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Differentiation in Access to, and the Use and Sharing of (Open) Educational Resources among Students and Lecturers at Technical and Comprehensive Ghanaian Universities

Judith Pete
Tangaza University College, Catholic University of Eastern Africa (Kenya)
jpete@tangaza.ac.ke

Fred Mulder
Emeritus UNESCO/ICDE Chair in OER at the Open University of The Netherlands (The Netherlands)
fred.mulder@ou.nl

Jose Dutra Oliveira Neto
University of Sao Paulo (Brazil)
dutra@usp.br

Kathleen Ludewig Omollo
Former Project Manager for the African Health OER Network; Ann Arbor, University of Michigan (United States)
Kathleen.Omollo@gmail.com

Abstract

This paper is the second in a series of three with a common goal to present a fair OER picture for Sub-Saharan Africa, represented by large-scale studies in three countries: Kenya, Ghana, and South Africa. This paper examines a deliberate selection of four Ghanaian universities with randomly sampled students and lecturers. Distinct questionnaires for students and the lecturers have been used, which generated a response from in total 818 students and 38 lecturers. The major outcomes based on the empirical data are: (i) there is a significant digital differentiation among lecturers and students at technical versus comprehensive universities in terms of their proficiency and internet accessibility; and (ii) the awareness and appreciation of the OER concept and open licensing is low but from the actual variety and types of processing by respondents of educational resources (not necessarily open) there is a preparedness for openness for the future.

Keywords: Educational Resources, Open Educational Resources (OER), ICT, differentiation, access, use, sharing, universities in Ghana, students, lecturers, open education

Introduction

This paper is the second in a series of three with a common goal to present a fair 'OER picture' for Sub-Saharan Africa, represented by large-scale studies in three countries: Kenya, Ghana, and South Africa. In the first paper in the series, which focused on Kenya, we have noted that the African traditional setting is characterized by sharing practical wisdom and indigenous knowledge between the elderly and the younger generation (Pete, Mulder & Oliveira Neto, 2017). However, when institutionalized education was introduced in Africa by countries from the Global North it brought along with it proprietary-based principles and mechanisms. With the introduction of Open Educational

Resources (OER), however, there is an opportunity to restore the traditional African principle of free and open sharing.

OER are defined 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" (UNESCO/COL, 2012).

The enormous potential of OER to simultaneously improve the access to education as well as the quality and efficiency of education (Daniel, 2009; Mulder, 2010, 2013), makes it a strong and logical alternative to proprietary-based learning materials. This holds for any audience, but in particular for those in countries in the Global South.

First, it is necessary to clarify what we mean by 'open'. An authoritative source in this respect is David Wiley who views that "'open' stands for free access plus, however, some formal rights and permissions to be granted to the users" (Wiley, 2016). These can be adopted according to an 'open licensing' scheme as offered, for example, by Creative Commons. In the first paper in the series, we have elaborated more on the concept of 'open' according to Wiley's body of thought. In practice, however, quite frequently there is confusion and misinterpretation about OER. For this reason, in all three papers in the series, we use two terms, namely (O)ER and OER. (O)ER we use to capture both expressly openly licensed resources and other digital educational resources where licensing is unknown. OER we use only when educational resources considered align with the open licensing definition expressed by Wiley.

In the series, we study the so-called (O)ER differentiation which is defined as

> "the existing inequalities in the use of (O)ER in society, that involves not only unequal access to (O)ER, but goes further to include the inequalities that exist between groups of people in their ability and capability to actually create, use or re-use, repurpose, and holistically utilize (O)ER for individual and common good" (ROER4D, 2017).

While our series focuses on (O)ER differentiation in three countries in sub-Saharan Africa –namely Kenya, Ghana and South Africa– other series in the Research on Open Educational Resources for Development initiative examine this topic in South America and Southeast Asia. From our previous paper we note the following important principle:

> "Underlying (O)ER differentiation there is digital differentiation (often called the digital divide) which concerns physical access to new ICT technologies (like internet). Accordingly we can allocate different levels of digital proficiency and of (O)ER proficiency to the key actors in education, students and lecturers" (Pete, Mulder & Oliveira Neto, 2017, p. 174).

In this paper we report on a quantitative study of Ghanaian university students and lecturers. First, we present an overview of the university landscape and the major developments in the areas of information and communications technology (ICT) in education and OER in Ghana. Then we elaborate on the research questions and on the methodology of the study. The core of the paper is an in-depth analysis with the major results and findings for four research questions. The closing section summarizes the conclusions and recommendations.

Context

Ghana is a coastal country in West Africa with a population of 28.21 million people occupying a total land area of 238.5 square kilometers (Hilbert, 2016). Over half (55.3%) of the total population

is urban (CIA, World FactBook, 2017). Ghana is considered an emerging economy, with strong economic growth. In 2011, Ghana graduated from low-income status to lower middle income status as classified by the World Bank (2017a). In 2015, Ghana became a member of the Organization of Economic Co-operation and Development (OECD) (Okudzeto, Lal & Sedegah, 2017). Ghana spends 6.2% of its GDP on education. From that education budget, 18% goes toward tertiary education (CIA, World Factbook, 2017; The World Bank, 2017b). The Government of Ghana funds 77.3% of tertiary education in the country (World Bank, 2017b). Nationally, Ghana has 10 public universities, 81 private tertiary institutions offering degrees, and 1 regionally-owned West Africa tertiary institution (NAB, 2017). The majority of the university students are enrolled in public institutions, though the share in private institutions has been growing. For the 2014-2015 academic year, total tertiary enrolment was 320,746, with 248,507 in public institutions (77.5%) and 72,239 private (22.5%). The national enrolment in tertiary education is 13%, with a national target to increase this share to 25% by 2020 (NAB, 2017) The National Education Strategic Plan for 2010-2020 includes an ICT component, calling for the expansion of ICT for instruction at all levels, from primary to tertiary education (MOE, 2014a, 2014b).

Ghana adopted two national ICT in Education policies –one in 2008 and another in 2015 (Jowi, Knight & Sehoole, 2013). Both policies embody the principle of ICT as a means and an end. ICT is presented as a means to improve access to and quality of education and an end in teaching 21st century skills for workplaces with integrated ICT (Tagoe, 2014).

For over a decade, Ghana has pursued a vision of becoming a tech leader for West Africa. Ghana currently has 16 tech hubs, which is among the highest in the region. The other two countries studied in the OER differentiation series score also high in this respect: South Africa with 54 tech hubs and Kenya with 27 (Dahir, 2016). This strategy has grown and strengthened the local ICT workforce and provided talent for ICT initiatives across industries, including education (Tagoe & Abakah, 2014).

