Chapter 2

Factors influencing Open Educational Practices and OER in the Global South: Meta-synthesis of the ROER4D project

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Summary

This chapter provides a meta-synthesis of the findings from the Research on Open Educational Resources for Development (ROER4D) empirical studies based on the 13 sub-project chapters in this volume as well as other sub-project research reports. It does so by analysing how three phases of Open Educational Resources (OER) adoption – OER creation, use and adaptation – are observed in the studies as forms of Open Educational Practices (OEP), identifying where there are most likely to be disjunctures that inhibit optimal OER adoption processes and their longer-term sustainability. It compares the open practices reported in the ROER4D sub-project studies to an idealised or maximal set of open processes, modelled as the Open Education cycle framework. It draws upon social realist theory to uncover agential decision-making about OER creation, use and adaptation in relation to structural and cultural environments, and seeks to answer the ROER4D project's overarching research question: Whether, how, for whom and under what circumstances can engagement with OEP and OER provide equitable access to relevant, high-quality, affordable and sustainable education in the Global South?

This chapter interrogates findings from the ROER4D empirical studies using a meta-synthesis approach. Following a review of sub-project research reports (including, in some cases, primary micro data), the authors used a literature-informed set of themes to create the meta-level conceptual framework for claims about OER and OEP in relation to access, quality and affordability; the Open Education cycle; and structural, cultural and agential influences on the potential impact on access, quality and affordability. ▶

Nvivo software was used to help reveal literature-informed and emergent themes in the studies, identifying the most frequently occurring themes to provide a more comprehensive and classified interpretation of the findings across the empirical studies. Insights and recommendations were then distilled according to Archer's (2003; 2014) social realist theoretical framework which assesses social change – and its counterpart, stasis – according to dynamically interactive structural, cultural and agential factors. The authors used these three factors to guide their analysis of the ROER4D findings, as understood in relation to the three broad phases of OER adoption (creation, use and adaptation) proposed in the Open Education cycle.

Findings show that in the Global South contexts studied, the ideal or maximal Open Education cycle is incomplete in terms of optimising the benefits of OER adoption. There are five key points of disjuncture: (1) the dependence on copying of existing OER and the corollary failure to localise; (2) the adaptation of OER, but with inconsistent curation and rehosting of derivative works on publicly available platforms or in repositories, limiting access to the derivative OER; (3) limited circulation of derivative OER due, in part, to the absence of a communication strategy; (4) inconsistent quality assurance processes; and (5) a weak feedback loop for continuous improvement of the original or derivative work.

The chapter concludes with a critical exploration of the range of influences of OER and associated practices on access to educational materials, the quality of educational resources, educators' pedagogical perspectives and practices, and student performance as well as the overall affordability and sustainability of education in the Global South. It argues that full participation in the OER movement in the Global South requires that certain structural factors be put in place – including a minimum level of infrastructural support, legal permission to share materials and OER curation platforms – to curate curriculum-aligned OER in local languages. However, these structural adjustments alone are insufficient for the full value proposition of OER to be realised. While individual educators and some institutions are sharing OER, this willingness needs to be bolstered by a much stronger cultural change where communities of educators and students are given technical and pedagogical support to enable OER uptake – especially the creation and adaptation of OER produced in the Global South.

Acronyms and abbreviations

AVU	African Virtual University
CC	Creative Commons
CC BY-SA	CC Attribution-ShareAlike licence
CILT	Centre for Innovation in Learning and Teaching
CW4WAfghan	Canadian Women for Women in Afghanistan
DDL	Darakht-e Danesh Library
DIETs	District Institutes of Education and Training
FOSS	Free and Open Source Software
HEI	higher education institution

ICT   information and communication technologies
KOER   Karnataka Open Educational Resources
LMS   learning management system
MIT   Massachusetts Institute of Technology
MOOCs   Massive Open Online Courses
NGO   non-governmental organisation
OEP   Open Educational Practices
OER   Open Educational Resources
QA   quality assurance
ROER4D   Research on Open Educational Resources for Development
TESSA   Teacher Education in Sub-Saharan Africa
UCT   University of Cape Town
UNESCO   United Nations Educational, Scientific and Cultural Organization
UNISA   University of South Africa
WOU   Wawasan Open University

Introduction

From the late 1990s, there has been a concerted effort by a number of higher education institutions (HEIs), intergovernmental organisations and non-governmental organisations (NGOs) located predominantly in the Global North to intentionally create and share educational materials that are legally open for reuse and free to any user. Often referred to as "Open Educational Resources" (OER) or "open content", these materials are seen as a mechanism to address some of the formidable educational challenges in the Global South. These challenges include unequal access to education (UNESCO, 2014a); variable quality of educational resources, teaching and student performance (UNESCO, 2014b); and increasing cost and concern about the sustainability of education (UNESCO, 2017).[1] Although OER are not culturally neutral, as both the content and language are inherently value-laden and embedded within the pedagogical context in which they originate, the value proposition of OER is that these materials can be legally adapted for reuse in other educational environments.

There have been a number of OER research and implementation initiatives, but the extent and impact of OER adoption[2] in the Global South are not fully understood. The Research on Open Educational Resources for Development (ROER4D) project has sought to address this gap through 17 empirical studies undertaken in 21 countries across South America, Sub-Saharan Africa, and South and Southeast Asia (sometimes referred to as "developing countries" or "least developed countries"[3]). This chapter provides a meta-synthesis of 15 of these independent studies, drawing upon sub-project research reports and the chapters in this volume. The studies include one cross-regional survey of higher education students and university staff across nine countries; three studies on university

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1   See Chapter 1 of this volume by Arinto, Hodgkinson-Williams, King, Cartmill and Willmers for a more detailed discussion of the Global South context and how it shapes OERs' potential.
2   The term "adoption" in this context refers to the activities in each of the three broad OER adoption phases: creation, use and adaptation.
3   https://unstats.un.org/unsd/methodology/m49/

academics' adoption of OER in India, Mongolia and South Africa; three studies on teacher professional development in Colombia, India and Sri Lanka; one study of a Malaysian open university's use of OER as the basis for a postgraduate course; one on the influence of OER on students' performance in Chile; one on the use of an existing OER collection in Africa; one on teacher educators in four countries in East Africa; and one on the use of OER as component elements of Massive Open Online Courses (MOOCs).

This chapter analyses OER creation, use and adaptation in these studies, comparing the open practices reported to an "idealised" or maximal set of open practices, as elucidated in Hodgkinson-Williams' (2014) Open Education framework. This is done to help identify where disjunctures may inhibit optimal OER adoption processes and their longer-term sustainability. It draws upon Archer's (2003; 2014) social realist theory to uncover the structural and cultural factors most likely to influence the agential practices of OER creation, use and adaptation. The chapter concludes with a critical exploration of the range of influences of OER adoption and associated practices on access to educational materials, quality of educational resources, educators' pedagogical perspectives and practices, student performance, and the overall affordability and sustainability of education in the Global South.

OER and Open Educational Practices

This section provides a brief overview of how OER and their inherent Open Educational Practices (OEP) are understood in the existing literature, how they have been understood by the ROER4D researchers, and how the concepts are deployed in this meta-synthesis.

As discussed in more detail by Arinto et al. (Chapter 1), the term "OER" has been defined in a variety of ways by international agencies, philanthropic organisations and educational institutions as well as by researchers trying to describe the concept. The United Nations Educational, Scientific and Cultural Organization (UNESCO) originally defined OER as "any type of educational materials that are in the public domain or introduced with an open license. The nature of these open materials means that anyone can legally and freely copy, use, adapt and re-share them. OER range from textbooks to curricula, syllabi, lecture notes, assignments, tests, projects, audio, video and animation".[4] According to the Hewlett Foundation, OER are "teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others".[5] In 2012, the Paris OER Declaration adapted the original UNESCO version and defined 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 redistribution by others with no or limited restrictions".[6] The concept of open sharing of educational content was further entrenched in 2007 following Wiley's articulation of the "4Rs"[7] (revise, reuse, remix and redistribute) to describe the rights associated with OER (in 2014 he extended this to the "5Rs"[8] to include retention of resources). Each of these "Rs" essentially describes a

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4 http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/open-educational-resources/what-are-open-educational-resources-oers/
5 http://www.hewlett.org/programs/education/open-educational-resources
6 http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/WPFD2009/English_Declaration.html
7 https://opencontent.org/blog/archives/355
8 https://opencontent.org/blog/archives/3221

practice or set of practices an educator would employ in the course of their teaching when creating, using or adapting OER.

ROER4D researchers were invited to participate in a research concepts harmonisation process which led to a reasonable level of consensus on the phenomenon under scrutiny, but slightly different tacit understandings remained, due in part to linguistic norms and socially situated meanings. Most drew explicitly upon the UNESCO, Hewlett or Paris Declaration definitions, while some drew on slightly different sources to formulate their own working definitions of OER (Westermann Juárez & Venegas Muggli, Chapter 6) or used the more encompassing concept of "Open Education" to cover both OER and Open Access (Toledo, Chapter 4). For the purposes of this chapter, the term "OER" is seen as a component of Open Education and is understood to refer to teaching, learning and research resources that reside in the public domain or which have been released under an intellectual property licence that permits activities enabled by different degrees of openness.

Since at least 2007, researchers have included "practices" as a constituent aspect of the OER movement (Andrade et al., 2011). The term "OEP" primarily refers to the practices involved in planning, creating, adapting, curating, sharing and reviewing OER. Masterman (2016, p.41) argues that developing an OEP conceptual framework "involves disparate sources", as there is a lack of a "holistic repertoire of practices currently observable in the field". Originally, Conole and Ehlers (2010, p.2) defined OEP as "the practice of creating the educational environment in which OER are created or used". Subsequently, other practitioners and researchers have elaborated upon these definitions to include a more deliberate focus on "collaboration" (Karunanayaka, Naidu, Rajendra & Ratnayake, 2015), "open/public pedagogies in teaching practice" (Beetham, Falconer, McGill & Littlejohn, 2012), "crowdsourcing" (Weller, 2013), "open peer review" (Hegarty, 2015) and "using open technologies" (Beetham et al., 2012). The concept of OEP is more fluid and understood in a range of ways in the ROER4D studies. Teasing out what is "open" in an educational practice in different sociocultural settings and exactly how it differs from locally determined "good" pedagogical practice is sometimes very subtle.

In the ROER4D project, OEP are construed as individual or collaborative use, adaptation, creation, curation (retention) and circulation (distribution) processes of OER for others to locate, copy (reuse in its unaltered form), and/or adapt (customise or combine) and subsequently re-curate and re-circulate as teaching materials (Hodgkinson-Williams, 2014). OEP also include collaboration between educators, co-creation of materials by educators and students, crowdsourcing of ideas and/or materials among educators and members of the public, open peer review of materials, and use of open technologies to optimise sharing and reuse. It is posited that for OER to exist, there must of necessity be prior OEP, in the same way that Cronin relates OEP and OER more deliberately in her most recent definition: "[OEP] is a broad descriptor of practices that include the creation, use and reuse of [OER] as well as open pedagogies and open sharing of teaching practices" (2017, p.15). In other words, to optimise the use of OER to achieve equitable, good-quality and sustainable education, educators and students need to engage in OEP.

Although much of the production of and research on OER and OEP has taken place in the Global North (Andrade et al., 2011; Ehlers, 2011; Porter, 2013), a growing number of studies in the Global South are charting the shift from OER to OEP (Czerniewicz, Deacon, Glover & Walji, 2016; Perryman & Seal, 2016). Most ROER4D researchers initially focused

on the phenomenon of OER, rather than OEP, except for two (Czerniewicz, Deacon, Walji & Glover, Chapter 10; Wolfenden, Auckloo, Buckler & Cullen, Chapter 8). However, as studies progressed, it became clear that adoption of OER automatically involves some type of OEP (e.g. Karunanayaka & Naidu, Chapter 13; Kasinathan & Ranganathan, Chapter 14).

