programmes, nationally and locally, to foster the adaptation, curation and creation of OER (CA2A).

Spanish (original)	English (translation)
<i>“Incluso [en] los mismos libros para las instituciones se debería también propender por recursos abiertos, son cambios que pueden empezar desde la Secretaría, pero lastimosamente a eso se le da tan poca importancia.”</i> (E3-2ED.45.R3.UAR)	<i>“Even the same textbooks should be open resources. These are changes that can start from the Secretariat, but unfortunately this is given so little importance.”</i> (E3-2ED.45.R3.UAR)

Condition 2: Greater respect of copyright on all intellectual production conducted on the part of teachers and school managers (CA2B).

Spanish (original)	English (translation)
<p><i>“Realmente para generar un impacto grande también se tienen que empezar a formar [al] otro. Porque no se puede que tres estemos hablando un idioma y el resto estén aceptando cosas que no se deben. Entonces se genera un choque y en el proceso se generan rupturas ahí.”</i> (E3-2ED.R3.43.UAR)</p>	<p><i>“To really create a big impact, there is a need to begin to train other [teachers]. Because it is unfair that only three [teachers] are speaking one language and the rest are accepting things that are wrong. A collision is then generated and in the process there are ruptures.”</i> (E3-2ED.R3.43.UAR)</p>

Condition 3: Existence of a national, government-supported platform where teachers can find OER and publish their own resources (CA2C).

Spanish (original)	English (translation)
<p><i>“La idea es que con este tipo de ejercicio que estamos haciendo nosotros, se genere una comunidad académica y empecemos a generar nuestros propios repositorios... y que todos y cada uno de los maestros podamos utilizarlos, aprovecharlos y adecuarlos.”</i> (E1-2RD.S6.30.OEL)</p>	<p><i>“The idea is that with this type of exercise we are doing, an academic community is generating and we start producing our own repositories ... and every teacher can use and adapt them.”</i> (E1-2RD.S6.30.OEL)</p>

Sub-question 3: What new skills are required among teachers and teacher educators to adopt a new learning culture with OER?

The skills that teachers need today are not only technical, but should also incorporate teaching skills in the framework of a global society. This study has identified five key skills required by teachers and teacher educators to develop a culture of learning with OER.

Skill 1: An interest in exploring and learning to use existing ICT, particularly tools and services enabling the search, creation and adaptation of audiovisual, image and text resources (CA3A).

Spanish (original)	English (translation)
<p><i>“Los maestros se han encontrado con que cuentan con los recursos tecnológicos, portátiles, tabletas, móviles, pero no los saben utilizar. O no tienen esa conexión de cómo a partir de ese equipo yo puedo realizar este objeto o ese recurso para llevarlos a la clase. No sé en otras partes de Colombia, pero acá es mínimo y en primaria casi es cero.”</i> (E1-3RD.R1.37.ALA)</p>	<p><i>“Teachers have found that they have the technology resources, laptops, tablets, mobiles, but do not know how to use them. Or do not have that connection to use them to make this object or resource, and take it to the class.”</i> (E1-3RD.R1.37.ALA)</p>

Skill 2: In addition to ICT literacies, teachers need to have a working knowledge of copyright and open licensing (CA3B) so that they can indicate the permissions under which their work can be shared.

Spanish (original)	English (translation)
<p><i>“El trabajo de licenciamiento es bien apasionante. En primera instancia porque hay total ignorancia, yo lo reconozco, total ignorancia ... había escuchado a lo lejos “Derecho de Autor” y eso en la música, que lo de los CD piratas, pero de las cosas que uno por allá a lo lejos escucho y nada más. Pero ya cuando uno se empieza a meter y a leer y a hallarle la razón de ser... ¡Dios mío! Empieza uno como a evaluarse y por Dios Santísimo todas las medidas de patas que yo he realizado en mi vida profesional han sido bárbaras. Entonces es como ir metiéndolo a uno y de una manera indirecta ir metiendo a los muchachos [estudiantes] en un concepto que es el concepto de la legalidad, del reconocimiento del valor del otro, de que los aportes que se hacen se tienen que valorar y respetar en todo su concepto. Me parece eso un aporte para el proceso educativo grandísimo, porque yo le cuento que yo llevo ya 24 años de docente y esto para mí me ha significado un cambio total en mi forma de trabajo, en mi forma de ver cómo utilizo mis clases y los elementos de otros, cómo los reconozco, cómo los puedo reutilizar, cómo los puedo aplicar y al mismo tiempo los chicos empezar a ver que los trabajos son valorados y respetados por los demás, pienso que ése es el aporte más grande que puede haber en mi área.”</i> (E3-2ED.R2.2.ALS)</p>	<p><i>“The licensing work is very exciting. In the first instance because there is a total ignorance. I admit ... I had heard somewhere about copyright and that in music it relates to pirated CDs, but these are things one hears in the distance and nothing else. But when one begins to read and see the rationale ... My God! One begins to self-evaluate, and oh my God! All gaffes that I have made in my professional life have been barbaric. So it's like going and getting the kids [students] indirectly into the legality concept, recognising the value of the other, that their contributions have to be valued and respected. I think that's a great contribution to the educational process, because, let me tell you, I have been teaching for 24 years and this for me has meant a total change in my way of working, the way I see how I use in my classes elements created by others, how to recognise them, how I can reuse them, how I can apply them at the same time, the kids begin to see that works are valued and respected by others. I think that might be the biggest contribution in my area.”</i> (E3-2ED.R2.2.ALS)</p>