Ghana has been active in a number of open, distance, and e-learning consortia and projects. Ghana is a member state of the African Virtual University. In 2014, Laweh Open University College was established as the first Open University in Ghana and the second in West Africa. An initiative to launch the Open Universities of Ghana agency is currently under review with the National Council for Tertiary Education (MOE, 2017). Within the realm of OER, at the university level, two of Ghana's public universities were founding members of the African Health Open Educational Resources Network.

This network was launched in 2008 and supported through 2012 by a grant from the William and Flora Hewlett Foundation. The Colleges of Health Sciences at the Kwame Nkrumah University of Science and Technology (KNUST) and University of Ghana produced open educational resources in medicine, dentistry, and public health as part of their role with the network (Okudzeto, Lal & Sedegah, 2017; Omollo, Rahman & Yebuah, 2012).

Methodology

This methodology is consistent throughout the three studies in the series. Much of the methodology description below is excerpted from the previous paper on Kenya. The excerpts are indicated by italics. The text that is not in italics is paraphrased.

These are the research questions (RQs):

1. *What is the state of connectivity and digital proficiency among lecturers and students in Ghana?*
2. *What kind and level of use, re-use, creation, and sharing of educational resources (ER) is common among lecturers and students (but for the latter not including re-use and creation) in Ghana?*

3. *What is the level of awareness of licensing related to open educational resources (OER) among lecturers and students in Ghana?*
4. *How do lecturers and students perceive the value of openness in educational resources (ER), its implementation opportunities, and its institutional context (the latter item only for the lecturers) in Ghana?*

Note that RQ1 relates to digital differentiation, RQ2 to ER differentiation, and RQ3 and RQ4 to OER differentiation.

Surveys were distributed through email in coordination with university ICT departments. Survey responses were gathered from Month 1–Month 2, 2017.

In the first paper, we elaborated on the important observation that generally neither students nor lecturers are very knowledgeable or understanding of the OER concept. This appeared in a pilot from inconsistencies in responses as well as from questionable answers. We concluded that respondents had not really internalized the OER concept (in particular the associated open licensing approach), and we called this phenomenon the 'perception eclipse', which unintentionally would lead to at least partly invalid results. We therefore changed the reference from OER to ER in the questions related to this failure. The set of RQs presented above is the result of this exercise. Many survey studies unintentionally can be bothered by this perception eclipse, in particular in cases with concepts that are difficult to grasp or distinguish, such as OER. With our methodological measures we try to limit the perception eclipse as much as possible.

The lecturers' questionnaire includes 30 items, the students' version 26 [items]. Both questionnaires contain 4 items on RQ1 and 2 items on RQ3. For RQ2 the lecturers' version addresses 5 items, the students' version 3. And, RQ4 is being covered by 7 items (for the lecturers), and by 6 items (for the students). The remaining items (12, respectively 11) are either demographic or not relevant for this study. The items in the questionnaires offer multiple-choice answers from which the respondents should tick the relevant ones. Some of the questions can have more than one answer (Pete, Mulder & Oliveira Neto, 2017).

The research has an exploratory character and is wholly based on the quantitative descriptive data provided by the two questionnaires. There is no qualitative part such as additional in-depth interviews of representatives of the two populations studied. The sampled lecturers and students were invited to fill in the questionnaires available on SurveyMonkey. Some used the online SurveyMonkey, but the majority used the printed version of the questionnaires, which were later keyed into the SurveyMonkey by the local coordinators at the participating universities. Respondents were offered incentives in the form of flash disks.

We have collected data from four universities in Ghana, which represent two types of universities: those that provide comprehensive studies and those that are technical or technology-focused. In order to incorporate further diversity we have included one private university versus three public universities. The universities selected were:

- University of Ghana / UG *(public, comprehensive)*
- University of Cape Coast / UCC *(public, comprehensive)*
- Kwame Nkrumah University of Science and Technology / KNUST *(public, technical)*
- Catholic Institute of Business and Technology / CIBT *(private, technical).*

The random sampling of the lecturers and students was done on the basis of the courses delivered in those four universities in a chosen semester. Out of the full list for each university 30 courses were randomized. From each set of 30, the local university coordinators were asked to identify at least

10 courses with more than 30 enrolled students and with lecturers who were willing to support the data collection.

The target was to get responses from a minimum of 200 students and 10 lecturers from each of the four universities. In the end, we generated a sample of 818 students (405 at technical universities and 413 at comprehensive universities) and 38 lecturers (20 at technical and 18 at comprehensive universities). In the sample, the median age of the lecturers is 42.5, with a range of 27 - 68 years old. For the students, the median age in the sample is 25 with a range of 18 - 39 years old. With regards to gender, majority of the respondents were male. For lecturers, the sample was 81% male versus 19% female, while for students the sample was 57% male versus 43% female. For educational qualifications, 39% of lecturers have a PhD as their highest degree, 41% had Masters degree as their highest, and 19% had a Bachelors degree as their highest. The majority of the lecturers had been teaching in their respective universities for less than five years as lecturers, senior lecturers, assistant lecturers, or researchers. A very small percentage (approximately 4%) worked as administrators and consultants. The lecturers came from diverse disciplines, including applied science and technology, economics and business studies, history and geography, social sciences, religious studies, and education. The disciplines represented by students in the sample included applied science and technology, religious studies, education, and social sciences.

Results and findings

In our reporting here we limit the discussion to a selection of the most relevant outcomes of the two questionnaires. In the first paper in the series on Kenya, we focused on differences between universities in rural and urban areas. In this paper for Ghana, we focus the discussion on differences that emerged between technical and comprehensive universities. The results and findings are presented under the headings of the four research questions.

RQ1: What is the state of connectivity and digital proficiency among lecturers and students in Ghana?

