Technical Vocational Education and Training: the 'dark continent' in OER.

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Introduction

Over the past decade, more and more studies have been published about OER adoption by educators and educational institutions. The largest part of these studies is about OER in Higher Education and a growing amount is about OER and open textbooks in K-12 education. In addition, according to De Olivereira Neto et al (2017), most studies are focused on the Global North where education instructors "enjoy comparatively higher levels of economic development, educational provision, policy elaboration, and technological access than those in the Global South. This means that less is known about educators' OER-related practices in the region where OER is touted as having its potentially greatest impact" (De Olivereira Neto et al, 2017:2-3).

Despite the steadily growing number of studies on the use of OER by educators, there is part of the realm of education that still is 'a dark continent' for OER and OER studies, namely Technical Vocational Education and Training (TVET). As an indicator, we have analyzed the database from the OER Knowledgecloud[1], considered representative for the current state of international OER research, being available as Open Access. With a total of 1638 items in the database (27 October, 9:35 CEST), searching on "technical AND vocational" only gave 2 results (dating from 2011 and 2012).

The research presented in this paper provides the results of a systematic international literature review with the aim of localizing relevant studies on the potentialities and use of OER in TVET. The information from this literature review has been complemented by data from an international quantitative survey taken by members of an UNESCO TVET forum, and from semi-structured interviews with international TVET experts.

The research was commissioned by UNESCO with the aim to understand better the potentialities of OER for TVET and to provide Member States and UNESCO, in particular UNESCO-UNEVOC, with recommendations to support the creation and use of OER in TVET. The study was intended to fill the gap both on mapping the landscape of the use of OER and open practices in the field of TVET as well as on policy recommendations to support Member States' efforts in promoting and developing OER.

Technical Vocational Education and Training

Technical Vocational Education and Training is a term with a broad understanding. It covers formal, non-formal and informal learning for the world of work, starting after lower secondary level education. According to UNESCO (2015a):

> "Technical and vocational education and training' (TVET) is understood as comprising education, training and skills development relating to a wide range of occupational fields, production, services and livelihoods. TVET, as part of lifelong learning, can take place at secondary, post-secondary and tertiary levels and includes work-based learning and

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[1] https://oerknowledgecloud.org/

continuing training and professional development which may lead to qualifications. TVET also includes a wide range of skills development opportunities attuned to national and local contexts. Learning to learn, the development of literacy and numeracy skills, transversal skills and citizenship skills are integral components of TVET"

Globally various concepts and approaches to TVET exist. A common feature of TVET at the different educational levels is that it is generally considered to be a more practice-oriented educational and training pathway than general education.

TVET and the promises of OER

Marope, Chakroun and Holmes (2015) have observed that TVET is rising to the top in global debates about, and government priorities for, education and national development and in the strategic and operational priorities of regional economic communities. But, as they have pointed out, the sector's capacity to meet the demands being placed upon it is often limited. Therefore simply scaling up TVET provision in its current forms is not only unlikely to be feasible, but also unlikely to be an adequate response to meet demand and that the nature and roles of TVET systems in contributing to more equitable and sustainable holistic development will require their continuous transformation and expansion. Information and communication technologies (ICT) can be a driver for and a means of this needed change of TVET. ICT has the potential to improve access to, and quality of, learning, increase efficiency, reduce costs, foster innovation, make teaching and learning more relevant to people's work and lives and prepare individuals to become lifelong learners (Latchem, 2017a) (Mead Richardson, 2009). "Since education is considered the key to effective development strategies, technical and vocational education and training (TVET) must be the master key that can alleviate poverty, promote peace, conserve the environment, improve the quality of life for all and help achieve sustainable development". (UNESCO-UNEVOC, 2004:1).

OER are seen as appropriate ICT based means to one of the big challenges TVET is facing, particularly in developing countries: the lack of learning materials. At the International Ministers of Education Conference on ICT and Post-2015 Education in Qingdao in May 2015, a declaration was agreed upon that advocated for the use of technology in education (including vocational education) and detailed expectations with respect to Open Educational Resources (OER):

> *"Open Educational Resources (OERs) provide education stakeholders with opportunities to improve the quality of, and expand access to, textbooks and other forms of learning content, to catalyze the innovative use of content, and to foster knowledge creation. We commit to developing sector-wide strategies and capacity building programs to fully realize the potential of OERs to expand access to lifelong learning opportunities and achieve quality education."* (UNESCO, 2015b).

According to UNESCO (2015c), it is for this reason that OER have been adopted by an increasing number of countries to solve the problem of lack of learning materials.