OER and OEP as components of an Open Education cycle

In 2014, Hodgkinson-Williams proposed an elaboration of the practices associated with OER[9] (Okada, Mikroyannidis, Meister & Little, 2012; White & Manton, 2011), framing them within a more comprehensive set of OEP encompassing 10 distinct activities of an Open Education cycle (originally called the "10Cs" – creation, curation, circulation, certification, etc.) posited to optimise the key value proposition of OER, namely access to affordable, high-quality education. This model has evolved over the course of the ROER4D research process (Walji & Hodgkinson-Williams 2017a; 2017b) and been refined into an Open Education cycle which is based around a common conceptualisation activity, followed by three distinct phases: a creation phase, a use phase and an adaptation phase (Figure 1).
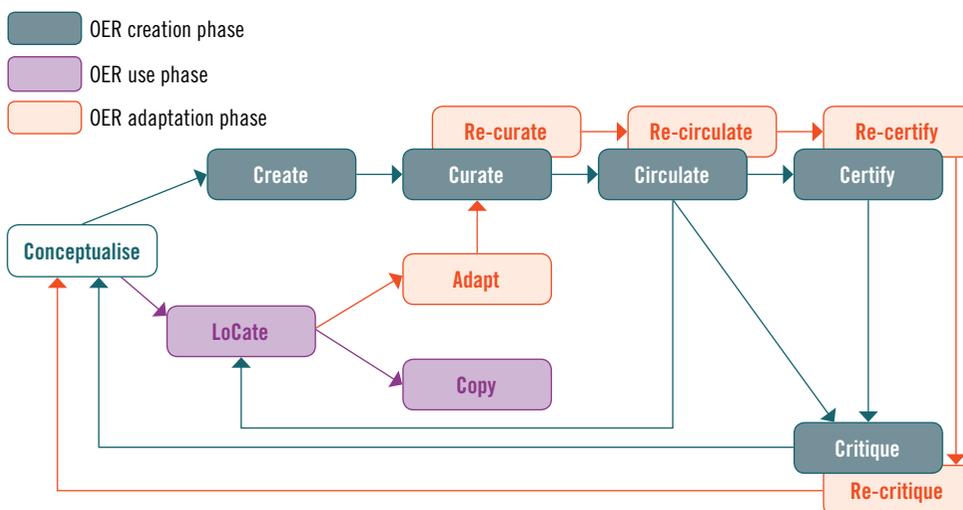

Figure 1: **Proposed "optimal" Open Education cycle (Adapted from Hodgkinson-Williams, 2014; Walji & Hodgkinson-Williams, 2017a)**

The **conceptualisation** activity includes planning what OER and which pedagogical strategies might be most suitable in a specific context; it is implicit in the OER creation, use or adaptation phases.

The **creation** phase refers to the development of original materials and/or tuition by the author or institution, either as a "self-use" of existing materials or as "born open" OER (i.e. developed with the view of being shared freely and openly). In order for these materials to be made publicly available, they need to be **curated**; that is, they need to be hosted on

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9   https://opencontent.org/blog/archives/3221

a publicly accessible platform with sufficient descriptive information (i.e. metadata) and appropriate open licensing (e.g. Creative Commons [CC])[10] for them to be easily found through internet search tools and legally reusable. Further **circulation** amongst potential users of the OER is required to raise awareness of the existence of the OER (e.g. via social media, OER portals), which are then ideally **certified** through some type of quality assurance mechanism, either by the OER creator, their peers, an educational body or the hosting organisation. Best practice also requires that the OER can be **critiqued** to ensure that user feedback informs subsequent phases of conceptualisation regarding the OER.

The **use** phase refers to finding OER (artificially referred to as "**loCate**" in this phase) so that it can be used in its original form (i.e. **copied**) in other contexts. This use phase, where OER are used "as is", implies a finite path as no subsequent OER are created from this activity.

The **adaptation** phase refers to OER being customised (e.g. revised, modified) or combined (e.g. remixed with more than one set of OER) in order for these derivative OER to be re-curated, re-circulated, re-certified and re-critiqued.

Factors influencing OEP and OER

To understand the adoption of OER and the OEP that are entailed in their creation and optimisation, as well as the impact of OER and OEP on increasing access to educational materials, improving learner performance, enhancing teacher pedagogy and improving the quality and reducing the costs of the materials themselves, some type of social theory needs to be advanced. In this meta-synthesis, we adopt Archer's social realist perspective that "for any process to merit consideration as a generator of social change it must necessarily incorporate structured human relations (context-dependence), human actions (activity-dependence) and human ideas (concept-dependence)" (Archer, 2013, p.4). In other words, "every theory about the social order necessarily has to incorporate SAC: structure, agency and culture" (Archer, 2013, p.4).

Porpora elaborates upon Archer's conception and suggests that "social change involves a dialectical relation between human agency and the contexts in which those agents find themselves, contexts that include culture, structure, and physical things" (2013, p.29). He includes "things, both natural and humanly made, since … new or transformed things also play a role in social change" (2013, p.29) and mentions the invention of computers and the internet as prominent examples.

Structural factors

Broadly speaking, structural conditions can refer to government and/or institutional policies, systems and infrastructure. Archer describes social "structure" as the "objective features of society" (2003, p.i) or the "material … aspects of social life" (1988, p.xi), as evidenced in "roles, organisations, or institutions" (2003, p.5). She maintains that "the identification of structures is possible because of their irreducible character, autonomous influence and relatively enduring character, but above all because this means that they pre-date any particular cohort of occupants" (1995, p.168). In Archer's theory, social structure also refers

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10   https://creativecommons.org/

to "human relations among human actors – relations like power, competition, exploitation, and dependency [or more precisely the] relations among social positions that human actors occupy" (Porpora, 2013, p.25).

In the ROER4D meta-synthesis, the concept of structure is understood to denote relatively enduring relations among human actors, the social positions they occupy, and things made by humans. These can include infrastructure, such as power supply, hardware, software, connectivity and information and communication technologies (ICT); the availability of OER in various repositories and portals as well as support of OEP on collaborative platforms; open licensing (such as CC); government or institutional policies, strategies, programmes and procedures; and funding from donors, governments and/or institutions. Structure also refers to the socioeconomic and geographic context in which students and educators are located (Table 1).

Table 1: Structural factors potentially influencing OER adoption

Structural factors	
Physical factors	**Relations and social positions**

Infrastructure – power supply, hardware (devices and printing facilities), software, connectivity
 	
OER repositories, aggregators, collaborative platforms and learning management systems (LMS)
 	
Geographic contexts (urban and rural)
	Policies, strategies, programmes and/or procedures at government, national, provincial and/or institutional level with respect to:
	  – Initial teacher training, teacher professional development, academic staff development in HEIs
	  – Intellectual property, copyright and CC licensing
	  – Free and Open Source Software (FOSS), Open Access, OER
	Funding
	  – Donor
	  – Government
	  – Institutional
	  – Self-funding
	Institutional support
	  – Technical support
	  – Curriculum and learning design support
	  – Library services

Cultural factors

Archer describes "culture" as "ideational aspects of social life" (1988, p.xi) that are manifest in "beliefs, theories, value systems, mathematical theorems, and novels etc" (2014, p.97). In order to undertake cultural analysis, Archer distinguishes more specifically between cultural "products" as the "cultural system" and "ideas" as the "socio-cultural" domain. The former has "an objective existence and autonomous relations among its components (theories, belief, values, arguments, or more strictly between the propositional formulation of them) in the sense that these are independent of anyone's claim to know, to believe, to assert or to assent to them" (Archer, 1996, p.107).

In this ROER4D meta-synthesis, OER are seen as the "products" that form the "cultural systems", whereas the "socio-cultural domain" is seen as the prevailing social, institutional and/or disciplinary values, norms, conventions, expectations and practices that may encourage or deter educator and student engagement in the adoption of OER. These norms include perceptions of what counts as "valuable knowledge" and, consequently, how the "quality" of OER and OEP is determined (Table 2).

Table 2: Cultural factors potentially influencing OER adoption

Cultural factors	
Cultural system (relations between ideas)	**Sociocultural domain (differences in ideas among people)**

OER as a product
   – Cultural content
   – Language
	Institutional/disciplinary norms or conventions
	Epistemic stance
	Perceptions of quality
	Pedagogic practices

Agential factors

As a number of individuals, institutions, government agencies and/or NGOs are involved in the need for and provision of formal education, this meta-synthesis endeavours to identify the agents who can influence and who are influenced by a range of factors in the process of adopting OER and/or engaging with OEP. The term "agent" (Archer, 2000) is used deliberately to indicate intentional agency exhibited by stakeholders, and their uptake (or not) of OEP and OER in response to the "structural and cultural" (Archer, 2003) conditions they face. In relation to Open Education, individuals and/or institutions are accorded the choice of whether (or not) to engage in OEP and/or adopt OER (Table 3).

Table 3: Agential factors potentially influencing OER adoption

Agential factors	
Institutional	**Individuals or groups of individuals**

Intergovernmental agencies
 	
Government – national and/or provincial (e.g. ministries of education)
   – Educational institutions
   – Schools
   – Teacher training colleges
   – Universities
   – NGOs
	Students (primary, secondary and university students)
	Educators (school teachers, teacher educators and university lecturers)
	Formal communities of practice or informal networks
	And their:
	   – Digital proficiency
	   – Curriculum and learning design skills
	   – OER awareness (including knowledge of copyright and open licensing)
	   – Professional identity (including reputation)
	   – Motivation and beliefs
	   – Priorities (including time constraints)

In the ROER4D project, Archer's theoretical perspective is used to understand under what conditions (structural and cultural) individuals', and/or institutions' decision-making (agential) result in change or constancy in OEP associated with OER adoption that may in turn influence access to affordable and good-quality education.

Methodological approach

In order to provide insights into the relationship between engagement with OER and OEP, and change or stasis with respect to equitable access to relevant, high-quality, affordable and sustainable education, findings from 15 of the 17 ROER4D empirical studies have been

interrogated using a meta-synthesis approach. Scruggs, Mastropieri and McDuffie (2007, p.395) explain that:

> Unlike quantitative synthesis (meta-analysis) of group experimental research reports, qualitative metasynthesis is not concerned with summarizing or reducing findings to a common, standardized metric, such as a mean effect size. Rather, the purpose is to integrate themes and insights gained from individual qualitative research into a higher order synthesis that promotes broad understandings of the entire body of research, while still respecting the integrity of the individual reports.

This is a useful methodology to adopt when, as is the case with the ROER4D studies, researchers used a variety of methodologies, included a range of participants and conducted their research over different time periods (Arinto et al., Chapter 1). This meta-synthesis therefore does not set out to compare the findings of each of the independent studies, but rather endeavours to engage more broadly with the key issues that may help to better understand what structural and cultural circumstances influence institutional and/ or individual (agential) adoption of OER. It also seeks to understand whether and how the adoption of OER can improve access to educational materials, the quality of educational resources, educators' pedagogical perspectives and practices and student performance, as well as the overall affordability and sustainability of education in the Global South.