Since the use of (O)ER presupposes certain proficiency in the use of computers, the participants' digital proficiency is an important item in the questionnaires. Figures 1 and 2 (lecturers) and 3 and 4 (students) show how the respondents at technical and comprehensive universities self-assess their digital proficiency. The 'advanced' share is larger at comprehensive than at technical universities:
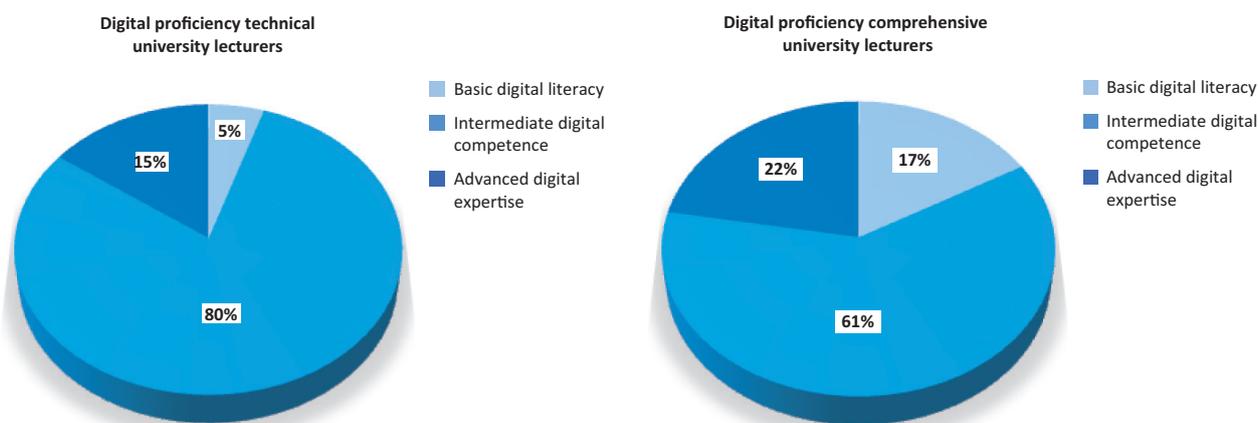

**Figure 1: Lecturers (Technical)**   **Figure 2: Lecturers (Comprehensive)**

**Digital proficiency technical
university students**

- Basic digital literacy
- Intermediate digital competence
- Advanced digital expertise

5%

27%

68%

**Digital proficiency comprehensive
university students**

- Basic digital literacy
- Intermediate digital competence
- Advanced digital expertise

12%

36%

52%
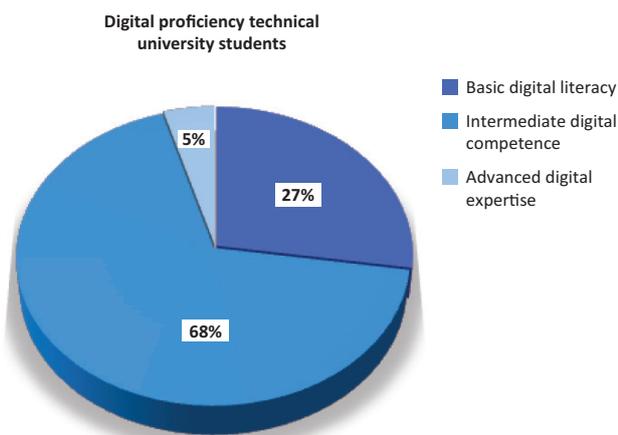
Figure 3: Students (Technical)
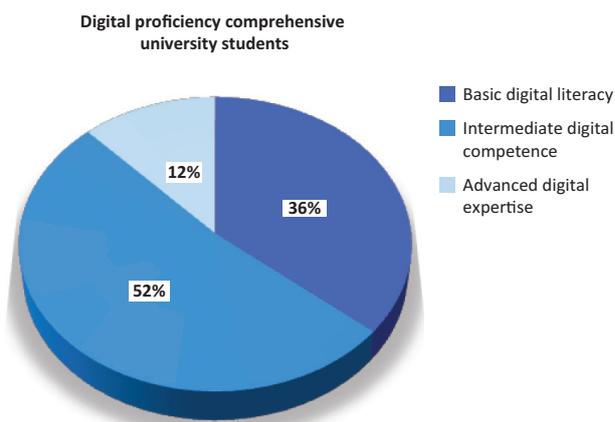
Figure 4: Students (Comprehensive)

22% versus 15% (lecturers) and 12% versus 5% (students). However, the 'intermediate' share is larger at technical than at comprehensive universities: 80% versus 61% (lecturers) and 68% versus 52% (students). When it comes to the 'basic' share, there is a reversal, with a higher percentage of basic competence at comprehensive universities as compared to technical universities: 17% versus 5% (lecturers) and 36% versus 27% (students).

Though the advanced share is higher at comprehensive universities, the overall technical competence ('advanced' plus 'intermediate') is rated higher at the technical universities with 95% of lecturers and 73% of students as compared to 73% of lecturers and 64% of students at comprehensive universities. The difference in the advanced share may be explained by the idea that lecturers and students at the technical institutions are more aware of the ICT industry broadly and may be self-critical in terms of how advanced their own digital competence is relative to the industry. Alternatively, it may reflect a difference in actual competence.

From Figures 1-4, we can conclude that the lecturers at both comprehensive and technical universities rate themselves more digitally proficient than their students, which is what one would prefer in the context of knowledge transfer for digital skills from lecturers to students. There is certainly room for improvement, however, observing that only 22% (comprehensive) and 15% (technical) of lecturers see themselves at the 'advanced' level of digital expertise.

With respect to digital literacy among lecturers Grimus and Ebner (2014) confirm the low prevalence in a similar study in Ghana. They noted that few instructors used the world wide web for preparation of their lessons and less than a third were familiar with basic internet skills.

Let us now move to Figures 5 and 6 regarding the location of internet access. The sample reveals that students and lecturers have different behaviors in terms of the locations where they access the internet. This was a multiple response question, where respondents were asked to select all that apply. For lecturers the most frequent way to access Internet is outside of their workplaces: around 42% of the lecturers access Internet at wi-fi hotspots, Internet cafés, and/or at shopping malls. This is in contrast to the students, where roughly 30% access internet at school, university or workplace. For lecturers, the least common method of access is public libraries. For students, the least frequent is family member's or friend's home.