Skill 3: Teachers need to strengthen their use of constructivist educational models in using ICT in order to engage in OEP and to create and use OER optimally (CA3C).

Spanish (original)	English (translation)
<p><i>“Los estudiantes pueden ser protagonistas y los profesores orientar mediante recursos, pero esto sólo se dará si logran modificar las prácticas educativas. Lo digo porque lo que yo veo es que se hace uso de tecnología en una clase, en ocasiones, sólo para acceder a los repositorios de contenidos del profesor.”</i> (E1-2RD.S6.25.ABA)</p>	<p><i>“Students can be protagonists in the classroom and the teachers counsellors, using resources, [open or not], but this will only occur if educational practices are changed. I say that because what I see is that using technology in the classroom sometimes is just to access teacher's content repositories.”</i> (E1-2RD.S6.25.ABA)</p>

Skill 4: Teachers need to develop an interest in and an ability to share and work within communities of teachers and teacher educators (CA3D).

Spanish (original)	English (translation)
<p><i>“Yo creo que ha dificultado el hecho de trabajar en equipo. Primero, porque no tenemos el espacio para reunirnos durante la jornada, y por fuera es muy complicado por el trabajo de otros. Así, la verdad hubiera sido mejor solos, pero no tendría el mismo impacto que el obligarnos a trabajar en equipo, sobre todo porque nos obligamos a trabajar involucrando ideas y áreas entre todos.”</i> (E2-1RD.S1.40.OEL)</p>	<p><i>“I would have been better off alone, because it is very difficult to have the time to work together. But it would not have the same impact if we were not forced into teamwork, especially because we compel ourselves to work by connecting ideas and areas together.”</i> (E2-1RD.S1.40.OEL)</p>

Skill 5: Teachers need to be supported to reflect on their teaching practice and document their pedagogical experiences (CA3E).

Spanish (original)	English (translation)
<p><i>“Interesante [en la sistematización lo de] la retroalimentación, así la experiencia se vuelve cada vez más enriquecedora. Muchos docentes realizamos trabajos en las instituciones que no damos a conocer, tal vez por falta de conocimiento en herramientas informáticas, o por no pensar que pueden servir de guía para alguien más.”</i> (E1-2RD.S4.39.ALE)</p>	<p><i>“It was interesting getting feedback to make the experience become increasingly richer. Many teachers create works in the institutions that go unknown, perhaps because we do not think they can serve as a guideline for someone else.”</i> (E1-2RD.S4.39.ALE)</p>

Sub-question 4: How do local needs and contexts impact upon the universal (mostly defined through the normative system of the Global North) versus local notions of meaningfulness/quality of OER?

In considering OER as a way to meet local needs and contexts (local language, local culture, social issues, geographies, ecology, needs, aspirations, priorities, etc.), teachers highlighted two key issues.

Issue 1: Teachers acknowledged the need for good-quality, universal disciplinary resources that can be adapted to their local sociocultural realities (CA4A).

Spanish (original)	English (translation)
<p><i>“Yo buscaba antes una página sobre el tema que estaba trabajando de ciencias naturales, y luego ahí llegaban y miraban. Les servía como para que ellos vayan fortaleciendo sus conocimientos y los que no entendían resolvían sus dudas.”</i> (E3.2ED.R6.1.A1A)</p>	<p><i>“I used to look at web pages on the subject that I was working on in the natural sciences, and then showed them to the students. It helped them to strengthen their knowledge and for those who did not understand, as a way to resolve their doubts.”</i> (E3.2ED.R6.1.A1A)</p>

Issue 2: Teachers recognised that if they want local, contextualised resources for their students they will need to start creating their own materials (CA4B).