This meta-synthesis included the following stages:

1. Reading through draft and final versions of sub-project research reports (including, in some cases, primary micro data) and noting similarities and/or differences in terms of key themes in their findings.
2. Engaging with the researchers to clarify concepts, data and/or findings to aid in the comparison of key themes.
3. Using a literature-informed set of themes to create the meta-level conceptual framework for the claims about OER and OEP in relation to the cycle of Open Education; and for the structural, cultural and agential influences on the potential impact on access, quality and affordability.
4. Ingesting pre-peer-reviewed research reports into the qualitative software analysis tool Nvivo to assist in the analysis of the literature-informed and emergent themes.
5. Using the meta-level conceptual framework to code the themes in the findings of each of the studies and then adjust the framework to include unanticipated themes emerging from the findings.
6. Identifying the most frequently occurring themes to provide a more comprehensive and classified interpretation of the findings across the empirical studies.
7. Distilling insights according to the theoretical framework proposed above.

Findings

The findings draw on the sub-project studies (Chapters 4–15) as well as the cross-regional study (Chapter 3) to understand the various types of educational practices related to or

involving OER, and to identify structural, cultural and/or agential factors that might account for these in various countries. The findings are analysed and discussed according to the Open Education cycle (Figure 1) highlighting the three key OER adoption phases in the order in which they appear most frequently in ROER4D studies, namely use, creation and adaptation.

Factors influencing stages of the Open Education cycle

Before examining practices, two key constraining and/or enabling factors that influence open practices are foregrounded. Firstly, agents' awareness of OER is key to both the adoption of OER and research on the phenomenon, and, secondly, the necessary infrastructure required to engage in OER-related practices.

Variable awareness of OER amongst educators and students

One of the key challenges in the ROER4D studies was knowing precisely what respondents considered "Open Educational Resources" to be, given the various terms[11] used to describe similar free and openly licensed materials. Most ROER4D respondents conflated OER with digital materials that are freely available on the internet, and they were generally not aware of copyright regulations that restrict use of online materials or alternative open licensing mechanisms that make freely available resources "legally open" (de Oliveira Neto, Pete, Daryono & Cartmill, Chapter 3; Oates, Goger, Hashimi & Farahmand, Chapter 15; Wolfenden et al., Chapter 8). Wolfenden et al. articulate the general sentiment in the ROER4D studies that "[l]ack of awareness of the licence did not preclude educators from adapting resources (even in cases where this may not have been permissible in terms of the resource licence), and there was much reported sharing of articles and videos directly with students through multiple channels, such as email, print, and posts on Facebook and other social media platforms" (Chapter 8, p.273). Thus, all data presented and inferences drawn need to be treated with some caution as the phenomenon being studied was imprecisely understood and/or implemented by participants.

Better access to infrastructure for educators than for students

Educators and students require access to particular infrastructure to adopt digital OER. A prerequisite for accessing digital OER is some form of power supply. In the Global South, access to uninterrupted electricity cannot be taken for granted, as reported by a number of ROER4D researchers. In Afghanistan, Oates et al. (Chapter 15) highlight the lack of a reliable power supply in the rural Parwan province, where their study was located. In East Africa, Wolfenden et al. (Chapter 8) and Adala (2017) both report the lack of a reliable power supply as a structural constraint to OER access. In India (Kasinathan & Ranganathan, Chapter 14) and South Africa (Cox & Trotter, Chapter 9), power outages can be quite common, although urban areas typically have fewer power disruptions than rural areas. In Mongolia (Zagdragchaa & Trotter, Chapter 11) and South Africa (Cox & Trotter, Chapter 9), higher education educators were more likely to enjoy a more robust power supply than university students, with school educators and students in rural environments having the least reliable power supply (Kasinathan & Ranganathan, Chapter 14).

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11   See Chapter 1 for a more extended discussion on the various definitions and terms associated with OER.

Access to, although not necessarily ownership of, digital devices is also a prerequisite for OER adoption. In the ROER4D project, the discernible trend was that educators had more ready access to such devices (sometimes owning more than one) than students. In Afghanistan, it was found that "almost all of the teachers in the study owned at least one digital device … However, of those who did own a digital device, less than half ... had internet access on their device" (Oates et al., Chapter 15, p.562). In Mongolia, Zagdragchaa and Trotter (Chapter 11, p.407) report that of 42 higher education staff surveyed, "57% … own their own laptops, though many also use the desktop computers provided by their HEIs". Wolfenden et al. (Chapter 8) elaborate that even in cases where HEIs in East Africa provided computers, teacher educators often complemented these with personal mobile phones. Although access to mobile devices was quite common amongst students and educators alike, students were less able to access computers as these were often insufficient for the large number of students (Adala, 2017) or the computers available were dysfunctional (Kasinathan & Ranganathan, Chapter 14). Kasinathan and Ranganathan point out that District Institutes of Education and Training (DIETs) in the provinces in India are making a special effort to replace dysfunctional computer labs in schools in order to advance the OER agenda.

In Sub-Saharan Africa, the availability, stability, speed, cost and limitations on internet connectivity were major factors in the extent to which educators engaged in digitally based OEP, including downloading and uploading OER. In their East Africa study, Wolfenden et al. (Chapter 8, p.269) accentuate the fact that "an absence of fast, consistent internet connectivity; and limited access to laptops and desktop computers were all reported to limit teacher educators' exploration of and familiarity with OER, most acutely [at a rural higher education institution] in Uganda". A similar situation was reported at the University of South Africa (UNISA), where adequate internet access was available only to educators as "many students did not have reliable access because they live in poor, rural areas with weak infrastructural support, or in urban townships far from the UNISA satellite centres" (Cox & Trotter, Chapter 9, p.306). The consequence is that "all teaching materials must be printable and deliverable by post so that every student gets the same educational experience"; should an academic wish to use OER in their teaching, "these resources [can] only be offered as 'additional' or 'optional' materials for the online students" (Cox & Trotter, Chapter 9, p.309).

In Asia, there is a more mixed picture of the availability and quality of connectivity. In Mongolia, most of the higher educators in this study "connect to the internet at work (81%) and/or home (76%) at speeds that they describe primarily as 'medium' (52%) or 'fast' (29–33%)" (Zagdragchaa & Trotter, Chapter 11, p.407). By contrast, restricted or slow internet access among educators is reported in Afghanistan (Oates et al., Chapter 15), and limited internet access and connectivity issues inhibited the work of teacher educators and pre-service teachers in Sri Lanka (Karunanayaka & Naidu, Chapter 13). In India, Kasinathan and Ranganathan (Chapter 14) report that connectivity was "patchy" and that this poor connectivity could have inhibited school teachers from uploading OER to the Karnataka Open Educational Resources (KOER) portal.[12]

In Chile, Westermann Juárez and Venegas Muggli (Chapter 6) report that more than 50% of higher education students felt that the institutional infrastructure supported the

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12   http://karnatakaeducation.org.in/KOER/en/index.php/Main_Page

optimal use of OER, although the educators saw the lack of infrastructure and connectivity as a barrier to student internet access. Poor internet connectivity was also reported by teachers in rural areas in Colombia (Sáenz, Hernandez & Hernández, Chapter 5).

It is worth noting that, while this discussion has been premised on OER being digitally mediated, it is not the case that all OER are digital. For example, Wolfenden et al. (Chapter 8) point out that printed copies of the Teacher Education in Sub-Saharan Africa (TESSA) materials are available from the libraries at the participating HEIs. In her study of five African countries, Adala (2017) also confirms that teacher educators accessed materials from the African Virtual University (AVU) collection online and via print copies. Similarly, Goodier (Chapter 7) reports that printed open textbooks were distributed to students in publicly funded schools in South Africa, whilst in Chile, according to Westermann Juárez and Venegas Muggli (Chapter 6), printed versions of a teacher-adapted Wikibook were given to higher education students. However, Wolfenden et al. note the inadequacy of print OER over the long term and compellingly argue that "[a]ccess to the internet is central; without this, individual use of OER is static" (Chapter 8, p.266).

Having laid out these agential and structural prerequisites for engagement with OER and associated open practices, we now turn to an analysis of the use, creation and adaptation of OER reported most frequently in the ROER4D studies. Baseline data on OER use by higher educators (de Oliveira Neto et al., Chapter 3) and students[13] are drawn from the cross-regional survey to provide a quantitative benchmark of OER use. Findings from the other sub-projects are also scrutinised in an attempt to explain the extent of OER uptake. However, it must be noted that these are not exact comparisons and at best might indicate trends and factors influencing these trends. Referring to examples from the ROER4D studies, the next section highlights the uneven uptake or relative absence of some of the practices that would optimise the adoption of OER. The discussion begins with findings regarding conceptualisation, which is the first step in each of the three phases of OER use, creation or adaptation. This is followed by a description of the most frequently occurring "use" phase (conceptualising, locating, copying), followed by the "creation" phase (creating, curating, circulating, certifying and critiquing), and finally the less commonly reported "adaptation" phase (conceptualising, locating, adapting, re-curating, re-circulating, re-certifying and re-critiquing). For each step within these phases, the key enabling and/or constraining structural, cultural and/or agential factors are identified in an attempt to explain the degree of the variable uptake of OER and the associated OEP.

The conceptualisation stage in the use, creation and adaptation of OER

The ROER4D studies revealed different degrees of explicitness in conceptualising the search for existing OER, production of new OER or adaptation of existing OER. More specifically, it was found that conceptualisation may take place anywhere along a continuum of intentionality, from being completely subconscious to being part of a formal curriculum planning process at the institutional level.

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13 http://roer4d.org/3305

Overt planning of OER more easily discernible in institutional or project-based settings

Lesson planning is often implicit in the process of searching for OER (or any materials on the internet) by individual educators; it is seldom made explicit unless there is a specific requirement to do so. In the East African institutions studied by Wolfenden et al. (Chapter 8), the normally opaque activity of finding and copying OER verbatim by individual educators became visible as they were required to create lesson plans. In Afghanistan, lesson plans were also analysed to identify changes in pedagogic practice (Oates et al., Chapter 15). A similar requirement, although in the context of shared lesson planning, was stipulated by the in-service teacher education programme at the Open University of Sri Lanka where student teachers were required to reflect on and write up their experiences in planning and implementing their OER-based lessons (Karunanayaka & Naidu, Chapter 13). In Colombia, the planning process was made visible in the oral presentations that the educators gave about their experience in developing OER, although writing up these processes was an unusual practice for these educators (Sáenz et al., Chapter 5).

Moreover, the ROER4D studies suggest that implicit planning to use materials "as is" by individual educators and students is driven more by the relevance of materials than by their "openness" *per se*. As Cox and Trotter summarise: "the 'openness' of an OER is rarely more important than the practical, pedagogical concerns surrounding the relevance, utility and quality of *any* educational material" (Chapter 9, p.293). In their study, one of the respondents from a South African institution remarked: "there's a lot of stuff that's just not applicable. Some of the stuff has snippets that are nice. [But] I seldom find things that I want to use as a whole" (Cox & Trotter, Chapter 9, p.315). This sentiment is shared by educators in Mongolia whose key concern was local relevance, irrespective of whether the material was openly licensed (Zagdragchaa & Trotter, Chapter 11). More generally, because the criteria used are often not made explicit, much of the reasoning around the selection of OER is still not well understood.

By contrast, in institutional or project-supported settings where the organisational reputation risks are high, planning and support, especially in the OER creation phase, are more deliberate and elaborate. For example, in the institutionally funded University of Cape Town (UCT) MOOC Project involving lecturers, learning designers and video production experts, formal planning processes were needed to produce the MOOCs (which included original OER as constituent elements) (Czerniewicz et al., Chapter 10). At Wawasan Open University (WOU) in Malaysia, an official curriculum committee conceptualised the structure of a formal distance learning course prior to identifying existing OER to be used in the course instead of proprietary textbooks to reduce the cost of course development (Menon, Palachandra, Emmanuel & Kee, 2017). A team of writers, editors, librarians and learning designers put together the OER-based course package and offered it in both Malaysia and India (Menon et al., 2017). Similarly, a full-time multilingual editor organises and manages teams of volunteer translators from around the world to translate English-language OER into Dari and Pashto for the digital Darakht-e Danesh Library (DDL) in Afghanistan (Oates et al., Chapter 15).