This finding reveals higher than expected internet access from home for both students and lecturers. Previous sources on internet usage and locations found that, about 2.7% of households in Ghana had a working internet connection with 19.7% using internet overall (Stork, Calandro &

Lecturer's location of internet access
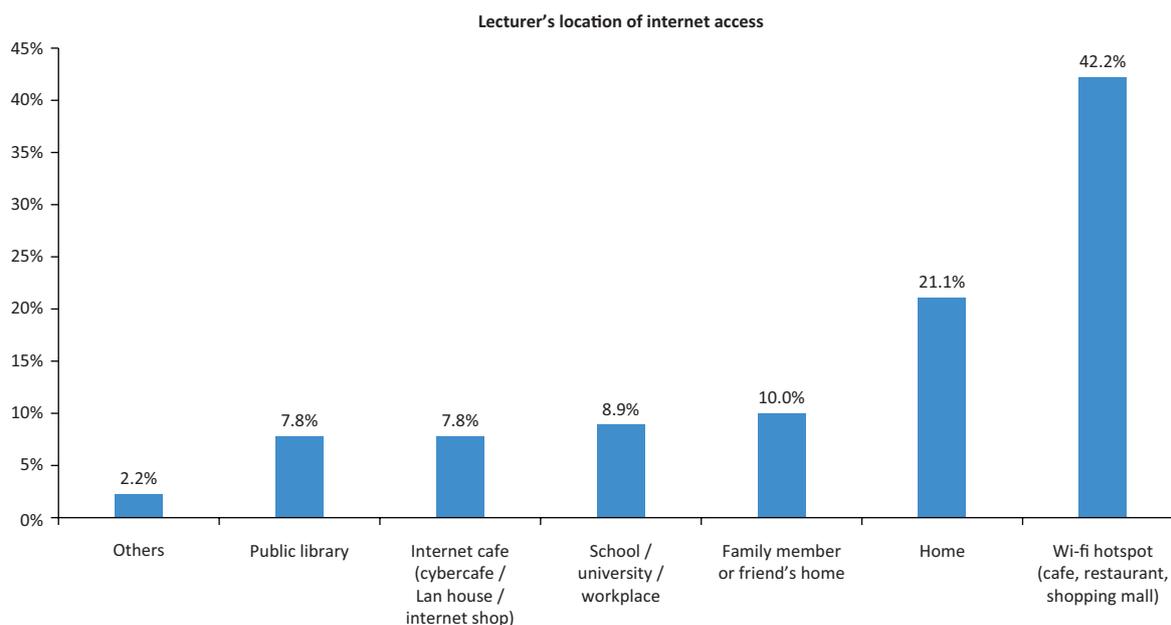
Figure 5: Lecturer's location of internet access

Student location of internet access
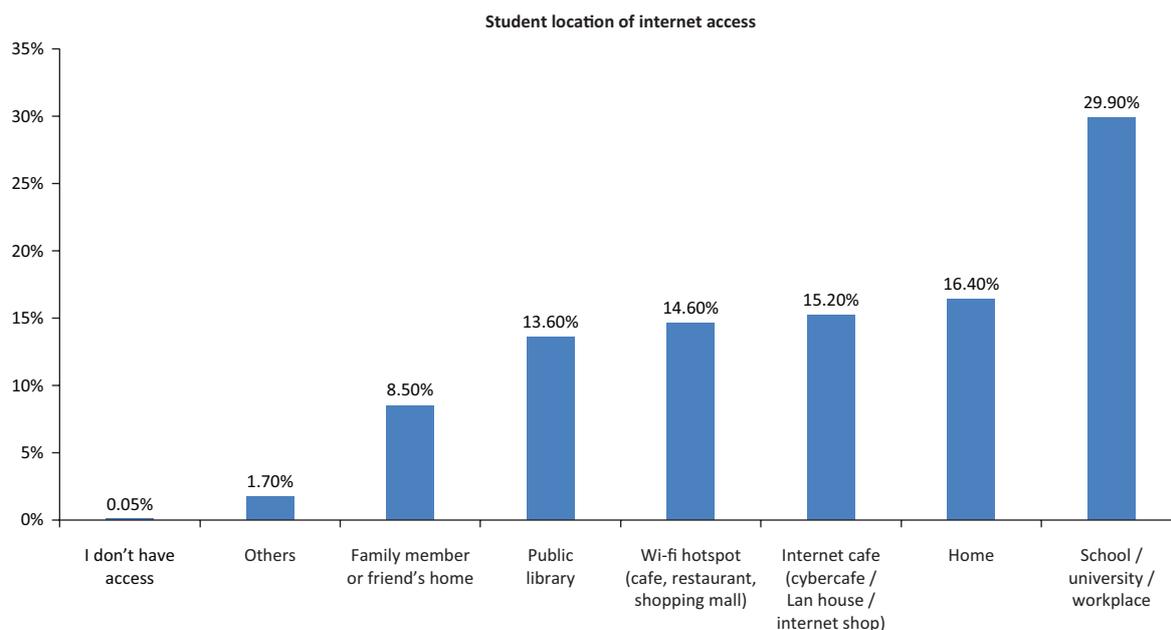
Figure 6: Student's location of internet access

Gillwald, 2013). When asked about where they used the internet in the last 12 months, 61% of respondents said they used mobile phones, 35% said they used it at work, 51% said they used it at a place of education, while 58% said they used it at internet cafes. Similarly, though Ghana was one of the first countries to be connected to the underwater cables for the internet, internet usage across population grew slowly. A 2011 source estimated 5.3 users per 100 inhabitants (Fosu, 2011).

Regarding the devices used to access the internet, Figures 7 and 8 show similar patterns for students and lecturers. This was another multiple-response-select-all question. For the lecturers the ranking from most frequent to least is laptop computers, mobile phones, desktop computers,

Lecturer's devices for internet access

Student's devices for internet access
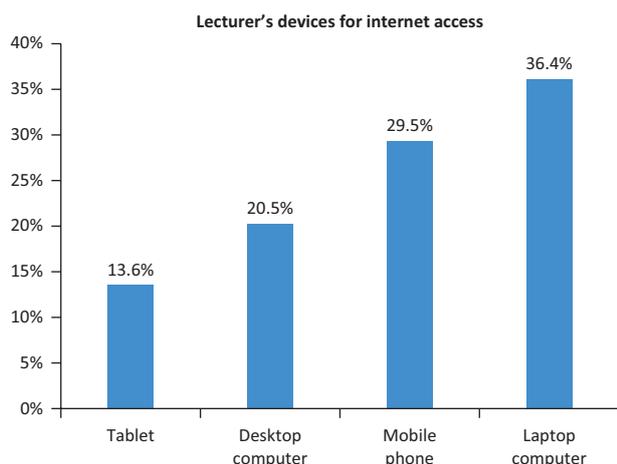
Figure 7: Devices used by students   **Figure 8: Devices used by Lecturers**
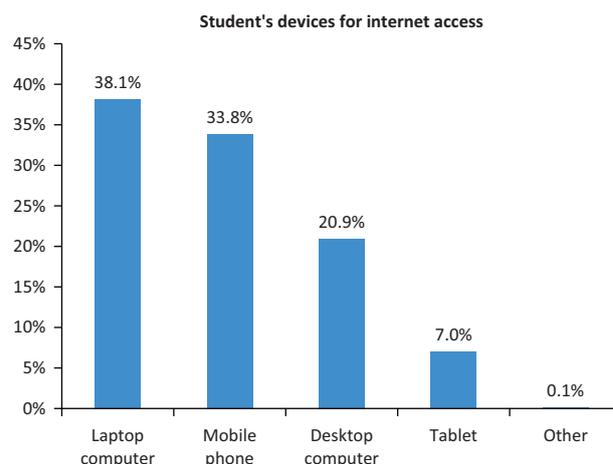
and tablets respectively. For the students, the pattern is the same although the proportions vary. This finding of mobile phones as a substantial method of access on par with that of laptops is consistent with other studies.