Spanish (original)	English (translation)
<p><i>"(...) a veces nos limitamos mucho. Cuando el maestro se va a los textos como tal, como en matemáticas, los ejercicios están desde una perspectiva... por ejemplo desde escenarios netamente matemáticos, escenarios subreales para el contexto, donde está el avión, la represa tal, pero eso no pertenece a la realidad del estudiante. Entonces si uno quiere generar procesos desde la realidad del estudiante en la asignatura correspondiente, pues necesita empezar a crear ciertas cosas uno mismo."</i> (E3-2ED.R3.5.UAR)</p>	<p><i>"We simply use the texts as we receive them. As in mathematics, the exercises are from one perspective ... for example, from purely mathematical scenarios, or with elements that do not relate to the reality of the student, like talking about planes, trains, or dams. So, if I want to produce processes considering the reality of the student in the corresponding subject matter, I need to start creating some things myself."</i> (E3-2ED.R3.5.UAR)</p>

Sub-question 5: How do institutional and systemic factors in a public system, which are perceived as compartmentalised and hierarchical, interact with and influence the building of a participatory OER model within the government/public system?

The study identified three key institutional policy and systemic factors that negatively influence the building of a participatory OER model within government schools in Colombia.

Factor 1: Systemic factors within the public schooling sector were unfavourable in terms of building an OER participatory model, as policies do not promote the creation of OER by teachers or provide the time for them to do so (CA5A).

Spanish (original)	English (translation)
<p><i>"Cuando llevamos la carta para poder trabajar como equipo [Carta o formulario para vincularse formalmente al proyecto], ella [La directora] fue muy enfática en decir que si y solo si nos reuníamos por fuera de clase, por fuera del horario académico, firmaba. Así que buscamos espacios entre los tiempos libres que tenemos para reunirnos y avanzar en el proceso."</i> (E2-1RD.S2.32.OEL)</p>	<p><i>"When we took the letter [application form to the principal to work as an institution in the project] to work as a team, she [the principal] was very emphatic in saying that she signed it if and only if we met outside class, outside of school hours. So we found some free time to come together and advance the process."</i> (E2-1RD.S2.32.OEL)</p>

Factor 2: Institutional policies and practice seem to reinforce traditional ideas about the classroom being a space for the transmission of information (CA5B).

Spanish (original)	English (translation)
<p><i>“Yo también tuve la intención de trabajar en 10 y 11 con aplicaciones, materiales educativos que servían para los niños de primaria. Llegaron padres de familia y me dijeron: “profesora, pero de qué le sirve a los niños pequeños que trabajen en eso. Enséñeles otra clase de cosas, por ejemplo a hacer una carta, o hacer un acta” y bueno... listo, eso se puede hacer, pero lo que yo estaba planteando les está aportando a los jóvenes, y no sólo a ellos sino también a otros. Pero les cuento que eso ha sido complejo, porque mi intención es una y lo que ellos quieren es otra.”</i> (E1-3RD.R2.17.NOA)</p>	<p><i>“I had the intention to work on 10 and 11 applications to create educational materials to be used for primary school students, but parents came and said, ‘Mrs Teacher, what is the value for the children to do this? You should teach other kinds of things, for example, to write a letter or give a correct quote’ ... And this can be done, but what I was asking them to do is to contribute to the youth, and not only them but also to others. But, let me tell you, this has been difficult because my intention is one thing and what they want is another.”</i> (E1-3RD.R2.17.NOA)</p>

Factor 3: The current teaching culture is rooted in individual work schemes rather than in collaborative work (CA5C).

Spanish (original)	English (translation)
<p><i>“Yo no había trabajado con ellos antes... en grupo... no. Es que en las instituciones lo que pasa es que somos grupo pero para reuniones y para recocha, pero ya como de sentarse a trabajar yo creo que es la primera vez, yo llevo seis años en el colegio y es la primera vez que nos sentamos a ver qué íbamos a hacer.”</i> (E3-2ED.R2.48.ALS)</p>	<p><i>“I had not worked in a group with them. The thing is that in the institutions we are a group just for meetings and hanging out, but like coming together to work, I think this is the first time. I have been at the school for six years and it is the first time we sat down together to see what we would do.”</i> (E3-2ED.R2.48.ALS)</p>

Deepening stage: Establishing the foundation to promote the adoption of OER in Colombian schools

Once the Axial Categories were established, the next step was to establish the relationships between them in order to obtain the Selective Categories, bearing in mind the primary research question. The categories and the relationship between them were discussed and reviewed with teachers through virtual and face-to-face meetings.