Overall, analysis of the ROER4D sub-projects suggests that the more institution-, programme- or project-driven the OER development process is, the more likely it is for the curriculum or resource planning activities to be made overt, shared with others and/or

formally documented. The latter provides a framework for how others might use the original or adapted versions, especially within a formal teaching environment.

The OER use phase

For the purposes of this analysis, the concept of "OER use" is deployed in the first instance to mean reuse of the resource in its original form (also referred to as use "as is", verbatim or in an unaltered form) in various contexts (e.g. in a class, in a study group, on a website, in a video) following Wiley's definition.[14] The ROER4D studies also employed the term "use" in a broad sense to distinguish between "creation" (Cox & Trotter, Chapter 9) and the more overarching concept of OER uptake in general. In a number of the sub-projects, the term "use" was employed to refer to copying original OER as well as adapting OER through some form of customising (revising) or combining (remixing). Where it was possible to disaggregate these practices, they are reported separately.

Use of existing OER reported more frequently by educators than students

The ROER4D cross-regional survey (de Oliveira Neto et al., Chapter 3) provides an overall sense of the use of OER by educators in the Global South (Figure 2). The survey was administered to 295 randomly selected educators at 28 HEIs in nine countries across South America, Sub-Saharan Africa, and South and Southeast Asia. Slightly more than half (51%) of the educators surveyed stated that they had used OER at least once; one-quarter (25%) said they had never used OER; and slightly fewer than a quarter (24%) said they were not sure whether they had used OER. This suggests that while a small majority have used OER and have some familiarity with it, a sizeable minority have never used OER and/or are not aware of the concept. As Figure 2 illustrates, the level of OER use appears to be slightly differentiated by region: 50% in South America, 46% in Sub-Saharan Africa, and 56% in South and Southeast Asia.
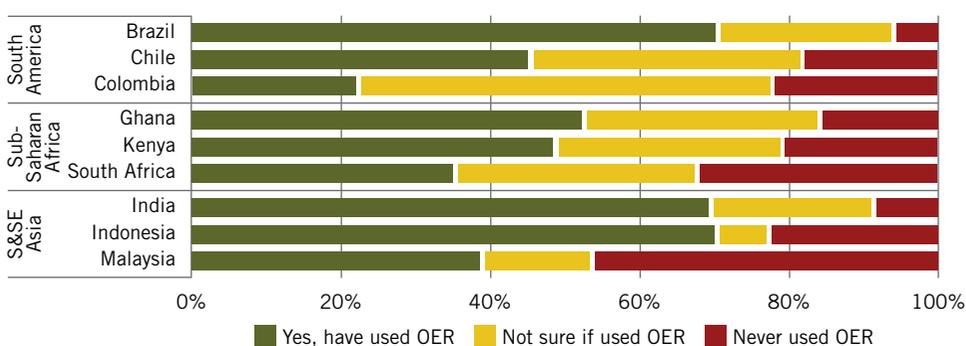

Figure 2: OER use by educators (Source: de Oliveira Neto et al., Chapter 3)

By contrast, far fewer students reported using OER compared to the educators. Of the 4 784 randomly selected students surveyed in the same study, only 39% reported having used

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14   https://opencontent.org/blog/archives/3221

OER at least once; more than a third (35%) were not sure whether they had used OER; and slightly over a quarter (26%) had never used OER before[15] (Figure 3).
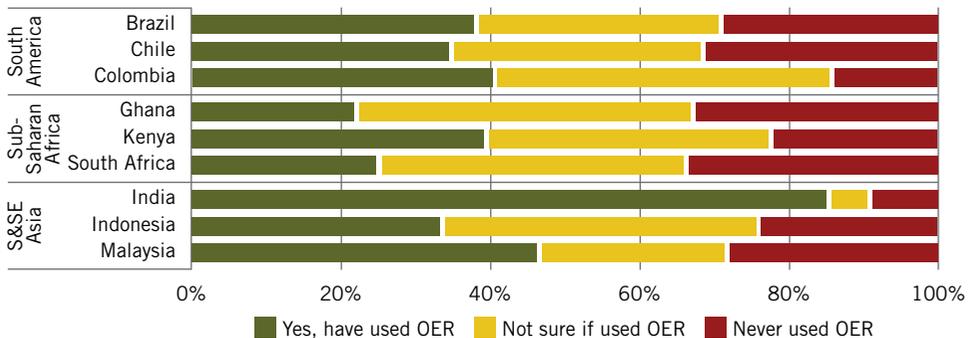

Figure 3: OER use by students[16]

Compared to the other countries, student use of OER in India (85%) is exceptionally high, and considerably higher than use of OER by the educators in the same study. Apart from the cross-regional survey, the majority of the ROER4D studies focused primarily on OER adoption by educators, so probing student adoption of OER presents an opportunity for further research.

Selecting OER challenging for educators given the volume of online resources

In order to use OER, educators must first find and select them. Some participants found this quite challenging. Wolfenden et al. (Chapter 8, p.269) note: "Many respondents found the sheer volume of available online resources daunting and were anxious for quality guidelines; without these they doubted whether they had sufficient expertise to judge whether a resource was of appropriate quality." Karunanayaka and Naidu (Chapter 13) report that the pre-service teachers in Sri Lanka who participated in their study found the workshop activities that specifically taught them how to identify suitable OER especially valuable. Amongst university educators in South Africa, workshops on locating OER highlighted that: "This process was a revelation for many, as most had never searched for OER via a dedicated OER repository, meaning that they had previously struggled to determine which materials were legally open for reuse and which were closed" (Cox & Trotter, Chapter 9, p.314).

Educators valued having a repository of materials relevant to their context

The OER platforms or repositories mentioned by participants in the ROER4D studies varied and included a few that are OER-friendly (e.g. Wikipedia, Google Scholar, Khan Academy, AVU, TESSA, TED Talks, Massachusetts Institute of Technology (MIT) OpenCourseWare, Commonwealth of Learning and Wikimedia Commons). However, not all participants were

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15   http://roer4d.org/3305
16   http://roer4d.org/3305

aware that materials on these sites are in fact OER. Some participants reported looking for resources by searching Google and YouTube, but without filtering for materials with an open licence even though this functionality exists. In the study on Mongolia, of the educators who reported using OER, "the majority (50%) stated that they find resources through Google Scholar searches, followed by institutional repositories (33%) and personal websites or blogs (25%)" (Zagdragchaa & Trotter, Chapter 11, p.413). In Sri Lanka (Karunanayaka & Naidu, Chapter 13), India (Kasinathan & Ranganathan, Chapter 14) and Afghanistan (Oates et al., Chapter 15), and in partner institutions of the AVU (Adala, 2017), some respondents said they really valued having a specific repository of materials that they felt was relevant to their context. These resource collections were hosted on an institutional LMS (Karunanayaka & Naidu, Chapter 13), a provincial OER portal (Kasinathan & Ranganathan, Chapter 14), a project website (Sáenz et al., Chapter 5) and a local-language digital library (Oates et al., Chapter 15).

Locating OER a time-consuming process for educators

Those searching specifically for OER, such as the curriculum development team at WOU in Malaysia, confirmed that there was a sufficient number of materials for them to use, even though they took some time to find, and few video and audio materials were available (i.e. they were mostly text-based materials in HTML or PDF format) (Menon et al., 2017). The researchers noted that knowing how to identify OER and good internet searching skills might have reduced the time spent locating suitable OER (Menon et al., 2017). Similarly, educators in Sri Lanka observed that finding OER is a time-consuming process, specifically because so many OER exist (Karunanayaka & Naidu, Chapter 13).

Use of OER in its original form or not at all

With regard to type of OER use, merely copying the original seemed to be a common practice amongst educators. In Mongolia, respondents reported being more likely to use resources "as is" in their original form (Zagdragchaa & Trotter, Chapter 11). In East Africa, educators accessed the TESSA materials in print form from the library or from CDs to provide ideas for teaching, which is in line with the activity-based TESSA approach where "when you actually read these materials you should be able to actually copy and then you are able to do in your teaching" (Wolfenden et al., Chapter 8, p.272). One of the East African respondents "spoke eloquently about how many staff had a binary approach to OER: they either use OER in their original form or reject it outright as inappropriate" (Wolfenden et al., Chapter 8, p.271).

In Afghanistan, Oates et al. report that "[w]hile 20 teachers reported that they used both OER and the textbook, and eight said they mainly used OER from the DDL to design their lesson plan effectively, 23 said they did not use any OER and relied solely on a textbook when preparing their lesson plan" (Chapter 15, p.561). This pattern is similar in the five African countries in Adala's (2017, p.21) study:

> [One respondent noted] that the AVU OER was used as a primary resource, also [stating] that "the modules are heavily supplemented and complemented by other OER sources, sometimes to the extent that they may not necessarily take a primary position".

Educators' lack of awareness that they are using OER

There were a number of reports of general "use" of OER, but educators did not necessarily know that they had been using OER. For example, at one university in South Africa, Cox and Trotter (Chapter 9, p.318) report that: "All six interviewees we spoke to at UCT said that they had used OER, but only three had done so deliberately (seeking out materials from the Khan Academy, TED Talks and MIT OpenCourseWare)." At another South African university: "When asked who had used OER, five interviewees said yes and one said no, though two of the five admitted that they had done so inadvertently, not knowing that the materials were OER at the time (it only became apparent to them during the workshop that they had used OER before)" (Cox & Trotter, Chapter 9, p.323).

Table 4 provides a summary overview of the structural, cultural and agential factors influencing the use of OER at the ROER4D research sites.

Table 4: **Structural, cultural and agential factors influencing use of OER in the ROER4D studies**

	Structural factors	Cultural factors	Agential factors
LoCate (find)	**Enablers** – Global, national, provincial or institutional repositories – Institutional or project support and guidance **Constraints** – Volume of online resources	**Enablers** – OER relevant to context hosted locally **Constraints** – Searching for OER not the norm – Need for quality guidelines	**Enablers** – Skills to search for online materials **Constraints** – OER awareness and open licensing awareness – Time to find materials – Lack of skills to filter by open licences
Copy (use in original form, "as is")	**Enablers** – Institutional or project support and guidance – OER available in print **Constraints** – Mostly text-based, while video and audio sought	**Enablers** – Copying a common practice – Some relevance of materials **Constraints** – OER not aligned to curriculum – OER not applicable to context	**Enablers** – Expertise to judge quality **Constraints** – Anxiety about ability to judge quality

The OER creation phase

Hodgkinson-Williams (2014, p.9) describes the OER creation phase as "the development of original materials and/or tuition by the author or institution either as a 'self-use' of existing materials or [as] 'born open' OER, i.e. developed with the view of being shared freely and openly". In the ROER4D project, this definition was extended to include collaborative creation as well as individual and/or institutional development and co-creation with students (Walji & Hodgkinson-Williams, 2017a; 2017b).