Methodology

The study has used a mixed methods approach, consisting of three ways of collecting data and information:

1.   Literature review
2.   Survey
3.   Interviews with TVET experts

Literature review

The literature review was developed through an extensive and systematic research. Scope of this research has been the identification of relevant and publicly available articles, book chapters and reports on the question as to what evidence is available with regard to the relevance of OER and MOOCs (with the learning materials available under an open license) in TVET. To conduct this literature review the following process was followed:

- 22 collections of publications have been identified.
- These sources have been searched on the terms: TVET or "Technical Vocational Education and Training", OER or "Open Educational Resources", MOOC or "Massive Open Online Courses", (TVET or "Technical Vocational Education and Training") and (OER or "Open Educational Resources"), (TVET or "Technical Vocational Education and Training") and (MOOC or "Massive Open Online Courses"), OER and "Skills Development", MOOC and "Skills Development".
- Results were limited to publications in English, Open Access available, and published in the time span of 2002-2017.

The results:

- The initial search identified 770 papers, reports and book chapters
- A further examination of the abstracts of these papers, reports and book chapters, and when available full texts, limited the initial collection to 45 publications under the restrictions: published in English language, online and under open access conditions accessible and retrievable, and "OER/MOOC and TVET" as issues referred to. The collection of publications was supplemented with articles and reports mentioned in references in the initial 45 publications and which after reading seemed relevant. Ultimately this has resulted in a total list of 61 publications.

Survey

The aim of the survey has been to collect evidence on practices of creation and use of OER in TVET and the support stakeholders are providing. The Terms of Reference for this study, created by UNESCO-UNEVOC, have been used as the basis for the topics and questions to be dealt with in the survey.

The questions are divided into 3 chapters:
1. General. Information about institution, country, position and expertise of OER and TVET (7 questions)
2. Use. Practices about creation, use and impact of OER in TVET (9 questions)
3. Support. Practices about supporting policies and activities for creation and use of OER in TVET (10 questions)

The questions in the chapters Use and Support were both open-ended and closed questions. All questions in the General chapter were mandatory to fill in. All other questions were non-mandatory.

When relevant, respondents could provide answers from a national viewpoint and/or from an institutional viewpoint. Respondents were able to decide for themselves which of the viewpoints (one or both) they were having sufficient knowledge about for their responses. This viewpoint could be determined per question. For example, a respondent was able to answer a question from a national viewpoint and answer the next question from both viewpoints.

The survey was online available from 3 July 2017 to 7 August 2017. Respondents were targeted via a message in the UNESCO-UNEVOC TVET forum (http://www.unevoc.unesco.org/go.php?q=e-Forum+-+Message+Board&skin=efor&lang=en&action=threadlist&thread=3744) on 3 July 2017. Reminders were posted in this forum on 18 July and 31 July. Additionally, several twitter messages were sent out, and stakeholders in the UNESCO-UNEVOC network were emailed individually to get their attention on the survey. Some of the stakeholders reported spreading the call for respondents among their network. This means that it is not possible to determine how many people were initially approached to participate. Therefore, it is not possible to determine the response ratio.

Ultimately, 349 responses were received, of which 257 (73.6%) were usable for analysis. Of these usable responses, 181 (70.8%) respondents had completed the survey for 100%.

Interviews

The aim of the interviews was to collect information and data on OER for TVET additional to the information from the literature review. Predominantly the questions in the interview arose from this literature review. They were meant either to elucidate items from the review or elements not mentioned in the review which we considered to be relevant.

The interviews were semi-structured. Depending on the answers, other questions than on the list have been asked.

To determine the interviewees, a longlist of candidates was constructed. Selection of the candidates was determined by:

- Spread over the world regions
- Expertise on TVET and OER
- Spread over organizations involved in TVET (public, private, NGO)

From this longlist, a shortlist was constructed in close cooperation and agreement with UNESCO-UNEVOC. The candidates on this shortlist were approached by email, in most cases accompanied by a Letter of Endorsement by UNESCO-UNEVOC. The questions were sent along with the email. Some of the individuals approached did not reply or pointed to colleagues who were (in their opinion) better suited to be interviewed.

Ultimately, 10 interviews were taken in the period 21 July to 23 August 2017, with a duration between 30 and 70 minutes. All interviews were recorded for the purpose of analysis by the researchers only. It was agreed upon that none of the statements would be made traceable to individual interviewees.