As a result of this analysis, the Selective Categories emerged. For the purposes of this study, these are statements about what should be considered in order to foster a pattern of OER adoption amongst a community of Colombian teachers:

- CS1: Teachers implement pedagogical models based on constructivist theory.
- CS2: Teachers learn to use ICT to create and express (not only access) information.
- CS3: Teachers use open licences to promote collaborative creation by teachers and students.
- CS4: Teachers receive pedagogical support rather than mass standardised training.

- CS5: Policies, programmes and infrastructure are in place to promote the adoption, curation and creation of OER at institutional and national levels.

Table 3 outlines the relationship between Axial and Selective Categories in the data analysis approach, mapped against research sub-questions.

Table 3: Relationship between Axial and Selective Categories in data analysis approach

Research questions	Code	Axial Categories	Code	Selective Categories
1. What kind of processes would support a community of teachers in actively engaging with the creation and adaptation of a contextually situated and collaborative OER model?	CA1A	Teacher training should be focused on continuous pedagogical support rather than just training.	CS4	Teachers receive pedagogical support rather than mass, standardised training.
	CA1B	OER should be created and used within constructivist pedagogical models.	CS1	Teachers implement pedagogical models based on constructivist theory.
	CA1C	Collaboration among fellow teachers for creating OER should be promoted.	CS4	Teachers receive pedagogical support rather than mass, standardised training.
	CA1D	Opportunities to share and publish educational experiences with OER should be encouraged.	CS5	Policies, programmes and infrastructure are in place to promote the adoption, curation and creation of OER at institutional and national level.
2. What enabling conditions would encourage wider adoption by peers of contextually created OER within the community?	CA2A	The existence of policy and programmes, nationally and locally, would foster the adaptation, curation and creation of OER.	CS5	Policies, programmes and infrastructure are in place to promote the adoption, curation and creation of OER at institutional and national level.
	CA2B	Need for greater respect of copyright on all intellectual production conducted on the part of teachers and school managers.	CS3	Teachers use open licences to promote collaborative creation by teachers and students.
	CA2C	The existence of a national, government-supported platform where teachers can find OER and publish their own resources.	CS5	Policies, programmes and infrastructure are in place to promote the adoption, curation and creation of OER at institutional and national level.

3. What new skills are required among teachers and teacher educators to adopt a new learning culture with OER?	CA3A	Interest in exploring and learning to use existing ICT, particularly tools and services enabling the search, creation and adaptation of audiovisual, image and text resources.	CS2	Teachers learn to use ICT to create and express (not only access) information.
	CA3B	Copyright knowledge and use of open licences.	CS3	Teachers use the open licences to promote collaborative creation by teachers and students.
	CA3C	Strengthening of constructivist educational models based on the use of new technologies.	CS1	Teachers implement pedagogical models based on constructivist theory.
	CA3D	Ability to share and work within communities of teachers and teacher educators.	CS4	Teachers receive pedagogical support rather than mass, standardised training.
	CA3E	Systematic reflection to transform teaching practices.	CS4	Teachers receive pedagogical support rather than mass, standardised training.
4. How do local needs and contexts (local language, local culture, social issues, geographies, ecology, needs, aspirations, priorities, etc.) impact upon the universal (mostly defined through normative system of the Global North) versus local notions of meaningfulness/ quality of OER?	CA4A	Teachers need universal, disciplinary, quality content that can be reused.	CS5	Policies, programmes and infrastructure are in place to promote the adoption, curation and creation of OER at institutional and national level.
	CA4B	Importance of local and contextualised resources for student learning.	CS2	Teachers learn to use ICT to create and express (not only access) information.
5. How do institutional and systemic factors in a public system that is perceived as compartmentalised and hierarchical interact with and influence the building of a participatory OER model within the government/public system?	CA5A	Education policy does not promote or provide time for the creation of educational resources by teachers.	CS5	Policies, programmes and infrastructure are in place to promote the adoption, curation and creation of OER at institutional and national level.
	CA5B	Traditionally, education has the primary function of transmitting information.	CS5	Policies, programmes and infrastructure are in place to promote the adoption, curation and creation of OER at institutional and national level.
	CA5C	Current teaching culture is rooted in individual work schemes rather than collaborative work.	CS4	Teachers receive pedagogical support rather than mass, standardised training.