A 2015 study touted "mobile phones were the most used device to access the web all the time in Ghana" (Frimpong & Vaccari, 2015). Though laptops were more frequently used than phones in our sample, the slight edge of laptops may simply be because those respondents have multiple device options and computer ownership is believed to be higher among lecturers and students than in the general population. A 2010 study of medical students at KNUST and UG found that 67% of those at KNUST and 89% at UG owned their own personal computer and an additional 24% at KNUST and 5% at UG shared a computer with another student (Adanu et al., 2010).

The high (number 2) ranking for the usage of mobile phones in our study suggests opportunities to integrate mobile phones into innovative teaching and learning approaches. Grimus, Ebner and Holzinger (2012), connote that, "while computer-labs and desktop-computers are scarce in schools in developing countries, mobile networks, mobile phones and now smart-phones have the potential to question new approaches to learning and teaching". Teachers and students are starting to take advantage of the opportunities of mobile phones for learning (Grimus & Ebner, 2014).

A report by Meeker and Wu (2013) stated that 75% of web users used mobile phones compared with 71% using desktop computers. Grimus and Ebner (2014) propose that mobile penetration compensates for the lack of fixed ICT infrastructure and offers the chance to provide on- and off-line content for learning and knowledge-creation via mobile devices.

Our findings in Ghana show a fruitful ground for an extension of mobile learning at universities, while also noting that it would require a major shift in thinking and attitudes among both lecturers and students. The government is in a position to further stimulate this promising development with specific policies and incentives.

The last topic addressed under this research question is the level of satisfaction that students and lecturers at technical and comprehensive universities express to have with the internet connection where they most frequently access it. This relates to three aspects: cost, speed, and stability. Respondents could only select one option in each of the three categories. In Figures 9 and 10 we see very diverse pictures where we compare 'technical' with 'comprehensive'. For both students and lecturers, the dissatisfaction at the technical universities is very pronounced (for all three: cost, speed
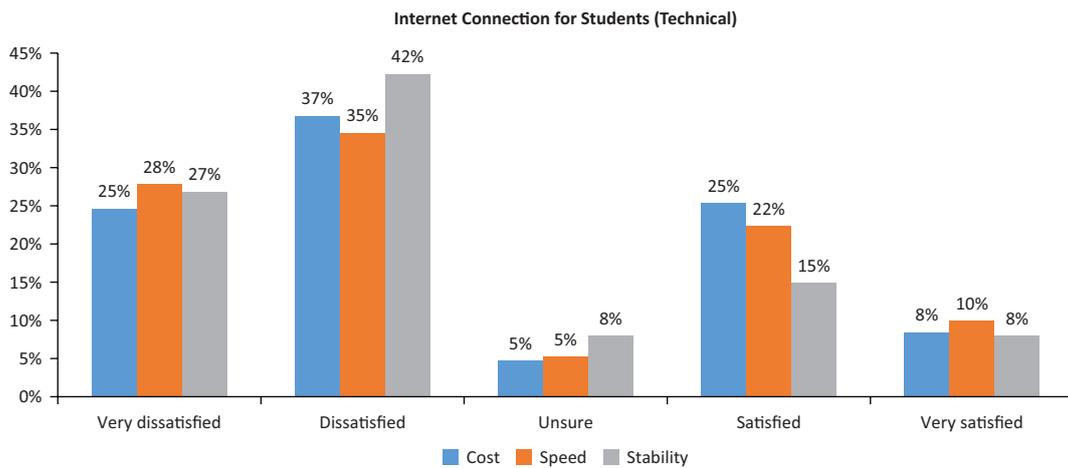
**Figure 9: Internet connection technical students**
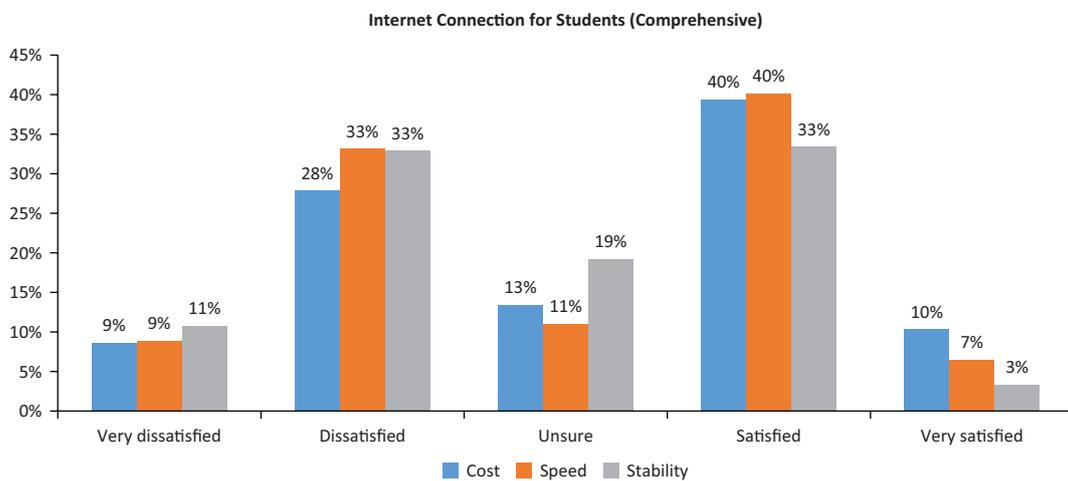
Figure 10: Internet connection comprehensive students

and stability) while at the comprehensive universities the overall satisfaction is positive. There is a substantial digital divide or differentiation between technical and comprehensive universities in terms of internet access and accessibility. Whereas most of the lecturers at technical universities are very dissatisfied, some of their counterparts at comprehensive universities are 'unsure' of their levels of satisfaction.