Main findings of the study

From the survey and from interviews, it appeared that interpretations for the term "OER" are manifold. These interpretations range from "available on the Internet for free" to the rigorous definition as is commonly used in the open community (digital learning materials with open, free access and published under an open license that permits adaptation and republishing). When thinking about policies or capacity building programs to mainstream OER in TVET, a broader view of OER may have advantages.

The literature review revealed that no substantial research on OER in TVET takes place or has been reported upon. There is a highly uneven pattern of projects and programs: in some countries awareness of OER has still to begin; other countries (e.g. United States) have a policy on OER in TVET. The main target group in activities to realize mainstreaming OER are teachers and trainers, and less

the learners. When it comes to such programs, the Commonwealth of Learning is an important stakeholder in the field of OER in TVET.

The main motives to adopt OER in TVET and main opportunities for OER in TVET, found in the survey and in the interviews are:

- Technical education is more expensive than regular education. OER is one option to extend more equally access to these materials. Especially videos are important means to realize this;
- OER increase efficiency, by sharing short courses among institutions;
- OER contribute to quality improvement when used by teachers: improvement of their own technical knowledge and providing updated learning resources to learners;
- OER enables a more quickly response to market needs;
- OER contribute to inclusion and increasing equity;
- OER enables collaboration between teachers and labor market, teachers and learners and among teachers;
- OER enables cost savings for students.

The main barriers that prevent mainstreaming OER in TVET are for a part the same as those in other sectors: lack of vision and supporting policy (both national and institutional), lack of awareness of OER among teachers and policy makers and human factors (fear of sharing because of possible copyright infringement, unwillingness to share), high teaching load and an infrastructure with insufficient capacity. But there are also specific characteristics of TVET that hinder publishing and using OER:

- Teachers and trainers in TVET mostly have no educational background;
- Repurposing of OER is important in TVET. Teachers and trainers in TVET often have insufficient (ICT-)skills to do this;
- Cultural and language issues hinder reuse across borders;
- ICT infrastructure is inadequate in many areas;
- For non-formal TVET, learners in TVET have insufficient skills to be able to self-learn using OER. A teacher/trainer is necessary to guide them along a learning path;
- In TVET skills development is important. Many available OER are about theory and not about practice and skills;
- TVET is a complex area, fragmented over formal and non-formal education, a lack of standards and low status in many countries. This makes overall policies and action plans difficult to accomplish.

Although there is wide recognition among policy makers of the potential and importance for TVET in general and the use of OER specifically, this is not matched by equally efforts to implement OER in TVET. The specific characteristics of TVET also means that lessons learned about mainstreaming OER in other sectors are less useful to implement in TVET.

At the recent 2nd OER World Congress in Ljubljana, similar conclusions about the uptake of OER were drawn, resulting in the Ljubljana OER Action Plan 2017[2]. In this plan, governments and other stakeholders are encouraged to implement 42 recommendations to lower the barriers that currently exist in mainstreaming OER. This Action Plan is recommended in an accompanying Ministerial Statement[3] by 20 Ministers, present at the congress.

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[2] https://en.unesco.org/sites/default/files/ljubljana_oer_action_plan_2017.pdf
[3] http://www.oercongress.org/wp-content/uploads/2017/07/WOERC2017_Ministers_statement.pdf

Discussion and conclusions

TVET covers a broad range of education and training. It concerns young people gaining knowledge and skills from basic to advanced levels (including higher education) and leading to initial qualifications, to adults in continuing education and training. TVET takes place in a variety of learning settings and contexts: in schools, colleges and various other education and training institutions, in enterprises, or in a combination of both; in formal and non-formal education and training; in informal settings, on the job or other socio-economic contexts. Changes in the world of work require that people need to update frequently their skills and competences at their workplaces. Another consequence is that people more and more are required to perform changing tasks. These developments lead to an increase in informal on-the-job learning, and henceforth of formal recognition of these learning activities. These developments also lead to new demands to the knowledge and skills base of the initial vocational education and training.

All this makes TVET a crucial element in enabling the learning society. It is a key to provide citizens with the skills necessary to fully benefit from the digital transformation (Latchem, 2017a, 2017c). According to Marope, Chakroun & Holmes (2015), TVET is gaining attention because of its potential to contribute significantly to the development of the skilled, knowledgeable and technology-savvy people required to support accelerated, sustained and shared growth.