Condensation stage: Collaborating in context for the adoption of OER in Colombian schools

The analysis of the relationship between the Selective Categories and the research question led to the establishment of a Core Category: *The adoption of OER is more effective when teachers adopt pedagogical models focused on collaboratively creating and recreating contextually relevant knowledge.* The Core Category (CN based on Spanish acronym) is the synthesis of the substantive theory, which emerges from data processing using the Grounded Theory technique, and collaborative data analysis conducted with teachers through the reflection and action spiral of the PAR process.

Analysis of Selective Categories around specific objectives allowed clarification of the relationships related to the aim of the research, culminating in a concept map of the Core Category (Figure 2).

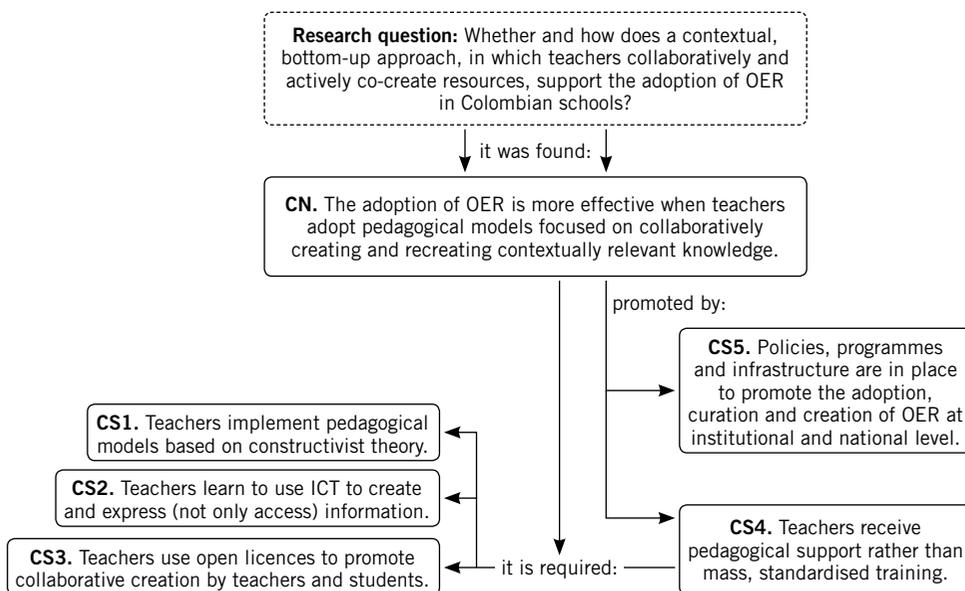


Figure 2: Concept map of the Core Category

In relation to Objective 1 of the study – to study how a collaborative and local OER model can be embedded within the ecosystem of a community of teachers in Colombia – it emerged that this is possible under two general conditions:

Condition 1: Pedagogical support that encourages long-term participation of teachers (linked to CS4), where teachers participate in reflection and actions (linked to three axes):

1. Pedagogical practices where teachers see themselves and their students in an active role in generating knowledge, which is connected to constructivist models based on a deep understanding of the realities of the sociocultural context (linked to CS1).
2. An approach to the use of ICT that favours not only access, but also creation and expression, incorporating ICT infrastructure available to teachers and students (linked to CS2).

3. The adoption of open licensing as a base structure to promote the collaborative creation of resources and sharing in the classroom (linked to CS3).

This pedagogical support involves providing ongoing, flexible and personalised follow-up with teachers about their OER projects. This means identifying and working according to subjects of interest, expectation and the learning needs of teachers and the school where they teach. It also entails this process not taking place according to a uniform and rigid schedule of sequentially developed topics. To this end, training strategies should promote feedback and support among teachers, as well as an interest in sharing ideas, knowledge and learning – in other words, encouraging teamwork and participation in Open Education networks and communities. In order to achieve this, it is important for the advisor to carry out processes of adaptation, curation and creation of OER in pedagogical practice in order to become a role-model for teachers.

Condition 2: Formulation of policies and programmes at institutional and national level to promote the adoption, curation and creation of OER (linked to CS5). In this regard, it was recognised that changes in classroom practices are more responsive to actions and reflections emerging from a bottom-up approach than to external directives. At the same time, the need arose for institutional conditions (particularly from the perspective of educational policies) to assist in decreasing the resistance of teachers and principals to participating in OER activity. This fosters the sustainability of initiatives beyond the efforts of just a few teachers who have an intrinsic motivation for the development of pedagogical innovation with ICT.

Concerning Objective 2 of the study – to understand how a model of adaptation-curation-creation of OER can contribute to effective use of OER for teacher development – it was established that the participation of teachers in a process of using and adapting OER that takes into account teacher needs as well as the sociocultural realities of their students, encourages uptake of OEP that revolve around the use of OER.

