Open Educational Resources in Higher Education:
Two Approaches to Enhance the Utilization of OER

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ABSTRACT

Open educational resources (OER) are openly licensed educational materials that can be used in different educational settings to help make education available to all. However, proper deployment of OER still faces many barriers, including the lack of know-how among educators and helpful supporting tools. Many educators do not have the necessary knowledge to efficiently find, utilize, edit, or distribute high quality OER. Adding to this challenge is the lack of technical tools to support them when producing OER or converting their existing educational materials to OER. In this paper, the authors introduce two practical approaches applied at the Learning Technologies Research Group at RWTH Aachen University to enhance the utilization of OER in higher education. The first one addresses the qualification of educators to the concept of OER, and the second one focuses on providing technical support to educators when producing OER.

KEYWORDS

convOERter, OER Benefits, OER Challenges, OER Projects, OER Tool, OER Utilization, OER Workshops, Open Educational Resources (OER), Technical Support

INTRODUCTION

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) considers the right to education a fundamental human right. According to UNESCO, universal access to high-quality education contributes to peace, sustainable social and economic development, and fosters intercultural dialogue. Open Educational Resources (OERs) and associated processes and procedures have been introduced and negotiated intensively during the last 4 decades as a strategic means to improve the quality of education for all. However, several challenges still inhibit the proper deployment of OERs worldwide.

In this article, we will introduce a general background of the potential of OERs and present two approaches conducted at the Learning Technologies Research Group at RWTH Aachen University

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that specifically address two main challenges. The first approach is aimed at qualifying educators with the concept of OERs. The second introduces a tool currently in development to support educators in converting their educational materials to OERs.

Definition

The concept of OERs was introduced at a conference hosted by UNESCO in 2002 (Yuan et al., 2008). UNESCO defined OERs 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, 2019). In simpler words, OERs are free learning materials that can be delivered in many forms, such as documents, research papers, videos, audio files, images, slides, etc. Some of the most well-known OER distribution platforms are YouTube, Wikipedia, and OpenCourseWare.

One of the most important promises of OERs lies in the potential to reduce demographic, economic, and geographic educational boundaries for everyone. It is important to note that "openness" exists in different domains and can have various meanings (Yuan et al., 2008). The concept of openness in the OER world was born from the idea that knowledge should be freely accessible to all. The two most important characteristics of openness are free availability and reducing technical, legal, or economic restrictions on using the resources. One of the most accepted definitions of "open" in the context of OERs was proposed by David Wiley, founder of the Open Content Project (1998–2003). According to this definition, copyrightable content can be considered "open" if it provides free permission to everyone to engage in the following 5R activities:

1. **Retain:** The right to make, own, and keep their copy of the resource.
2. **Revise:** The right to edit, adapt, and modify their copy of the resource.
3. **Remix:** The right to create something new by combining the resource with other material(s).
4. **Reuse:** The right to publicly use the original, revised, or remixed copy of the resource.
5. **Redistribute:** The right to share the original, revised, or remixed copy of the resource with others (Wiley, 2021).

These permissions are in line with the definition of Open Educational Resources. A key difference between OERs and other educational resources, many of which are freely available, is that OERs can be adapted and reused without needing to ask the copyright holder (Kanwar, 2018). OERs, along with Open-Source software, Open Access (OA), Open Data (OD), form part of "Open Solutions" (*UNESCO*, n.d.). Open licensing, such as Creative Commons (2001), is commonly used to identify the conditions that define acceptable usage of OERs.

Benefits

The cost of educational material can impose such an immense economic burden on some students that it may affect their academic success. The increasing costs of commercially available encyclopedias have proceeded to outweigh economic growth. This negatively influences access to higher education materials. OERs can play an important role by facilitating access to free online high-quality educational materials (Buczynski, 2006). The benefits of deploying OERs within educational practices can be discussed from different perspectives:

- **Reduction of expenses for books and supplies:** OERs reduce the additional costs on students for purchasing books or paper since learning materials are freely available digitally.
- **Augmentation of teaching materials:** OERs provide supplementary instructional resources that can be accessed remotely.

- **Assistance in choosing courses:** Students can obtain an outline of the online classes and determine whether it suits their purpose.
- **Increasing confidence of students:** Students can view and rework the course material at the time and place of their choosing. They can take advantage of a range of course-related online tools to help them improve and feel more positive in their studies.
- **Development of flexible course infrastructure with approved materials:** Educators can use and adapt available OERs to create their own teaching infrastructure that better addresses their student's needs and interests. This increases the relevance and efficiency of teaching and learning.
- **Collaboration and scalability:** Educators can enhance their visibility by sharing their teaching infrastructure and content for use by students and other educators all over the world.

Challenges

Despite the abovementioned benefits and opportunities of OERs, certain obstacles still inhibit the proper use and widespread deployment of OERs. These challenges need to be addressed and discussed within the OER community to find appropriate solutions. Some of these challenges are described in Table 1.

This article will concentrate on two of the above challenges: the lack of know-how about OERs and technical support tools. However, tackling these challenges will also help with other challenges by increasing the awareness of OERs and the perception of their quality.