Gyamfi and Gyaase (2014) affirms the difficulties related to internet access and slow speed of connectivity within and outside the learning environment, which poses a challenge to implementing blended learning in higher learning institutions in Ghana. The current weak internet connection hinders innovations in teaching and learning.

RQ2: What kind and level of use, re-use, creation, and sharing of educational resources (ER) is common among lecturers / students in Ghana?

Here we consider the processing behaviour of both lecturers and students with respect to different categories of educational resources.

Figures 11 and 12 show interesting patterns for the lecturers and the students in their processing of four ER categories:

(a)   Office documents (like Word, Powerpoint, Excel) and PDF
(b)   Images, audio, video
(c)   e-Books, lecture notes, quizzes, tutorials
(d)   Textbooks, whole courses, massive open online courses (MOOCs), data sets

This was another multiple-response-select-all question.

In the spectrum of five different modes of processing, the three in the middle are the most relevant for this paper, representing respectively the 'use' (mode 2), 're-use' (mode 3), and 'sharing' (mode 4) of ER. In their responses, both lecturers and students show an attitude and behaviour of embracing
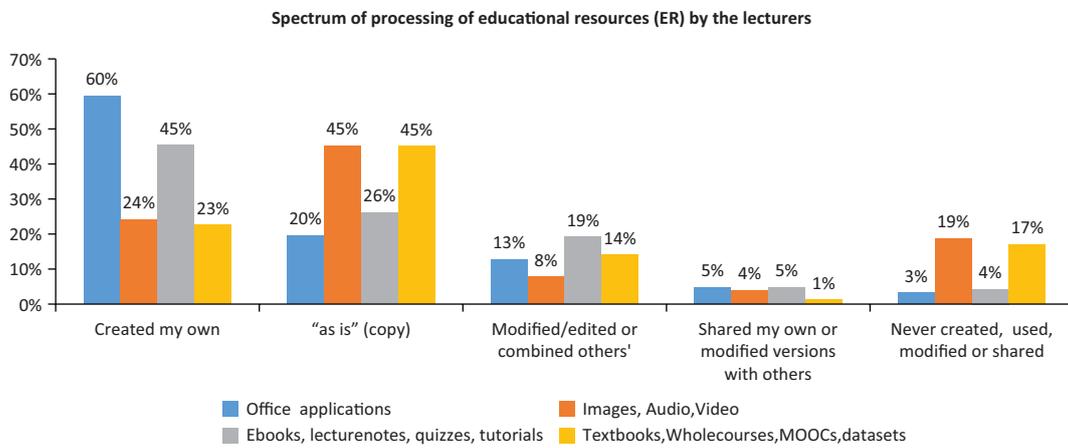
**Figure 11: Spectrum of processing of educational resources (ER) by the lecturers**
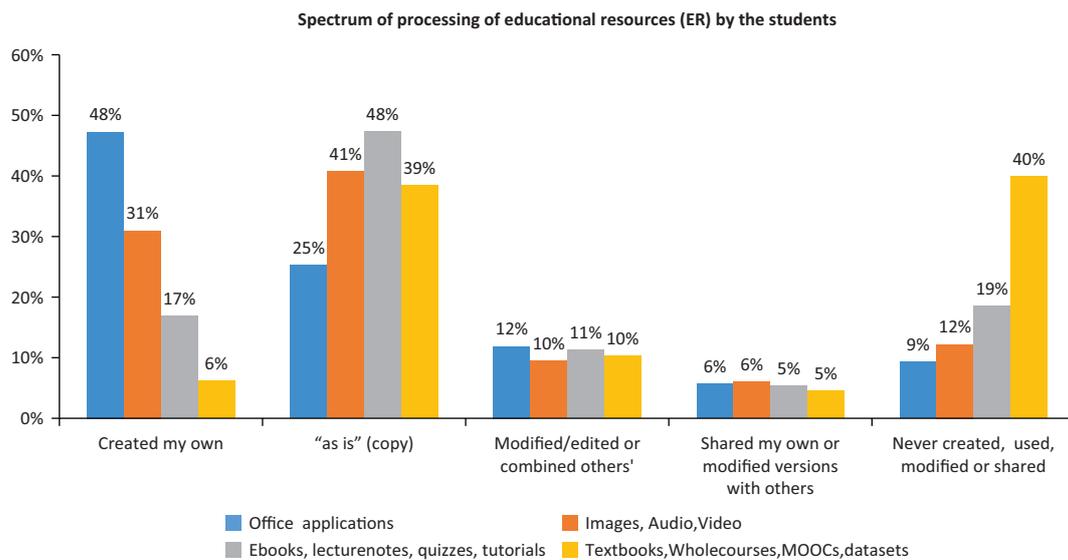
Figure 12: Spectrum of processing of educational resources (ER) by the students

key attributes of openness in educational resources. A measure for this can be found in the sum of the scores for modes 2, 3, and 4, averaged over the four ER categories, which amounts to:

- for the lecturers: 51% as compared to 38% for mode 1 ('create') and 11% for mode 5 ('never created or used')
- for the students: 54% as compared to 26% for mode 1 ('create') and 20% for mode 5 ('never created or used').

These results are similar to the outcomes of the Kenya study and both countries exhbit a preparedness for openness. This may apply merely on pragmatic grounds and without a solid understanding of the OER concept as we have pointed out earlier in this paper. But it could also comprehend a promise towards real appreciation of what OER and open licensing can offer.

Next, in Figure 13 we show the lecturers' responses about types sources they would feel free to use resources for their teaching. This was another multiple-response-select-all question.

At first glance, this picture seems to present overall relatively responsible lecturers in terms of copyright considerations: 'fair use' (22%), 'acknowledgement' (16%), and 'open licensing' (16%), which sums to 54%. In the Kenya study, we found a similar sum (59%). In both countries, however, we see a large share (46% in Ghana, and 41% in Kenya) for an unregulated, blurry area. Moreover, we can have serious doubt on the validity of the high scores on the right hand side of Figure 13, realizing the lack of knowledge and understanding of the option of 'open licensing' which actually also might apply to the other two options. It seems that most of the lecturers take great liberty in their use of others' ER.

Table 1 shows the top 5 out of 13 possible options of activities that lecturers say to undertake if they use educational resources from others. This was a multiple-response-select-all question. Here, we see a broad variety of use. Again, it shows that the lecturer's operational behavior is parallels the open philosophy.