Addressing copyright and open licensing in the activities of adaptation, curation and creation with teachers and students (linked to CS3), and identifying the possibilities offered by ICT in schools (linked to CS2), resulted in deep reflection by the participant teachers in this study on their practices and their teaching models, driven by a realisation that they and their students can have a more active role in the creation and co-creation of knowledge (linked to CS1). In this sense, the activities and reflections developed in this study allowed the participant teachers to recognise the predominance of information transmission in their pedagogical practices – which is set by the schools' curricular structure where emphasis is placed on the content rather than on skills development.

The participation of teachers in an experience that served as an example of pedagogical support secured long-term teacher engagement going beyond training (linked to CS4), enabling them to articulate concerns and thoughts about how to replicate this type of learning scenario with their own students. Therefore, teachers were not limited to the co-creation of OER, but developed pedagogical practices with their students where learning revolved around the creation and collaborative employment of information, using and publishing openly licensed content. Thus the main results or outcomes of this research are not the published OER, but the OEP that developed around these resources.

Finally as proposed in the Core Category (Figure 2), it was identified that it was possible to foster the adoption of OER when teachers are recognised and supported as content creators in collaboration with other teachers and students. This finding indicates that a bottom-up, contextually situated approach effectively supports the adoption of OER.

Discussion

The literature on OER suggests that this kind of resource has the potential to address current education challenges, such as the high cost of accessing information, the cultural homogenisation of the North, lack of cultural contextualisation and lack of customisation of educational content, among others. A central question is how to encourage OER adoption by teachers and schools in the Global South in order to take advantage of their benefits and establish efficacy in the sphere of education.

Most OER initiatives have focused on access and free distribution of content to achieve true democratisation of knowledge, as seen in the Colombian government programmes such as *Recursos Educativos Digitales Abiertos* (Open Educational Digital Resources) (Colombia Ministerio de Educación Nacional, 2012) and *Centros de Innovación Educativa Regional* (Regional Educational Innovation Centers).²⁰ In this sense, some studies show that it is common for teachers to adopt OER because of the possibility of using them without modification in their classroom activities (Lozano et al., 2010). However, other authors such as Gértrudix et al. (2007) and Moreno et al. (2011) have stated that OER have a tremendous value – not only in terms of these resources being a finished product that promotes access to knowledge, but above all for being a means to transform classroom relationships with respect to the creation and recreation of knowledge.

In light of the activities and collective reflection processes carried out with teachers in this study, the authors suggest that OER can be a means to transform pedagogical practices when adopted through collaborative processes of adaptation, curation and creation of content that takes advantage of open licensing. This concurs with findings expressed by Anaya and Hernandez (2008) in previous research undertaken in southwestern Colombia.

In this sense, phrases like “resistance and anger”, “interest to understand” and “desire to share” expressed by teachers in the course of this study were learning situations that encouraged them to be creators (and not merely consumers or content users) by getting to know the limitations of a traditional conception of copyright and the possibilities of open licensing (Hernández et al., 2014). The importance of moving from information access to information creation is an essential aspect for some authors when referring to processes of pedagogical appropriation of ICT, such as Kaplún (2005) and Moreno et al. (2011).

The findings mentioned in the context of Phase 1 of this research showed that working with open licences became a way to get teachers interested in the pedagogical implications of their decisions when choosing types of material to circulate in the classroom. This interest helped teachers to move quite naturally to OEP. This study was therefore about more than just the experience of co-creating OER, but served as a means to provide examples of OEP where creating and sharing content with open licensing was key in the training process.

20 <http://www.colombiaaprende.edu.co/html/micrositios/1752/w3-propertyname-3020.html>

This resonates with prior research undertaken by Grinsztajn et al. (2015), Hegarty (2015) and Stagg (2014).

Despite this enabling context, OER adoption did not happen automatically. Teachers expressed that receiving information on OER, open licensing and copyright issues allowed them to engage with the concepts superficially, but that adoption and true understanding took place only in the production of resources and the continuous review and feedback processes. It was found that the way to appropriate these concepts was learning by doing, particularly when doing so with others, as pointed out by Sapire and Reed (2011) regarding OER, as well as by Antúnez (1999) and Huayta et al. (2008) in their studies on teaching practice. This is correlated with the perspective of social learning that Coll et al. (2007) present in their studies on constructivism.

It was thanks to the OER creation process that teachers' concerns emerged and were clarified, particularly when working on topics such as what to consider when using Creative Commons licensing, how to find compatible resources depending on each licence, and how to assign licences correctly. Through this process, teachers also learned about the implications of taking a decision to create resources for sharing, how to exploit the works of other authors and the value of collaborative creation.