To realize this potential, however, current TVET systems have to acquire agility to stay current and responsive to the quickly changing contextual demands. Open Educational Resources have the potential to contribute to this required agility of TVET systems. One of the problems of learning materials, especially in sectors facing fast developments driven by ICT, is to keep up with actual developments. To update learning materials is very often a costly and time-consuming process. Open collaborative development of resources by TVET institutions, by TVET institutions and industry, and sharing, reuse and repurposing of resources in the form of OER are ways to cope with these challenges. In this way, OER can contribute to more agility of TVET systems.

Our study has been exploratory. The literature review has revealed that there are not many publications – available under open access - on OER in TVET. On this basis we may argue that OER in TVET is not an issue researched and discussed in international literature comparable to OER in higher education or secondary and K-12 education. This absence calls for action, especially when one realizes that only 14.6% of the world population between 15-64 years has an educational attainment of higher education, of which 6.6% are from high income regions (World Bank, 2017). This raises the question: what is the OER community doing for the remaining 85.4%?

From the available literature, on a global scale there emerges a highly uneven pattern of projects and programs: in some countries OER's awareness must still arise, while other countries have formulated policies on OER in TVET (e.g. in the USA the so-called Z-degree programs in Community Colleges). In most projects and programs identified, the main target group in activities to realize mainstreaming OER in TVET are teachers and trainers. When it comes to such programs, the Commonwealth of Learning is an important stakeholder in the field of OER in TVET

The study has found broad support for the opinion that OER in TVET has the potential to offer a big contribution in accomplishing the task of skilling people. But it is also found that a large gap exists between asserting this opinion and activities to actually adopt OER in TVET. The following findings support the statement about the gap between intentions and actual implementation. Also some explanations are presented why this gap exists.

One of the conclusions that can be drawn from our study and from programs like INVEST Africa, the Virtual University of the Small States of the Commonwealth and the University of the South Pacific in particular is that it confirms what Latchem (2017b) already had concluded with regard to ICT for TVET: adoption of OER calls for more than a series of one-off interventions, projects or funding. Profound adoption of OER in TVET requires the creation of education and training ecosystems of TVET wherein stakeholders at different levels, institutional, sectoral, national and international, agree, cooperate and share information and resources. Inclusion of and engagement with national government and stakeholders are a prerequisite, and it requires at national level an enabling policy for innovation of TVET in general and adoption of OER in TVET in particular.

Lessons learned from INVEST Africa are that adoption of OER in TVET at institutional level requires changes, not only in the ways of teaching and learning. It also requires institutional policy and capacity planning, most likely also the adaption of organizational structures, innovative staff and teacher development, ICT skills development, and instructional design capacity development (flexible and blended model of TVET, and OER for TVET) , and last but not least adequate (ICT) infrastructures. This advocates for programs where adoption of OER is part of a larger innovation program (e.g. the implementation of a flexible and blended learning program).

A too strict focus on adoption of OER is also not recommended for other reasons. The survey has shown that in the reality of TVET, people appear to have a much broader view of open educational resources than the internationally accepted definition, also used in this research. This may be concluded from combining the question in the survey in which respondents were asked to rate themselves in terms of experts in OER, and the question wherein was asked whether one knows what the CC-BY logo stands for. 39% of the respondents who indicated to be (somewhat) expert in OER, did not know the meaning of the logo or had never seen the logo. For respondents who are teacher or trainer, this mismatch between OER expertise and knowledge about the CC-BY logo even is 53%. One might conclude from this that there is a great non-awareness of what OER is. One can also conclude that people who are experienced in TVET have in practice a broad view of what open educational resources for TVET are.

For non-formal and informal self-learners, the free access characteristic of OER is important, not the rights to repurpose them as expressed in an open license. The reported massive use of Youtube is an illustration, as are the opportunities that free available MOOCs without their learning materials published under an open license can offer. Of course, for teachers this open license is important, because within TVET in many cases resources need to be repurposed to fit into the context of use. But, given the major challenges facing TVET, using whatever is available as freely available and accessible resources is understandable. One could see it as the first step towards the use of OER. Our study has shown that in TVET practices openness is a continuum ranging from using freely available materials to the use of OER in the free and 5R's sense.

The best option for many of the uneducated, undereducated and even qualified unemployed young people appears to be to help them develop the knowledge and skills needed for self-employment or for establishing micro, small and household enterprises. Building skills in the informal sector, however, will require a paradigm shift with regard to the design of the technical and vocational skills development, financing and certification systems.

Characteristics of TVET (skills development, learning by doing) and characteristics of its learners (no or little competencies for self-learning), makes that self-learning in TVET cannot gain much attention. This means the added value of OER in several areas of TVET is non-existent for learners (other than financial), but existent for teachers and trainers.