Similarly, in Table 2 the top 5 out of 11 possible options is presented for activities that students say to undertake when using educational resources created by others. The sample reveals differences in behavior between students from technical and from comprehensive universities. The most frequent activity differs between the two. For students at comprehensive universities, it is summarizing the
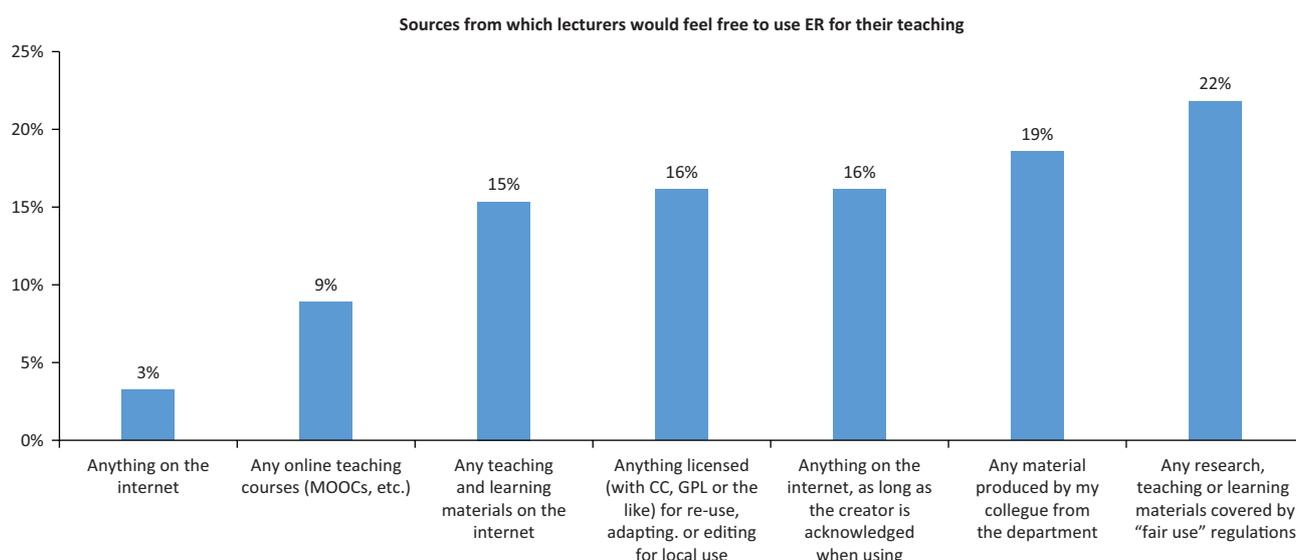

Figure 13: Sources from which lecturers would feel free to use ER for their teaching

essential ideas, whereas for their technical counterparts it is integrating the content with other content (which is ranked 4 for the comprehensive students). Note that almost all lecturer's top-5 activities from Table 1 return in the list of activities for the students in Tables 2 and 3, albeit not necessarily in the same positions.

RQ3: What is the level of awareness of licensing related to open educational resources (OER) among lecturers and students in Ghana?

In Figures 14 and 15 responses have been collected to the question whether lecturers, respectively students have used any licenses to express the rights others have to use the materials they have processed (created, edited, modified, or combined). The dominant option in both figures is that no license is assigned: 57.5% for the lecturers, and 81.3% for the students. Traditional copyright

Table 1: Lecturer's activities undertaken when using educational resources created by others

Use of ER: lecturer's activities (top-5 in percentages)	
Change the content or add locally relevant information, examples and scenarios	19%
Integrate the content with other content in order to develop a module or new unit	19%
Transform the content by adding an interpretation, reflection or practice	16%
Summarize the essential ideas	16%
Combine the content with new media	7%

Table 2: Student's activities undertaken when using educational resources from others - Technical

	Technical University
Integrate the content with other content in order to develop a module or new unit	19%
Transform the content by adding an interpretation, reflection or practice	15%
Copy the content and use it unaltered	13%
Change the content or add locally relevant information, examples and scenarios	13%
Summarize the essential ideas	12%

Table 3: Student's activities undertaken when using educational resources from others - Comprehensive

| Use of ER: student's activities (top-5 in percentages)	Comprehensive University
Summarize the essential ideas	20%
Change the content or add locally relevant information, examples and scenarios	14%
Transform the content by adding an interpretation, reflection or practice	13%
Integrate the content with other content in order to develop a module or new unit	8%
Combine the content with new media	8%
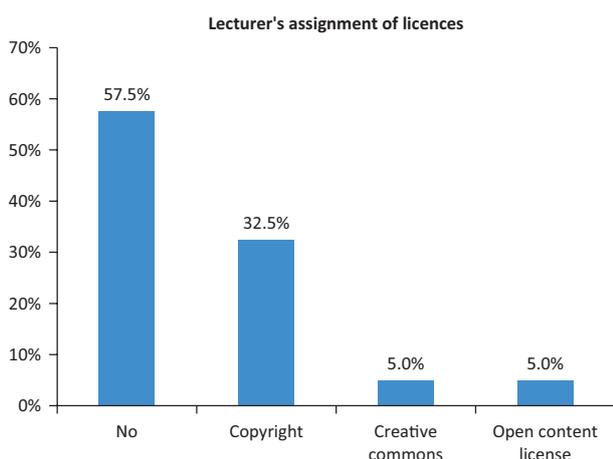
Figure 14: Lecturer's assignment of Licenses
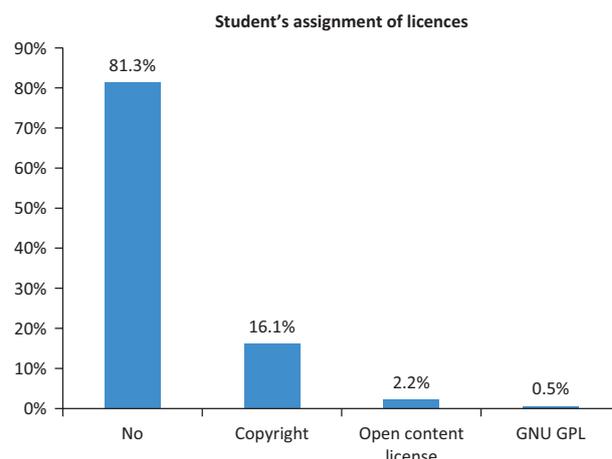
Figure 15: Student's assignment of Licenses

assignment scores 32.5% (lecturers) and 16% (students), and various open licensing schemes rate in total 10% (lecturers) and 2.7% (students).