Limited creation of OER, especially by students

Trying to ascertain the practice of OER creation when participants were not always clear about the concept of OER posed a real challenge to researchers in the ROER4D project. To estimate OER creation, de Oliveira Neto et al. (Chapter 3) in their cross-regional study asked whether individual educators had shared educational materials with an open licence. They found that 23% of the 295 randomly selected higher education educators surveyed reported that they had openly licensed their teaching materials (Figure 4). In the sub-project in Mongolia, 76% of the higher education educators surveyed said that they had never created and shared OER (Zagdragchaa & Trotter, Chapter 11).
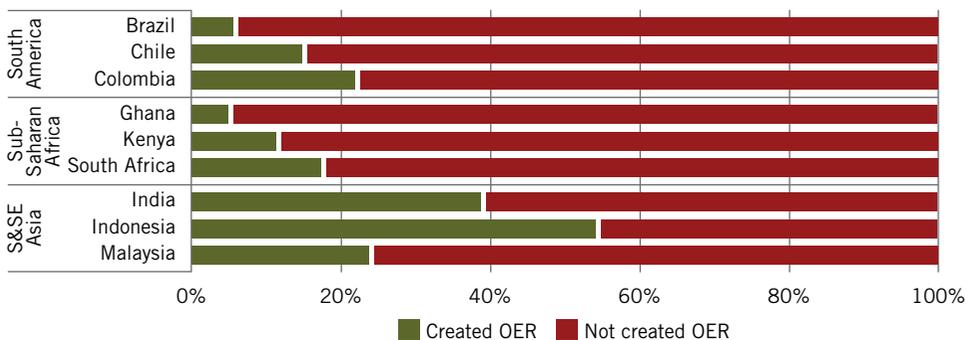
Figure 4: OER creation by higher education educators as indicated by applying open licensing on teaching materials (Source: de Oliveira Neto et al., Chapter 3)

Still, in general, OER creation was the second most likely OEP undertaken by educators in the ROER4D studies – on par with informally sharing materials found on the internet, but less frequent than "as is" use of existing OER. The study of 117 higher education educators in India found that they were more likely to create materials than customise or combine OER (Mishra & Singh, Chapter 12).

With respect to higher education students, the cross-regional survey revealed that only 9% of the 4 784 randomly selected students reported that they had openly licensed their own materials in some fashion, thereby creating OER[17] (Figure 5).
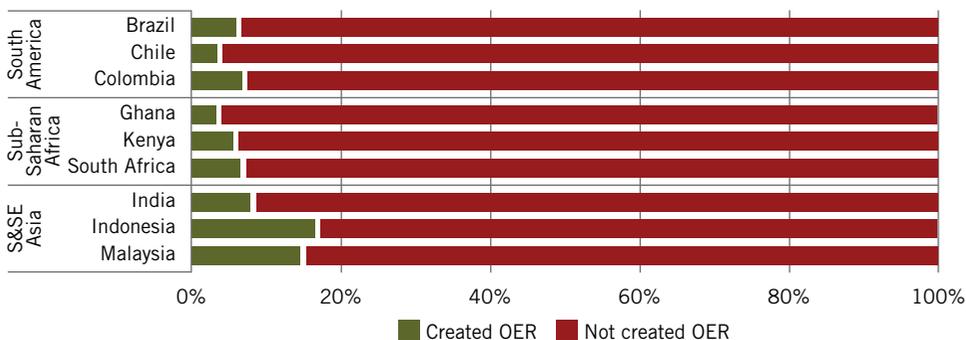

Figure 5: OER creation by higher education students as indicated by open licensing of shared materials[18]

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17   http://roer4d.org/3305
18   http://roer4d.org/3305

As Figure 5 illustrates, there appears to be more OER creation by higher education students in South and Southeast Asia (9%) than in South America (5%) and Sub-Saharan Africa (5%). Both tertiary educators (41%) and students (16%) in Indonesia reported creating OER more frequently than the educators and students in the other countries.

Lack of legal permission for educators to share the OER they create

Among the structural and agential factors that specifically influence OER creation, the most important is whether educators actually have the requisite permission to share materials they create while working at an institution. In their study of three South African HEIs, Cox and Trotter (Chapter 9, p.301) highlighted the importance of determining "whether it is the lecturers (the actual developers of the teaching materials) or the institution itself which holds copyright over the teaching materials". They established that at UCT, "lecturers possess copyright on their teaching and learning materials, allowing them to transform any of their teaching resources into OER" (Cox & Trotter, Chapter 9, p.307) if they choose to do so. This practice stands in contrast to the other two institutions they studied (Cox & Trotter, Chapter 9). They explored the extent to which other universities in South Africa hold copyright over materials produced by their educators and found that lecturers hold copyright on their teaching materials in only five of the country's 26 universities.[19] This is in line with South Africa's Copyright Act of 2008 which grants employers default copyright ownership over employees' work-based creations.

A ROER4D (2017) briefing document on OER policy reports that intellectual property laws in some other countries have different provisions. An OER-friendly arrangement is in place in Mongolia where the Copyright Law of 2006 states that: "The author of a work created in the course of execution of his/her duties shall enjoy non-economic intangible rights; the employer may have the exclusive rights over the exploitation of the work created as part of the exercise of official duties if not otherwise stipulated in the contract."[20] This suggests that educators should be able to share their teaching materials as OER as long as they do not profit financially from the process.

Low digital proficiency inhibits OER creation by educators and students

A number of the ROER4D studies focused on OER creation by educators (Cox & Trotter, Chapter 9; Czerniewicz et al., Chapter 10; Kasinathan & Ranganathan, Chapter 14; Menon et al., 2017; Sáenz et al., Chapter 5; Westermann Juárez & Venegas Muggli, Chapter 6); only one included OER creation by students (Westermann Juárez & Venegas Muggli, Chapter 6). These studies raised digital proficiency as an agential factor in educators' and students' ability to create OER. At UCT, where researchers interviewed the academics who had worked with the Centre for Innovation in Learning and Teaching (CILT) team to collaboratively create MOOCs, the individual creators were relatively skilled in the use of various digital technologies and the CILT team included technically skilled pedagogical support staff (Czerniewicz et al., Chapter 10). In India, by contrast, the educators in the teacher professional development group were observed to have "nascent digital literacy skills and limited time to gain technical proficiency" (Kasinathan & Ranganathan, Chapter

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19   http://roer4d.org/2298
20   http://www.wipo.int/wipolex/en/text.jsp?file_id=203958

14, p.527). In both the Indian and Colombian studies, researchers actively supported participants' acquisition of digital skills by teaching them how to use FOSS. According to Sáenz et al. (Chapter 5, p.163), "free and/or open software … was encouraged to promote greater coherence between the technologies used and the open licensing approach to promote social values within an open culture framework". Lack of digital proficiency as a barrier to OER creation also emerged in the sub-project in Chile, where students who were required to contribute to Wikibooks found the editing quite complicated and were therefore reluctant to contribute (Westermann Juárez & Venegas Muggli, Chapter 6).

Participation in professional development networks aids collaborative OER creation

In Karnataka province in India, 88% of school teachers who were part of a professional development network produced 25 original video resources in the local Kannada language for demonstration of various science concepts, which formed the core resource material for a statewide training programme (Kasinathan & Ranganathan, Chapter 14). Collaborative OER creation was also reported by groups of pre-service teachers in nine provinces in Sri Lanka (Karunanayaka & Naidu, Chapter 13). In Colombia, 22 teachers from six schools created 16 OER, of which 10 were created individually and six collaboratively. The researchers noted that this was a new practice for the school teachers, who did not usually create materials, either on their own or collaboratively (Sáenz et al., Chapter 5).

Like school teachers, higher education faculty do not often create materials collaboratively unless there is a specific institutional policy or project (usually accompanied by funding) which requires them to do so. An example is the MOOC Project at UCT that was undertaken by academics in collaboration with an institutional learning design and materials production unit (Czerniewicz et al., Chapter 10). The creation of these MOOCs "inspired careful consideration of licensing options for the MOOC as well as discussion about the kind of licensing in the educators' future formal courses" (Czerniewicz et al., Chapter 10, p.370).

Co-creation among students and educators still a nascent activity

Co-creation of materials among students and educators is likewise still in a nascent phase at the ROER4D research sites. In Chile, Westermann Juárez and Venegas Muggli (Chapter 6) report that even though their project provided opportunities for co-creation with students, not many students took up this offer. In the East African institutions they studied, Wolfenden et al. (Chapter 8) also mention some educators sharing student work with the next cohort of students. In Afghanistan, after undergoing OER training, 78% of the participating Afghan teachers said that OER helped them initiate collaboration among students (Oates et al., Chapter 15).

Curating original OER more likely with government, institutional or project support

Hodgkinson-Williams (2014) describes the curation phase of the Open Education cycle as the hosting of materials and/or tuition on a publicly accessible platform with sufficient descriptive information (i.e. metadata) and appropriate open licensing (e.g. CC) for these resources to be easily found with search engines on the internet and aggregation platforms.

The term "curation" is more often used by librarians, but it is gradually becoming a familiar term amongst educators.

In the Karnataka study, the KOER portal began as an initiative to publish the resources shared by school teachers participating in the Subject Teacher Forum mailing lists (Kasinathan & Ranganathan, Chapter 14). The overt curation strategy was the creation of a MediaWiki-based portal, maintained by the NGO IT for Change[21] where all content created by the teachers is uploaded and assigned a CC Attribution-ShareAlike (CC BY-SA) licence. Some of the teachers reported difficulties uploading their materials to the KOER portal, primarily due to a lack of technical competence, sometimes reverting to sharing materials via email instead (Kasinathan & Ranganathan, Chapter 14). However, IT for Change, with some support from the provincial government, has been able to act as curator and assist teachers in sharing materials, particularly those in the Kannada language (Chapter 14). This model is being implemented by the government in two other states in India.

In Afghanistan, the DDL[22] was established by the NGO Canadian Women for Women in Afghanistan (CW4WAfghan) to serve as an independent source of knowledge, information and pedagogical tools for Afghan school teachers (Oates et al., Chapter 15). Like IT for Change, CW4WAfghan takes responsibility for the curation and ongoing maintenance of OER uploaded to the DDL. While the teachers are able to upload materials to the DDL and choose a relevant open licence, it seems that this is still an incipient practice (Oates et al., Chapter 15).

In the Colombian project, as mentioned, the participating school teachers created 16 OER in Spanish and thus faced the challenge of where to curate these materials and how to describe them so that they would be found through a Google search. With the support of the ROER4D researchers in Colombia, the teachers were able to upload their materials to third-party platforms (in most cases YouTube) and publish on the Collaborative Co-Creation of Open Educational Resources by Teachers and Teacher Educators in Colombia project website[23] to make clear the attributed author and copyright holder of the materials, the open licence used (in this case, CC BY-SA), and other descriptive data such as subject area, grade level, institution and its location, and the email details of the author. Sáenz et al. (Chapter 5, p.174) note that:

> Addressing copyright and open licensing in the activities of adaptation, curation and creation with teachers and students … and identifying the possibilities offered by ICT in schools … 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.

There were other ROER4D studies that alluded to an open curation strategy. For example, the MOOC production team at UCT used third-party MOOC platforms (FutureLearn and Coursera) to host their MOOCs (Czerniewicz et al., Chapter 10). At least two of the MOOCs were curated well enough to be reused by the MOOC educators in their regular campus-

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21   http://karnatakaeducation.org.in/KOER/en/index.php/Main_Page
22   https://www.darakhtdanesh.org/en
23   https://karisma.org.co/cokrea/

based classes, and one was used at a university in Maryland, USA (Czerniewicz et al., Chapter 10). Cox and Trotter (Chapter 9) report that creators of OER at UCT curated their original materials on the OpenUCT[24] institutional repository, where uploading the materials and attributing metadata is the responsibility of the individual lecturer. Although this strategy recognises the agency of the lecturers and bolsters autonomy, there is a risk that the OER will not be described adequately to make them easy to find online.