BACKGROUND

After illustrating the main challenges that still face the proper deployment of OERs, we will introduce a general overview of the current situation of OERs in Germany and some existing OER tools. After that, two approaches to overcome some of the challenges mentioned above will be discussed. These approaches will benefit school teachers and teachers-in-training as well as university educators.

Table 1. OER Challenges

	Challenges	**Description**
1	Low Awareness	There are many regions and communities who are unaware of OERs.
2	Online Literacy	Many learners in many places are still digitally illiterate so they cannot take proper advantage of OERs.
3	Linguistic and Cultural Challenge	There are places worldwide where the only language used is the local mother tongue. Therefore, potential learners might lose interest in OERs because they are mostly in English. Also, some communities adhere to the existing academic schemes and are less open to modernizing their teaching and learning formats.
4	OER Policy of Institution	Many institutions do not have a clear OER policy. Furthermore, there is a lack of knowledge of open licenses' impact on educators and administrators who produce teaching materials.
5	Perceptions of OER Quality	There are many open issues concerning quality assurance and evaluating the quality of OERs.
6	Lack of Know-How	There is still a lack of know-how in the domain of OERs among educators. Some might not have adequate knowledge about creating, combining, licensing, or even finding OERs.
7	Lack of Technical Tools for Producing OERs	There is a lack of tools that can support producing OERs or converting existing educational materials to OERs.

OERs in Germany

Innovative educational concepts are needed to prepare students of all learning types worldwide for their future careers. As discussed above, OERs can play an important role in higher education by enabling students and educators to select the most suitable learning material from publicly licensed and commercially available resources. This can contribute to reducing inequalities in access to quality educational resources.

The OER movement in Germany was relatively stagnant until 2012 (Neumann, 2018). In that year, the first "OERcamp" was held, and expert hearings on OERs were organized in Berlin by the German Federal Ministry of Education and Research (BMBF). An OER report recommending short- and medium-term measures was published by a working group of BMBF and the Standing Conference of Ministers of Education and Cultural Affairs of the states (KMK) in 2015 (Deimann et al., 2015).

With further support from BMBF, the OER information service (OERinfo), an online portal that provides comprehensive information on the current state of knowledge and best practices, OER Camps, and other initiatives related to OER activities in Germany, were initiated in 2016. Between 2017 and 2018, several OER projects were funded by BMBF as part of the OERinfo funding line. The material generated in these projects is shared on the OERinfo portal.

In addition to national initiatives, a number of state-wide initiatives to strengthen the use of OERs have been defined in recent years in Germany. Since 2016, the Ministry of Culture and Science of the State of North Rhine-Westphalia and the Stifterverband have been awarding "Fellowships for Innovation in Digital Education" to support individual educators in implementing their innovative digital concepts. The program was expanded in 2019 to include tandem fellowships which are awarded to educators who cooperate with a didactics specialist, teaching/learning researcher, or with an educator from a different subject area or university. In addition to enabling educators to develop and implement their innovative teaching concepts, the initiative emphasizes networking between the awardees. Since 2020, all eligible universities in North Rhine-Westphalia (NRW) receive a grant of 50,000 Euros annually to organize a university-wide competition to award their university's "Fellowships for Innovation in Digital Education."

Moreover, the state of NRW announced the "OERContent.nrw" funding line in 2019 and again in 2021 to specifically support cross-university production of digital teaching and learning open educational resources. This initiative fosters collaboration between different universities. Given the growing importance of collaborative and interdisciplinary work environments, it makes sense for educators to pool their resources together and cooperate in creating and using free, high-quality open educational resources when appropriate.

The state of NRW also created the "Curriculum 4.0.nrw" funding line in 2019 to promote the development of digital teaching in university curricula. The material developed from the "Fellowships for Innovation in Digital Education," "OERContent," "Curriculum 4.0.nrw," and several other state-wide funding lines will be shared on the newly available NRW online OER portal, Open Resources Campus NRW (ORCA.nrw).

The state portal ORCA.nrw is a cooperative project of 42 universities and the Ministry of Culture and Science of the State of North Rhine-Westphalia that establishes a service infrastructure that supports the digital transformation of universities in the state. The ORCA.nrw portal represents an important cross-institutional OER infrastructure and serves as a common state-wide repository for OERs. A clear state-wide repository for OERs is expected to improve their accessibility for educators and their impact. It should also trigger other educators to publish their teaching material, exchange ideas, network, and use available OERs, when appropriate. ORCA.nrw also provides educators with offerings for further education in didactics and legal advice regarding using OERs. These initiatives are targeted specifically at university educators.

Even though Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen University does not yet have a formal OER policy, there is already a broad spectrum of OERs developed at the university and experience gained in creating and implementing OERs. Several RWTH educators

have been successful in the "Fellowships for Innovation in Digital Education," "OERContent," and "Curriculum 4.0.nrw" programs. This and other experiences have shown that common deterrents for the creation and more widespread use of OERs are the lack of knowledge and comfort with intellectual property rights and the lack of support tools to develop OERs and convert existing teaching material into OERs. Although OERs are published under public copyright licenses, differences in the licensing options can lead to confusion and incompatibility. Sometimes material cannot be shared as OERs, since it contains copyrighted material without the proper permission of the copyright owner. Moreover, finding appropriate alternatives to copyrighted materials, including pictures and illustrations is often challenging.