The pattern of behaviour in the two figures clearly shows that both the lecturers and students are not really aware of the licensing in use for ER. According to a survey by McAndrew (2010) on redefining "openness", it was noted that awareness of licensing remains low and few academics engaged in other methods of teaching seek out materials on the basis that they are OER.

The response to the reverse question, whether lecturers and students themselves have ever used OER that are available in the public domain or have an open license, shows a fair share with 'Yes', but yet about 52% of both lecturers and students responded with 'No' or 'Don't know'. We conclude that overall the awareness and appreciation of open licensing, let alone commitment to this approach, is low. However, it is not absent either, which may provide a fruitful basis to further embrace the open licensing policy.

RQ4: How do lecturers and students perceive the value of openness in educational resources, its implementation opportunities, and its institutional context?

In this research question, we are addressing the OER concept per se, giving the response the deserved treatment but at the same time being cautious and in some cases even reserved in our conclusions when the results are raising doubts. One cause for this could be the perception eclipse that easily may have interfered with the response in this 'getting-to-OER' part of the survey. Another reason could be fatigue with the respondents when filling out the final questions in the long questionnaire. We start in Table 3 with the top 4 out of 6 options of identified potential motivators for the use and reuse of ER which actually might be considered to represent a stimulating gate to convert to OER. Lecturers and students had the same top 4, but with different ratings, which is why it has been consolidated into a table for both groups.

The table shows an even picture with all four motivators rated close to 'very important' (5.2-4.7) by the lecturers and 4.8-4.0 by the students. The other two motivators, regarding 'normal practice' and 'reputation' (not shown), score lower.

Table 6 presents the top 6 out of 12 options of potential barriers for the use and reuse of ER. Lecturers and students had the same top 4, but with different ratings. Where the ER motivators can be viewed as stimuli for a conversion to OER, the ER barriers likewise can be inhibitors in a development process towards OER in Ghana.

Table 4: Potential motivators for the use and reuse of ER among lecturers and students

Potential motivators for the use and reuse of ER (top-4) > from 'very unimportant' to 'very important' < (mean on a 5 point Likert scale)	Lecturers	Students
Bringing down costs for students	5.2	4.8
Helping other educators/students	5.0	4.4
Bringing down costs for course development for the institution	5.0	4.2
Knowing that other educators/students may use my materials, improves the quality of my materials	4.7	4.0

Table 5: Potential barriers for the use and reuse of ER among lecturers and students

Potential barriers for the use and reuse of ER (top-6) > from 'not at all' to 'extremely' < (mean on a 5 point Likert scale)	Lecturers	Students
Lack of access to the internet	4.6	4.0
Lack of time	3.8	3.7
Lack of training	3.6	3.4
Lack of hardware	3.5	3.3
Lack of software	3.2	3.3
I worry about the quality of OER	3.0	3.2

Table 6: Lecturer's opinions on OER in their educational institution

Lecturer's opinions on OER in their educational institution (top-5) > from 'strongly disagree' to 'strongly agree' (mean on a 5 point Likert scale) <	
Policies adopted by my institution support the use of OER	4.0
My institution has reliable infrastructure to store and preserve access to teaching and learning materials (OER)	3.8
The OER initiative in my institution provides equal access to educational materials to anyone	3.6
The OER initiative in my institution is able to sustain the maintenance through internal funding and/or external contributions	3.0
There are ways for handling and utilizing OER in my institution as the main or supplemental materials to support our courses	3.0

This table shows substantially lower scores as compared to Table 3. Almost all barriers are expressed in terms of 'lack of …', except for 'quality worries', and the two lowest scoring barriers: 'no reward system' and 'no compensation' (at 2.8, not shown).

Table 7 summarizes the top 5 out of 10 statements about OER as applied to their educational institution for which the lecturers indicate their level of agreement.

The highest scored response in Table 7 has a score of 4.0, and even the bottom-5 (referring to 'instructors attitudes', 'diversity', 'support services', 'quality assurance', 'credentialing') have scores of 3.0. We see overall positive ratings among all 10 options. This shows a relatively positive and optimistic picture among its lecturers, which may be unrealistic. We have no firm explanation for this relatively positive picture among the lecturers, but, again, it could be due to the perception eclipse or fatigue with the respondents, or even an expression of loyalty with their educational institution.

Final reflections, conclusions, and recommendations

Ghana is one of the countries in Sub-Saharan Africa that first embraced global developments with regards to online learning through the adoption of two national ICT in education policies, in 2008 and 2015., Ghana has been very active in a number of open, distance and e-Learning consortia and projects, including African Virtual University and the African Health Open Educational Resources Network. For a decade Ghana has pursued a vision of becoming a tech leader for West Africa and beyond. It has currently embraced 16 digital innovation hubs, which is an indication of promoting online and open learning as key in expanding access to and quality of education.

By spending more than 6.2% of its GDP in education, Ghana views education as a crucial driver for social, political and economic development. There are also promising initiatives to create a better ICT environment and infrastructure as seen in its National Education Strategic Plan of 2010-2020, which calls for the expansion of ICT for instruction at all educational levels.

However, gaps in access to ICT and to higher education exists and there is significant digital differentiation, as demonstrated the findings from sample that included lecturers and students at public and private comprehensive universities and technical universities. Our major conclusions and recommendations include:

1. There is a significant digital proficiency differentiation between lecturers and students at technical and comprehensive universities in Ghana, irrespective of the adoption of national ICT in education policies in 2008 and 2015; as well as setting up a national education strategic plan for 2010-2020. This therefore calls for a boost from the government and other stakeholders.
2. There is substantial digital differentiation in terms of internet accessibility and the extremely low level of satisfaction with the internet connection at the technical universities as compared to the comprehensive universities. This poses a serious challenge to realizing the national education strategic plan for 2010-2020.
3. Overall awareness and appreciation of open licensing is low and therefore a hindrance in the adoption of the OER philosophy and especially the 2008 and 2015 Ghanaian ICT Policies.
4. The decision to change reference from OER to ER in collecting data on the actual processing and behaviour of respondents with respect to different ER categories rather than gathering their perceptions of the value of openness in ER, has worked out well. We call upon the OER research community to be equally specific and cautious with respect to the outcomes of similar empirical OER studies, in particular when a perception eclipse may exist.

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Conflict of interest

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