The lack of an open curation strategy is evident in many of the other ROER4D sub-projects where educators report using and storing OER, very likely without metadata, on a password-protected LMS (Adala, 2017; Karunanayaka & Naidu, Chapter 13; Wolfenden et al., Chapter 8). In this case, even if the original OER have a CC licence, the adapted OER, which may include more up-to-date material, more relevant examples and/or more creative activities, may never be shared or used by others, even within the institution.

Based on the foregoing, the structural and agential factors that seem to enhance the curation of original OER include the availability of a suitable platform with ongoing technical support, as well as knowledge of open licensing and digital fluency on the part of the participants. The establishment and sustainability of a content-curation platform is more likely if it is supported by government, an institution or a NGO.

Informal sharing of materials more frequent than sharing via formal OER distribution channels

"Circulating" is a term used to describe dissemination of OER through informal sharing and formal distribution mechanisms to aid discoverability. It follows very closely on the heels of curation, and is undertaken in order to share content more widely via email or a formal platform, as merely curating materials on an institutional or third-party platform is insufficient for optimal visibility and reusability.

The ROER4D studies confirm that educators are generally willing to share their materials informally (Karunanayaka & Naidu, Chapter 13; Oates et al., Chapter 15). Mishra and Singh (Chapter 12) report that their respondents in Indian HEIs felt that it is a teacher's inherent responsibility to share. Several of the respondents in East Africa described how they shared their own resources as well as those of their students under CC licensing (Wolfenden et al., Chapter 8). However, while many educators were keen to share their own materials and those of others, this often seemed to take place irrespective of licensing conditions. In Chapter 14, Kasinathan and Ranganathan observe that educators seldom openly licensed their materials and it "appeared that teachers treated the resources created by them and shared on mailing-lists as self-evidently open" (Chapter 14, p.538) – what these authors termed "implicit OER". They go on to explain that "during the focus group discussions, it emerged that teachers found the default copyright approach counter-intuitive, especially in the context of online digital resources, since these were usually easy to download and re-use, and were mostly gratis" (Kasinathan & Ranganathan, Chapter 14, p.537).

However, not all educators were willing to share, mostly citing concerns about quality and contextual and pedagogical appropriateness (Cox & Trotter, Chapter 9; Wolfenden et al., Chapter 8). One of the respondents in Wolfenden et al.'s study said that she would not share her materials if she was unsure about the quality or if someone might not find them useful.

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24   https://open.uct.ac.za/

In terms of communication about the OER, even in MOOCs which are formally curated on a third-party platform, Czerniewicz et al. (Chapter 10) report that lecturers adopted strategies to extend the reach of OER beyond the MOOC platform (e.g. the "Ask Mark" collection on YouTube that was developed in the "What is a Mind?" MOOC).[25] The dissemination of these materials and other MOOC offerings was supported through active Twitter and Facebook campaigns to alert potential students. Although some of these "OER communication" activities emerged as a result of the learning design and production team supporting the lecturers, at least one of the lecturers had previously produced his own videos on a dedicated YouTube channel.

Factors inhibiting sharing seem to be more agential in nature, with educators not fully understanding copyright and open licensing and having to make sense of the paradox of being able to find and download both fully copyrighted and openly licensed materials, but being legally restricted from sharing the former and not the latter. On the other hand, factors encouraging communication about OER seem to be related to the imagination and technical skills of educators and support teams.

Quality assurance more likely within institutional or project initiatives

The "certify" and "critique" steps in the Open Education cycle, which represent the quality assurance and feedback activities that ideally link back to further integration of OER, were deemed important by the participants in the ROER4D studies, but were seldom reported as personal practices. Individual educators frequently expressed their concern about the quality of their teaching materials. In their South African study, Cox and Trotter (Chapter 9, p.316) report that educators were not confident about sharing their work "as OER just yet [or] would have to reassess their work with an eye to making it public before doing so".

In cross-country, institutional or project initiatives, quality assurance processes are often included in the original development of OER. For example, with respect to the AVU materials, Adala (2017) mentions the quality assurance and accreditation processes followed and how these processes included ministries of education and organisations such as the Teachers Service Commission. At an institutional level, Menon et al. (2017, p.32) report that the quality framework adopted at WOU was a "very robust one involving a number of systematically sequenced standard operational practices, including feedback loops at relevant stages of curriculum formulation, OER selection, material development and draft material trials". By contrast, from a project perspective in India, Kasinathan and Ranganathan (Chapter 14, p.536) acknowledge that the:

> … large volume of materials shared on mailing lists and the KOER platform means that only a very small sample has been formally checked for quality assurance purposes. One of the expectations of the Education Department was that teachers would peer review the resources uploaded to the KOER platform, and use MediaWiki functionality to continually edit and revise the content. Such continuous peer editing and revision of resources is a higher-order skill not yet seen in the KOER context. Acknowledging that more formal structures are required for review processes, [the Directorate of School

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25   https://www.futurelearn.com/courses/what-is-a-mind

> Educational, Research and Training] is considering setting up state and district resource groups of teachers and teacher educators to play the role of peer reviewing and revising OER.

An unexpected finding was that individual educators reported using OER to check the quality of the materials they create but which they do not necessarily share. In their study in East Africa, Wolfenden et al. (Chapter 8, p.271) highlight the perspective of an educator who suggested that the benefit of exploring OER was that it "gave them a quality benchmark which sometimes caused them to feel they were doing a 'substandard' job compared to their international peers and that they were using 'old' methods". Similarly, Cox and Trotter (Chapter 9, p.320) report that an educator had "used OER to check the quality of her own teaching materials, not to incorporate them into her teaching practice".

Formal critique or feedback more easily actionable in institutional initiatives

Although, in principle, educators felt that "sharing education resources helped them obtain feedback … if [they were] seeking to improve their materials" (Mishra & Singh, Chapter 12, p.436), this ambition was more easily discernible in institutional initiatives than in cross-country, project-based or individual initiatives. For example, with regard to the UCT MOOC Project, Czerniewicz et al. (Chapter 10, p.372) reflect that:

> … the experience of making a MOOC not only exposed educators to new open pedagogical strategies, but also to feedback from MOOC participants. The feedback in the form of completed assessments, peer review, comments, discussion threads and assignments enabled the educators to witness the effect of the pedagogical strategies they employed as they taught in a distributed network and as part of a diverse community.

The feedback led to educators designing additional online activities, such as video recordings of the lecturer responding to questions from students.

Table 5 provides a summary overview of the structural, cultural and agential factors influencing the creation of OER in the ROER4D research sites.

Table 5: Structural, cultural and agential factors influencing OER creation in ROER4D studies

	Structural factors	Cultural factors	Agential factors
Creation	**Enablers** – Government support for OER portal – OER creation part of teacher development programme – School-based OER support programme – Institutional funding for OER – Institutional, technical and/or learning design support – Project activity supporting OER creation in local languages – Permission to use open licences **Constraints** – Variable government support for infrastructure – Lack of institutional permission to share created works, including OER	**Enablers** – Professional teacher development network – Input from students **Constraints** – Unfamiliar practice amongst educators	**Enablers** – Digital proficiency – Consideration for future reuse in formal courses **Constraints** – Lack of digital proficiency – Lack of awareness of OER and open licensing – Lack of time to gain digital proficiency
Curation	**Enablers** – Public but local (language, curriculum) OER platform – Ongoing technical support **Constraints** – Password-protected LMS	**Constraints** – Curation not a common practice amongst educators	**Enablers** – Prospect of reuse **Constraints** – Digital proficiency – Lack of knowledge of licensing and how to assign metadata
Circulation	**Enablers** – Formal platform – Technical support **Constraints** – Default copyright clause	**Enablers** – Informal network	**Enablers** – Willingness to share – Responsibility to share – Adopting strategy to share on a range of platforms **Constraints** – Concern about quality
Certify and Critique (quality assurance) [QA]	**Enablers** – QA built into institutionally created OER – Feedback loop – Availability of continuous revision loop **Constraints** – Formal structures required for QA	**Enablers** – Using OER to check quality of own teaching materials **Constraints** – Quality not always checked in community of informal sharing	**Enablers** – Feedback enabled review of pedagogical strategies **Constraints** – QA not usually part of individual practice

The OER adaptation phase

Hodgkinson-Williams (2014, p.9) originally described the adaptation phase as consisting of two separate actions, namely: "customise", equivalent to Wiley's concept of "revise", and "combine" as a simpler way of describing what Wiley refers to as "remix".[26] It should be noted that the latter concept does not necessarily have a ready translation in other languages. During the course of the ROER4D project these two processes were deliberately collapsed into "adaptation" (Walji & Hodgkinson-Williams, 2017b), as it became clear that respondents in the ROER4D studies could not easily discern the subtle differences between revising a single OER and remixing multiple OER. In the meta-synthesis it became apparent that respondents and researchers alike used a range of other terms to describe the adaptation process, including modify, change, translate, contextualise, localise, refine, repurpose, rewrite, edit, add, reduce, delete, resequence and improve, mirroring the reuse processes described by Okada et al. (2012) quite closely.

Limited adaptation of OER by educators and students

The cross-regional survey shows that only 18% of the 295 randomly selected educators surveyed reported having adapted (modified) OER at least once (de Oliveira Neto et al., Chapter 3) (Figure 6).
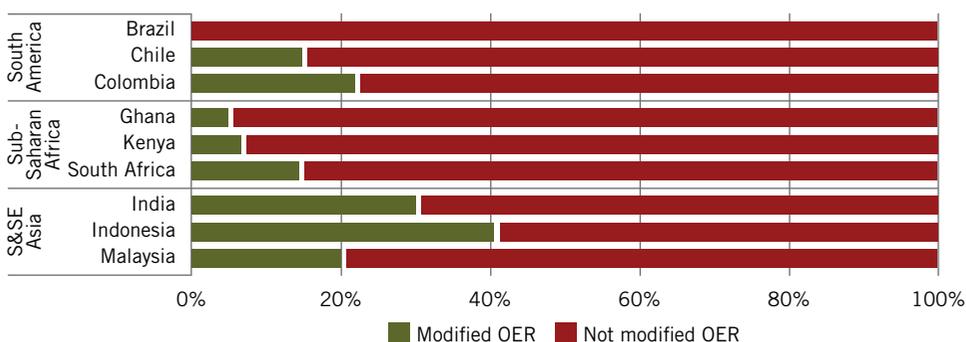

Figure 6: **OER adaptation by higher education educators (Source: de Oliveira Neto et al., Chapter 3)**

As Figure 6 illustrates, the level of OER adaptation by higher education educators appears to be greater in South and Southeast Asia (30%) than in South America (12%) and Sub-Saharan Africa (9%). Moreover, none of the nine educators surveyed in Brazil reported adapting OER; in contrast, 15% and 22% of the educators surveyed in Chile and Colombia, respectively, reported that they had adapted OER (de Oliveira Neto et al., Chapter 3). Conversely, Kasinathan and Ranganathan (Chapter 14) provide an indication of high levels of adaptation by the "Collaborative OER Adoption" cohort of teachers in their study.

The adaptation of OER by tertiary students is very limited, with only 6% of the 4 784 randomly selected students surveyed reporting that they have modified OER at least once[27] (Figure 7).