This process was relevant because teachers compared what they were previously doing in the classroom with the new aspects that the use of OER makes possible, encouraging reflection which led to changes in their ways of teaching. It provided further support to the idea that – as suggested by some authors, such as Elliott (2000) and Petrides et al. (2010) – collective reflection and understanding of one's own actions stimulates change. This was not an easy transition and required flexible and permanent support around action in the classroom. This pedagogical support model was a decisive factor in promoting changes inside the classroom, as established by two previous studies conducted by Benavides (2015) and Hernández (2015) in southwestern Colombia.

By assuming the adoption of OER as a way to transform classroom practices, it was possible to confirm Lessig's (2004) ideas on the value of open licensing to enrich and expand cultural expressions through collaborative work. In this particular study, it was found that the retention, reuse, revision, remixing and redistribution of existing OER²¹ facilitated the development of collaborative experiences in at least two dimensions: when a teacher contributes to the work of others through the publication of his or her own work, and when teachers gather to create materials together.

With respect to this first dimension, creating and publishing any work using open licensing is a way in which authors invite others to take their work as a starting point for developing their own ideas. Although this relationship does not involve direct interaction between people, it does represent a form of collaboration, according to the characteristics identified by Collazos et al. (2014). First of all, interdependence is present because every personal creation depends on the extant works and licences chosen by other authors when they originally published these works. Secondly, it is a type of collaboration that meets the following responsibilities: respect for the author's will expressed through the chosen licence, the work's attributions and the commitment to publish and share using open licensing. Finally, it constitutes a social agreement achieved through this type of licensing where

21 <https://opencontent.org/blog/archives/3221>

authors favour free access to cultural expressions over the personal benefits of their work (Lessig, 2004).

The second dimension refers to experiences where a group of teachers interact in order to create resources, utilising open licensing as a guideline. In this scenario, teachers have a common goal to which they have committed individually, marking the beginning of collaborative work. However, by using open licensing as a legal platform to collaborate, they adhere to a system of ideas and practices related to retention, reuse, revision, remixing and redistribution of content – actions that reinforce collaboration in terms of positive interaction, individual responsibility and the development of social skills for negotiation and co-evaluation (Collazos et al., 2014).

Even though the above-mentioned dimensions of collaboration were observed in the teacher teams participating in this study, teachers revealed that it was not easy to work in groups. Castro et al. (2005b) point out that these difficulties derive from an educational system that is focused on the individual work of teachers and on the individual outcomes that their students achieve. This leads to conceiving the curriculum as a form of “subjectification” (treating subjects as individuals and apart from one another), which promotes a teaching practice that fragments knowledge into academic disciplines and usually perpetuates the gap between theory and practice. The result is that teachers operate in isolation, disconnected from knowledge communities, and privileged pedagogic practices encourage students to respond to narrowly defined, competitive and individualistic evaluation systems.

Collaboration does not come naturally; there are no policies that encourage it in the educational sector, a factor which was confirmed by the teachers who participated until the end of this study. They admitted that the proposed collaborative work was not easy to achieve and that this was perhaps the reason some groups and teachers ended up withdrawing from the process. At the same time, the teachers revealed that their personal learning and the collective results obtained would not have been possible if they had worked individually.

Teachers acknowledged that group work helped them to stay motivated to continue the process. Moreover, thanks to mutual support, teachers were able to co-evaluate not only their OER but also practices surrounding these resources, and solve concerns about technological, pedagogical and legal aspects related to their teaching. Results are evidenced in the use of OER elaborated by the teachers themselves, in papers accepted and presented at different academic events, and in pedagogical reports that they wrote to account for the developed OEP – production processes in which teachers usually do not participate.

Conclusion

This study demonstrated that recognising the restrictive use of works that traditional interpretation of copyright imposes confronts teachers with uncomfortable realities because it does not correspond with the traditional dynamics of access, production and information exchange that occurs in schools. This reaction generates in teachers a greater interest to know more about open licensing and how to take advantage of the possibilities of adaptation, curation and creation of OER.

This initial finding revealed that any change in the attitudes and practices of teachers is enhanced when they are involved in guided experiences that prompt them to question and reflect on what they do from a different perspective. In this case, the questioning and reflection emerged when addressing copyright and open licensing in a process of examining pedagogical practices when using OER.