It all seems like OER for TVET has not been an issue researched and discussed in international literature comparable to OER in Higher Education or K-12 (see the poor results for the OER Knowledge Cloud database as reported in the introduction of this paper). In the online library of UNESCO - UNEVOC[4] no publication about OER for TVET was found either. This may be explained by characteristics of TVET: complex (many stakeholders involved, mixture of formal, non-formal and informal), practitioners as teacher (not speaking the "educational language"), lack of standards, language barrier because of less educated learners and (too) little attention on policy level.

And a last illustration of the gap between intention and implementation: in countries with a historically grown adequate TVET infrastructure (Germany, Sweden, Finland), OER has no priority.

Some of the characteristics that make TVET a complex area urge for close cooperation between stakeholders to realize effective TVET education and adoption of OER. OER could even contribute to realizing this (being a means to a larger end).

Ultimately, OER in TVET is about equal access to quality education, thereby contributing to UNESCO SDG 4. Equal access in relation to OER and to TVET is used in two related meanings: access to, and access for. The first refers to the right or opportunity to use or benefit from OER or TVET, while the latter stresses the equal opportunities. In particular women are often mentioned in the latter context. OER is seen as a means to achieve both aims in TVET. Equal access can also be looked at from a more economic and technical viewpoint. OER can help in achieving equal access to TVET because of their opportunity to decrease costs of education. Especially technical education is more expensive than regular education. OER is one option to extend more equally access to these materials. In this respect, are there lessons to be learned from other educational sectors with regard to the adoption of OER?

In this study we have observed that teachers and trainers play a crucial role in the uptake of OER. Ultimately, the challenge is to engage teachers and trainers with OER. In most projects and programs identified, the main group targeted are teachers and trainers following a line of reasoning which goes as follows: for training purposes for skills development in a certain field X, OER can be useful. To enable this, teachers and trainers should have the skills to publish, find and adapt OER. To acquire those skills, OER can be used. Therefore, many projects aim at creating awareness and capacity building in countries and institutions.

But this concerns only one factor determining the adoption of OER by teachers. From research by Cox & Trotter (2017) on adoption of OER by teachers/lecturers, it follows that whether or not teachers adopt OER is dependent on the interplay of different factors. Some of these factors are within the realm of lecturers' personal control while others are less so, or are out of their control entirely. In order to capture this complexity, they developed an analytical framework called the "OER adoption pyramid", which consolidates the essential OER adoption factors into six categories, layered according to the level of control that individual lecturers have over them. Moving from factors that are more externally determined (bottom) to those that are more internally determined (top), they are: infrastructure *access*, legal *permission*, intellectual *awareness*, technical *capacity*, educational resource *availability* and individual (or institutional) *volition*. The model suggests a certain prioritization of factors from the viewpoint of lecturers, in that the factors at the bottom – which are largely externally determined (by the state or the institution) – form a foundation upon which personal volition can be expressed. Without the factors at the bottom being positively provided for, it is difficult for the factors at the top to make much of a difference to eventual OER engagement of

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[4] http://www.unevoc.unesco.org/go.php?q=Online+library

teachers (Cox & Trotter, 2017). This is also a lesson to be learned for the uptake of OER in TVET, taking into account the specific characteristics of TVET as mentioned earlier.

Recommendations

Based on these findings, we formulate the following recommendations:

- Programs for creating awareness and capacity building should be more intensified and broadened. The last couple of years, especially the Commonwealth of Learning has been active in this field. However, there is a need for more of these programs.
- Adoption of OER calls for more than a series of one-off interventions, projects or funding. We recommend creation of education and training ecosystems of TVET and at national level enabling policies for adoption of OER in TVET
- Programs to adopt OER should be put into a larger context of innovation and not as a sole activity. E.g. embed activities on adoption of OER in TVET in larger programs using ICT to innovate TVET
- Create national and international repositories of training materials and case studies of good practices
- Make use of national and international "OER-TVET champions"
- Create an evidence base, among others on cost effectiveness of adoption of open licensing arrangements and harvesting existing OER

For UNESCO-UNEVOC we recommend:

- Continue current activities on creating awareness on policy level
- Collect good practices. Formulate guidelines on how to come to policy formulation, based on these good practices.
- Develop models and frameworks that governments and institutions can use, modify and apply to support in policy making
- Provide support on systems for quality assurance of OER in TVET.
- Organize, start with or intensify cooperation and collaboration (e.g. via consortia) with important stakeholders in the field of OER in TVET: Commonwealth of Learning, International Labor Organization, the World Bank and the Asian Development Bank

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