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26   https://opencontent.org/blog/archives/355
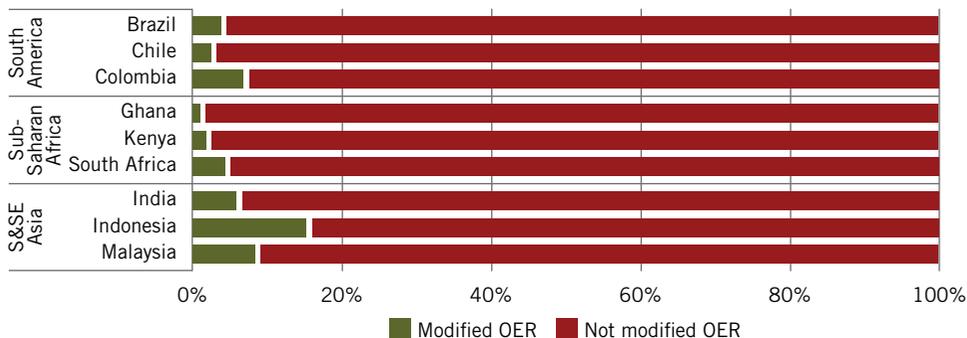27   http://roer4d.org/3305

Figure 7: OER adaptation by tertiary students[28]

As Figure 7 illustrates, there appears to be more OER adaptation by tertiary students in South and Southeast Asia (11%) than in South America (4%) and Sub-Saharan Africa (3%), which mirrors the regional differentiation for educators. Both tertiary educators (41%) and students (16%) in Indonesia reported adapting OER more frequently than the educators and students in the other countries in the three regions surveyed. As no ROER4D case study was undertaken in Indonesia, further research is needed to explain this trend, which may have to do with the initiative by Universitas Terbuka (one of the institutions where educators and students were surveyed) to use OER in their open and distance courses.

OER more readily adapted by institutions if coherent collections of OER are available

Where institutions aim to use OER as the basis for entire courses, having collections of OER might support their adoption. With regard to the OER-based courses at WOU, Menon et al. (2017) highlight the value of having a large coherent collection of OER materials in reducing the time needed for adapting and weaving resources together. Their study also highlights the level of knowledge of the discipline required for a curriculum development team to be able to integrate existing OER into a course.

Predominance of English-based OER requires a level of fluency in English

Both Adala (2017) and Wolfenden et al. (Chapter 8) mention the need for fluency in English for educators to be able to accurately translate OER into their language of choice. The educators in Wolfenden et al.'s study (Chapter 8, p.273) pointed out that "sometimes the use of OER made considerable demands on their students – for example, students accessed resources in English, but were then expected to use them in their practice in Swahili". Zagdragchaa and Trotter (Chapter 11) refer to the conundrum facing educators in Mongolia who would like to translate English-language OER into Mongolian to aid optimal comprehension by their students, but who have to consider the time investment of doing so if the students are sufficiently fluent in English to understand the materials in the original. The CW4WAfghan group responsible for the DDL in Afghanistan makes no such assumptions of English fluency and has volunteers from around the world undertaking the translation of English-language OER into Afghan languages (Oates et al., Chapter 15).

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28   http://roer4d.org/3305

Workshops needed to model and provide experience in OER adaptation

The ROER4D studies in India (Kasinathan & Ranganathan, Chapter 14; Mishra & Singh, Chapter 12), Sri Lanka (Karunanayaka & Naidu, Chapter 13) and Malaysia (Menon et al., 2017) all report the value of conducting workshops for school teachers and course writers to demonstrate and provide practice in OER adaptation. A teacher in the Sri Lankan study explained that "workshop activities helped us to identify relevant OER and identify the nature of their licences … it helped us to gain some knowledge and practice of the '4R' concept through practical activities organised during the workshop" (Karunanayaka & Naidu, Chapter 13, p.483).

Workshops can also provide educators with opportunities to use FOSS to create or adapt materials (Kasinathan & Ranganathan, Chapter 14; Sáenz et al., Chapter 5). In the ROER4D study context, they also helped educators learn how to upload materials to a public platform for sharing local curricula in local languages, as in the case of the KOER portal in India (Kasinathan & Ranganathan, Chapter 14), or to an institutional OER repository hosted on the LMS, such as the Open University of Sri Lanka's Moodle-based LMS (Karunanayaka & Naidu, Chapter 13). Post-workshop technical support was mentioned as a necessary function to assist the Indian school teachers in uploading or directly linking OER on the KOER portal (Kasinathan & Ranganathan, Chapter 14), but the researchers noted that even with ongoing technical support the teachers contributed more material to the portal during the workshop period than afterwards.

Adapted OER not always re-curated by educators and seldom by students

Where public and locally relevant OER portals and/or institutional repositories were available, OER adaptation could be observed and tracked in the ROER4D studies. The challenge was that not all educators had access to such repositories, or if they were available, they did not always know about them. For example, even if they had access to the original AVU materials, the educators in Adala's (2017) study did not know where or how to re-curate adapted versions. One of the educators mentioned that the majority of the educators and students were unaware of the materials and that his institution rarely created different versions of the AVU materials. While some of the educators interviewed said that they had been using AVU OER as supplementary material, the overall impression was that the adaptations of these materials were not publicly shared for readaptation. Thus, the original AVU materials are now considered outdated, inadequate and misaligned with the current curricula (Adala, 2017). Although there are a few reports of educators including OER in their courses, these versions are not accessible to other educators or students.

Need for ongoing support from institutional policy-makers and OER champions

Both Adala (2017) and Wolfenden et al. (Chapter 8) point to the valuable influence of institutional or project OER champions in building a culture of sharing. Provision of institutional support for OER adoption at WOU (Menon et al., 2017) and departmental support at UCT (Czerniewicz at al., Chapter 10) is noteworthy. Similarly, the ongoing support for OER adoption that is provided by IT for Change in India (Kasinathan & Ranganathan, Chapter 14), by CW4WAfghan in Afghanistan (Oates et al., Chapter 15) and by the Karisma Foundation in Colombia (Sáenz et al., Chapter 5) demonstrates the value of projects and/

or strategies to optimise the adaptation of OER. Without a formal strategy for continuous development, OER are likely to become outdated, which means that one of the key value propositions of OER will remain unrealised.

Table 6 provides a summary overview of the structural, cultural and agential factors influencing the adaptation of OER in the ROER4D research sites.

Table 6: **Structural, cultural and agential factors influencing OER adaptation in ROER4D studies**

Structural factors	Cultural factors	Agential factors
Enablers – Availability of "generic" and coherent body of OER for adaptation – Formal workshops to model and provide experience of adapting OER – Public but local (language, curriculum) OER platform to curate adapted OER – Public platforms on which educators and students can host and edit OER (e.g. Wikibooks, MediaWiki) – Technical support for re-curating post-workshop activities **Constraints** – Lack of locally relevant OER portals, repository or even institutionally driven OER repository hosted on an LMS – Lack of a strategy for continuous development of OER to avoid materials becoming out of date	**Enablers** – Presence and advocacy of local OER champions to build culture of sharing – Use of FOSS to promote open social values – Repurposed for different contexts **Constraints** – Adapted OER not always shared within community	**Enablers** – Sufficient knowledge of the discipline to combine congruent OER – Learning design skills – Ability to write materials – Fluency in English sufficient to be able to accurately translate OER **Constraints** – Lack of fluency in English sufficient to be able to accurately translate OER – Time to translate OER into local languages may outweigh benefits if students are already sufficiently fluent in English – Lack of time – Lack of knowledge of copyright and licensing

Discussion

The discussion section discusses the disjunctures within the Open Education cycle that are apparent from the patterns of OER adoption described in the previous section. The factors that account for these disjunctures are summarised, and their impact on OER as a means for widening access to educational materials, improving the quality of educational materials, enhancing the quality of teaching and learning and improving the affordability and sustainability of Open Education are explored. The discussion also touches upon the power dynamics around OER adoption in the Global South that are apparent in the ROER4D studies.

The incomplete Open Education cycle

What is clear from the findings of the ROER4D project is that in the Global South contexts studied, the ideal Open Education cycle is incomplete, resulting in the benefits of OER

adoption not being fully optimised. There are five key points of disjuncture: (1) the dependence on copying of existing OER and the corollary reluctance to localise; (2) in the adaptation of OER, inconsistent curation and rehosting of derivative works on a publicly available platform or repository, which limits access to the derivative OER; (3) limited circulation of derivative OER due, in part, to the absence of a specific dissemination strategy; (4) inconsistent quality assurance processes; and (5) a weak feedback loop for continuous improvement of original or derivative OER (Figure 8). There is also one unexpected enactment of the use phase, namely the emergence of the use of existing OER to prompt ideas for pedagogic practice (Oates et al., Chapter 15; Wolfenden et al., Chapter 8).
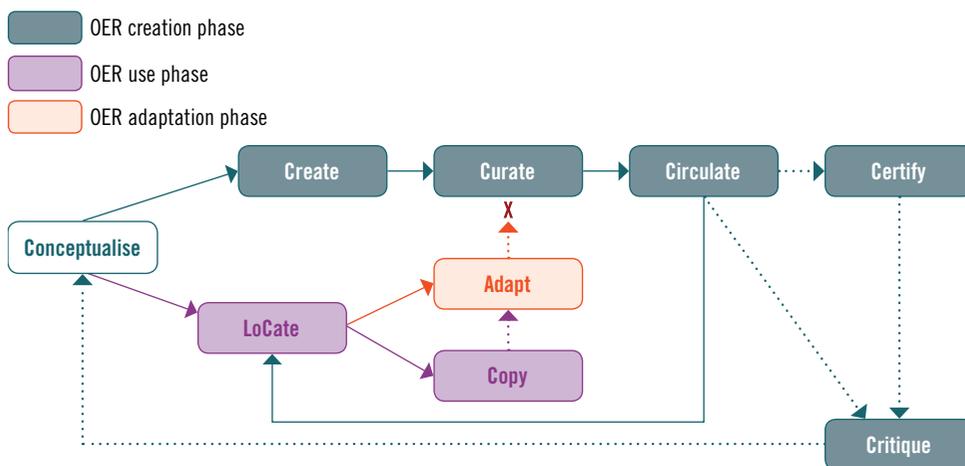

Figure 8: **Enactment and disjunctures of the Open Education cycle in ROER4D studies**

These disjunctures in the Open Education cycle indicate that educators in the Global South seem to be relying heavily on OER created in the Global North for use in their original form, thereby unwittingly reinforcing Northern epistemic hegemony. In addition, because most of the current OER are available in English, the reuse of OER "as is" and even the translation of OER, which requires a certain level of English fluency, sustains Anglo-linguistic preeminence. The latter seems to be more problematic in countries in South America, some countries in Sub-Saharan Africa and specific countries in Asia, for example Afghanistan.

More positively, it is clear that educators, and to a lesser extent students, are starting to create, curate and circulate local-language OER, albeit informally. While the formal quality assurance mechanisms are still nascent in individually developed OER, these are more well developed in OER creation that is supported by institutions or NGOs. The feedback loop, which ideally allows for critique to inform the next conceptualisation of OER, seems to be quite weak across the studies undertaken in the ROER4D project, with the exception of institutionally funded projects, such as the UCT MOOC Project. The value of this incipient OER creation phase is that countries in the Global South are taking the opportunity to showcase, at a global level, diverse perspectives and expertise through locally relevant resources and socially situated practices.

The major disjuncture is in the adaptation phase where the studies report not only limited revising and remixing of OER, but also virtually no re-curation, re-circulation, re-certification

or re-critique. The consequence is that an opportunity to include adapted OER in the global collection of culturally and linguistically diverse OER is being missed.

The factors that might influence this incomplete Open Education cycle are summarised in the following section in terms of their consequences for access to affordable, good-quality education in the Global South.

Structural, cultural and agential factors influencing OER adoption for access to affordable, good-quality education

This section synthesises the structural, cultural and agential factors influencing OER adoption and associated practices to improve access to educational materials, the quality of educational resources, educators' pedagogical perspectives and practices, and student performance as well as the overall affordability and sustainability of education in the Global South.