On reflection, the research team felt that they were correct to focus on the process of implementing OER by addressing the affordances of retention, reuse, revision, remixing and redistribution which are provided by open licensing. This made it possible for teachers to understand that the importance of OER is not merely the final output, but rather their capacity to serve as a mediation tool in a pedagogical process where active and collaborative work among students and teachers is recognised and encouraged, as well as the importance of referring to a sociocultural context to achieve deeper learning. In conclusion, the purpose of OER is to use these resources as a way of learning through adaptation, curation and collaborative creation of contextually appropriate content – not only as a free-access resource.

We also found that the adoption of OER in Colombian schools may be more effective if capacity-building efforts go beyond standardised, mass-training courses and are focused on pedagogical support for the development of OEP with an emphasis on the following aspects:

1. Promoting the adoption of constructivist pedagogical models where teachers and students have a more active role in the educational process.
2. Fostering the use of available ICT in schools, as well as the use of personal devices to not only access information and entertainment, but also create and capture ways of thinking and responding.
3. Harnessing Creative Commons licensing to find, adapt, create and publish content collaboratively with fellow teachers and students, as well as fostering alternative copyright management in schools. This implies rethinking the role and production of conventional textbooks.

Additionally, although this research was based on the interests, dynamics and needs of the participants to define a collaborative model of OER implementation, the teachers stated that the existence of government policies and programmes can help to create the necessary conditions to encourage a greater number of colleagues to include OER in their educational practices. As a result, teachers identified two kinds of actions which are required: first, specific initiatives by teachers and schools on Open Education; and second, to promote the adoption of OER as a means for implementing and consolidating OEP.

It is not always easy to permeate the pedagogical practices of teachers with these ideas. In this study, clues were found regarding the conditions that led to the distancing of some teachers from the proposed activities, the most important ones being: an idea of education centred on the transmission of information from a teacher or expert to a passive subject; low levels of ICT capacity; interest in learning practical aspects rather than being involved in pedagogical reflections on ICT; the difficulty of moving from an oral discourse to a formal written production that accounts for learning about practices themselves; and a culture where individual work predominates over collaboration. It was not possible to delve more deeply into these aspects because there was a reluctance on the part of teachers who stopped participating to continue interaction with the research team.

By contrast, it was found that teachers who see themselves, their peers and their students as social actors who can create and recreate knowledge are more inclined to explore the implications of permissions and conditions behind content sharing in the classroom by utilising open licensing. In this sense, they understand and favour the development of OEP which responds to the specific sociocultural context of the classroom. It is by recognising teachers as valid interlocutors and actors in generating educational resources and in open pedagogical and educational initiatives that we work towards addressing the educational challenges in Colombia.

Acknowledgements

The coordination team of the coKREA project acknowledges the dedication and collaboration of the school teachers who made developing this PAR process possible through their continuous participation. These co-researcher participants were: Alid Armando Mera Mosquera, Blanca Elsa Beltrán Quinayás, Edy Yaneth Martínez Torres and Nidia Lucía Girón Bucheli (School Normal Superior de Popayán – Cauca); Andrés Enrique Noguera Fuentes and Leonardo Ordoñez Gómez (School John F. Kennedy – Cauca); Yorlani Sáenz Montilla (School Liceo Alejandro de Humboldt – Cauca); Luisa Fernanda Hernández Barbosa, Magaly Astrid Henao Mosquera, Mariana Elizabeth Pérez and Martha Elizabeth Pizo Ocoró (School Técnico Agropecuario Margarita Legarda – Cauca); Lady Clementine Castro Arias, Marco Antonio Mina and Yilver Enrique Polanco Marin (School Límbania Velasco – Cauca); Margoth Loaiza Jaramillo, José Nelson Álvarez Carvajal, Jose Aldemar Yate Galvis, Julián Bedoya Giraldo and Libardo Antonio Corrales (School INEM Felipe Pérez – Risaralda); Carlos Abel Martínez Valencia, Dumas Manzano Franco and Martha Viviana Vélez (School Corazón del Valle, Valle del Cauca).

In addition, the project team would like to thank ieRed for its support in the calls for participation of teachers and the social-oriented events of the project, as well as the management and advisory team of the Research on Open Educational Resources for Development project and the International Development Research Centre which made this study possible.

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How to cite this chapter

Sáenz, M. P., Hernandez, U. & Hernández, Y. M. (2017). Co-creation of OER by teachers and teacher educators in Colombia. In C. Hodgkinson-Williams & P. B. Arinto (Eds.), *Adoption and impact of OER in the Global South*. Chapter 5 advance publication. DOI: 10.5281/zenodo.161271

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This work is licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence. It was carried out with the aid of a grant from the International Development Research Centre, Ottawa, Canada.