Factors influencing access to educational materials

The ROER4D studies suggest that, overall, the availability of OER is increasing access to educational materials in the Global South, even though they are mostly in English. Awareness of OER is, however, not ubiquitous and many educators and students cannot easily differentiate OER from other resources on the internet. Structural factors enabling access include provision of requisite infrastructure, which appears to be better in HEIs than in schools and better in urban than in rural areas – although this is not uniformly so across the countries studied in the ROER4D project. Provision of an uninterrupted power supply, access to functioning computers, especially in schools, and affordable internet connectivity cannot be assumed.

Despite these infrastructural challenges, it would seem that, in general, educators and students are sufficiently digitally fluent to use OER in the most limited sense of copying and reusing them for other purposes. The bigger challenge is where to curate and host adapted OER to provide continued access to updated materials. The emergence of local-language and curriculum-aligned OER platforms such as the KOER portal in India and the DDL digital library in Afghanistan helps in the provision of contextually relevant educational materials. Moreover, government support for the KOER portal and others like it in two other Indian states points to the value of locally relevant OER. However, the practice of hosting original and adapted OER on password-protected LMSs was also evident in some of the research sites, which, even with more encompassing open licensing provisions (such as CC BY), restricts rather than opens up access to educational materials. What seems to aid access to adapted materials is the provision of technical support to license and upload OER and an institutional or project-based strategy for continuous development of OER to avoid materials becoming dated.

Broadly speaking, the power over access to OER is mainly vested in provincial or state arms of government with respect to the schooling sectors and in institutions for the higher education sector. Where governments or institutions are unable or unwilling to invest in the infrastructure required to enable access, NGOs can provide temporary infrastructural support; the burden of access otherwise falls to the individual educator and student. What seems equally important is individual educators' and students' "epistemological access"

(Lotz-Sisitka, 2009), which reveals the educators' and students' ability to understand the OER in its original form as well as the linguistic fluency to be able to use or adapt it for their own sociocultural setting. In the ROER4D studies, educators and students reveal differing levels of epistemological access, as well as what van Dijk (2005) refers to as "skills access" to undertake the technical activities required to create, use and/or adapt OER.

Factors influencing the quality of educational materials

The influence of OER adoption on the quality of the educational materials themselves remains uncertain, as suggested by the range of articulated and unarticulated quality assurance mechanisms evident in the ROER4D studies. For example, although WOU has a quality assurance process which specifies quality checks at a number of points along the curriculum development process, the derivative OER remain behind a password-protected LMS. This means that they are not available for others to critique and adapt, and the adaptation process does not feed back into the Open Education cycle to encourage the ongoing refinement so valuable for the production of good-quality OER. The UCT MOOCs fare a little better as they have been subjected to quality assurance processes and are publicly available on a MOOC platform, but it is still not easy for others to access all of the constituent open materials for reuse, adaptation, re-curation and ongoing quality assurance. The quality of the OER in the DDL digital library in Afghanistan fares even better as there is a process for quality assurance of translations of existing OER.

The key influencing factors seem to be structural in nature, as institutions and/or projects have implemented or still need to implement strategies for continuous development and quality assurance of adapted OER. On the positive side, the lack of such strategies does not prevent educators from exercising agency – not only in selecting OER (and other materials) that they perceive to be relevant for their context (e.g. cultural, linguistic, geographic), but also in adapting these OER to meet specific pedagogic purposes. However, for individuals adapting existing OER, there is the complicating requirement of basic competency in English, which cannot always be assumed.

Overall, the ROER4D studies reveal that although the individual educators and students have power over searching for the OER they deem to be of a quality that is "fit-for-purpose" (Biggs, 2001) for their sociocultural context, they are dependent on the perceived reputation of the institutions or organisations from which the OER originates as a benchmark of quality assurance. This implies that the reputation of well-known and well-respected institutions or organisations indirectly holds a great deal of power over which OER are used.

Factors influencing the quality of pedagogy

The ROER4D studies seem to confirm the influence of OER on educators' pedagogical perspectives and practices, prompted by professional training and/or learning design support. For example, in the study in Afghanistan, Oates et al. (Chapter 15, p.565) suggest that a combination of "exposure to OER lesson models in the DDL, the general benefit of the DDL professional training, [and] review or the use of the lesson plan template in creating lesson plans" led to improved lesson design and instructional practice. The lecturers who were part of the UCT MOOC Project likewise attributed their adoption of more learner-centred pedagogical strategies to their involvement in MOOC-making – this was enacted not only within the MOOC, but also in their formal university teaching. It was noted that

this learner-centred pedagogical practice was "more enthusiastically enacted … when they were supported by learning designers" (Czerniewicz et al., Chapter 10, p.381). In the Mongolian study, one of the primary motivating factors identified for creating OER was that it "improved educators' own teaching materials because they knew that other educators might use them" (Zagdragchaa & Trotter, Chapter 11, p.416). However, some caution is needed when interpreting the relationship between OER use and improved teaching practice, especially over short periods of time, as the ROER4D studies also observed the persistence of entrenched practices, such as using the textbook exclusively as the basis for lesson planning and delivery (Oates et al., Chapter 15).

In general, the educators in the ROER4D studies exhibit quite strong agency over their pedagogical practices in terms of whether and how to engage with OER and whether or not to work in groups or individually. However, the power over their pedagogical choices is not absolute, as local institutional norms still hold sway – sometimes quite explicitly (such as in a school principal's lack of support) and at other times more implicitly (in relation to social expectations and unwritten codes of behaviour). For example, it is still common that educators at schools and in HEIs act autonomously, and collaboration is unusual unless there is a specific funded project which calls for it. Nevertheless, the greatest impact of OER adoption reported in the ROER4D studies centres around changes in teacher pedagogy and surfaces some shifts towards more learner-centred approaches, some collaborative work and embryonic co-creation with students.

Factors influencing student performance

Only one of the ROER4D studies specifically investigated the possible influence of the use of OER on student performance (Westermann Juárez & Venegas Muggli, Chapter 6). While circumspection is required in any attempt to draw causal relationships, this is particularly so in this case due to the many variables that could have accounted for the results, despite the fact that the researchers made every effort to isolate these variables in their quasi-experimental approach. An expected result was that students using video-intensive OER, such as a Khan Academy collection, were less likely to attend face-to-face classes than those using a teacher-adapted resource or the traditional textbook. Less expected was the fact that students using the Khan Academy collection did significantly better in their examinations, although not in the course as a whole. A different group of students using a similar set of video-intensive OER in a blended course fared no better than students using the proprietary resources provided by the institution. What is perhaps most surprising is that student results did not improve significantly when using a teacher-adapted OER in Wikibooks that enabled the students to contribute their own examples, despite the fact that the teacher and students alike said they preferred the Wikibooks resource. Overall, the results of the influence of OER on student performance are therefore slightly contradictory in this instance and may have more to do with the overall learning design and medium of delivery than the openness of the resources *per se*.

The ROER4D studies had a very limited focus on the influence of OER on student performance, so generalisations are not possible. A key issue raised in terms of further research is the need for more explicit and subtle discrimination between the learning design of resources, their digital nature and the features of the open practices involved in order to make claims about the influence of OER on student performance.

Factors influencing the affordability and sustainability of Open Education

While OER may be "free" for any user, there are "costs of access" that need to be considered in economically stressed environments, particularly the cost of internet connectivity. There may also be costs associated with certification, as mentioned by the MOOC researchers (Czerniewicz et al., Chapter 10). Nevertheless, based on findings from MOOC development at UCT (Czerniewicz et al., Chapter 10) and OER-based course development at WOU (Menon et al., 2017), it would seem that while there are initial costs in the creation and/ or adaptation of OER, especially in terms of technical and pedagogic competencies, there are longer-term cost and time efficiencies to be gained. While these efficiencies are yet to be determined in the WOU course studied, they are apparent from the reuse of the UCT MOOCs, which include re-runs of the same MOOC for external audiences, reuse of MOOC resources by lecturers within their own classes and reuse of MOOC resources by other lecturers in other institutions (although full cost-recovery models have not yet emerged in this case).

The key to achieving cost-effectiveness in education through OER adoption seems to be the development of the core materials and curating them carefully enough for both the original creator and others to adapt and re-curate. However, in the ROER4D sites in general, the most significant disjuncture in the ideal Open Education cycle is in the re-curation of OER, since all subsequent processes are dependent upon easy access to well-described and appropriately licensed materials. Having a specialised technical and learning design team to assist with this is more likely in HEIs than in schools, so a different configuration of support has to be envisaged. Kasinathan and Ranganathan (Chapter 14, p.531) provide just such a vision, as follows:

> For sustained OER creation, [the Collaborative OER Adoption cohort of] teachers suggested a decentralised model, comprising district-level resource groups which could regularly contribute to KOER, facilitated by the DIETs in each district. They also suggested increasing the core group of resource creators through the decentralised district-level groups. The teachers further emphasised that in order to allow teachers to continue this OER process in a sustainable way, it was important for the Education Department to make resource creation a formal responsibility of teachers and to incorporate a mechanism for reviewing the quality of resources.

Overall, the ROER4D studies suggest that the power to achieve cost-efficiency with OER lies with government and institutions, either in direct support of OER development or support for more formal communities of practice. An important caveat to this statement is that governments and institutions need to be more accurate and transparent about the costs of developing or procuring other educational materials in order to make credible evidence-based claims for the cost reduction that can be directly attributed to OER.

Conclusion

In sum, the ROER4D studies show that educators and students are not always aware of the legal distinctions between OER and copyrighted online resources, but the practice of searching for supplementary resources is growing. Use of OER is reported more frequently by educators than students and more readily in South and Southeast Asia by both groups than in South America and Sub-Saharan Africa. A key barrier to OER adoption in all three regions is a lack of the necessary technical infrastructure, including internet connectivity. This is more of a drawback for schools than for HEIs, and it is a notable constraint in rural environments.

Creation of local OER is the second most frequently reported activity in the ROER4D studies. An enabling policy environment is key in OER creation, as most school teachers and university lecturers do not have the legal permission to share the materials they produce in the course of their employment. Creation of OER by educators is enhanced with technical support and access to OER platforms, repositories, portals or websites. Educators are otherwise inclined to share created materials informally (e.g. via email), increasing the risk that these materials will not become part of locally relevant resources that others could draw upon. Support from government, institutions and NGOs is pivotal within this context, as the ROER4D studies show that quality assurance and ongoing development are more likely if OER creation is part of an institutional or project initiative.

One of the most compelling value propositions of OER is that they can be regularly updated and localised, thus reducing the cost of producing educational materials. However, the ROER4D studies show limited adaptation of OER by educators and students. A number of explanations for this are advanced, including the fact that most of the currently available OER are in English and a certain level of fluency in this language is required to understand and translate these materials. In addition, adaptation takes time, which can be reduced if more coherent collections of OER are available, rather than many quite granular OER. A disjuncture in the ideal Open Education cycle is noted in the adaptation phase where educators and students seldom re-curate their adapted OER, thus limiting peer review, quality assurance and redistribution. This gap needs to be systematically addressed if materials from countries in the Global South are to become part of the global knowledge resource collection.

What seems clear is that full participation in the OER movement in the Global South requires that certain structural factors be put in place, including a minimum level of infrastructural support, permission to share materials and OER platforms to curate curriculum-aligned OER in local languages. However, these structural adjustments alone are insufficient for the full value proposition of OER to be realised and for social change to occur. While individual educators and some institutions are sharing OER, this willingness needs to be bolstered by a more profound cultural change where communities of educators and students are given governmental and institutional support to enable OER uptake – especially the creation and adaptation of OER produced in the Global South.

Acknowledgements

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