Existing OER Tools

Many tools can be used to produce and publish OERs. In this section, we will introduce some tools that can be used to produce, or support, new content and may facilitate publishing OERs (see Table 2).

The tools mentioned above are valuable assets that support the production and publishing of OERs. Nevertheless, closer examination of the tools shows that almost all of them are designed to support the production of new content. There is, however, an extensive volume of existing and well-tested educational materials freely available. Why shouldn't these resources also be utilized and converted to OERs instead of always producing new content from scratch? To tackle this issue, we proposed developing a tool to support the semi-automatic conversion of educational materials to OERs. The beta version of the tool has been developed at the Learning Technologies Research Group of RWTH Aachen University. It supports educators willing to transform their materials into OERs interactively and efficiently. The following sections will introduce the tool and highlight its usage and functionality.

Methodology

Implementing OERs is rewarding but can be very challenging. This study presents two approaches developed at the Learning Technologies Research Group at RWTH Aachen University to overcome some of the challenges mentioned above. The first was developed in the "Quality Initiative in Teacher Education- OER Competences" in teacher-training programs (RWTH Aachen, 2021) to qualify educators within these programs of OERs. The second approach introduces a technical tool (convOERter) that supports educators in converting their existing educational materials into OERs with as much automation as possible. In addition to facilitating the conversion of already-existing educational materials into OERs, the tool supports educators in licensing their materials as OERs.

Approach 1: Concept for Sensitization and Qualification for OERs – LeBiAC

The OER competencies in the teacher-training (dOER) project continue the successful MINT-L-OER-amt project (Ali et al., 2018) at RWTH Aachen University. The project aims to qualify the educators of teacher-training programs and their students on the concept of OERs, thereby establishing OERs as a topic in the curriculum for teacher trainees. The goal is that no teacher-in-training leaves RWTH Aachen University without proper OER competencies. It follows the concept of "Train the Trainer," as qualified educators qualify their students, who act as OER multipliers after completing their studies by establishing OERs in schools and possibly qualifying their colleagues as OERs.

The qualification of educators of teacher-training programs mainly takes place in specific workshops. These interactively designed workshops were initially intended to train teacher trainees to be part of the OER community. However, the methodology has been extended to qualify other educators at the University of the Concept of OERs. The workshops are organized around the five components of the OER cycle: "Search," "Use," "Edit," "Create," and "Distribute." Figure 1 illustrates the main components of the OER cycle that are presented and discussed during the OER workshops.

The workshops are designed to foster active participation. After the participants acquire the necessary theoretical knowledge related to finding, creating, editing, distributing, and proper licensing of OERs, they have the chance to participate in different facilitated and practical sessions actively.

Table 2. OER Tools

Interactive Videos / Content	
H5P	H5P is one of the most widely used tools for creating and editing HTML5 content in a multilingual way. It helps to produce and reproduce interactive content like videos, presentations, games, quizzes, etc., and offers tools and documentation for creating new OER content. With H5P, a wide variety of interactive tasks can be created. The tasks range from searching images and answering questions to creating interactive videos. Further, within these videos, one can timestamp at which points questions have to be answered before the user can continue watching (*H5P*, 2022).
Worksheet Creation	
Tutory	Tutory supports the entire process of creating OERs. Worksheets with a wide variety of content, including cloze texts and multiple-choice questions, can be created in the internet browser. Images can also be easily integrated, for which several OER image sources can be searched automatically, and the selected images can be provided with source information. Tutory also doubles as an OER portal, allowing users to share their work with others (Tutory UG (haftungsbeschränkt), n.d.).
Mind-Mapping Tools	
WiseMapping	This allows for creating interactive mind maps, for example, in class (WiseMapping | Visual Thinking Evolution, n.d.).
Office Tools	
LibreOffice	LibreOffice is a high-quality, free, and open-source alternative to Microsoft's Office package. Like many open-source projects, the project is financed considerably by voluntary donations from satisfied users (LibreOffice - Free Office Suite, n.d.).
CC Licensing Tools	
Creative Commons Mixer	A tool that helps select the correct Creative Commons license for material that combines differently licensed source material (Rotzoll, 2017).
Creative Commons Chooser	An official tool that helps select the correct Creative Commons license for one's material (Creative Commons, n.d.).
Animation / Video Creation	
Moovly	It enables the creation of animations and provides an extensive range of sounds, images, and music for this purpose (note: these may not be CC-licensed!). It also offers a free version for educational purposes (Moovly, 2022).
Camtasia	It records videos that can then be edited in an easy-to-use editor. Although the 30-day trial version is free, the download requires registration with a valid email address (TechSmith Corporation, n.d.).
Image / Photo Editing	
Comic Life	This allows one to create comics with one's own images easily. The 30-day trial version is free, and discounts are offered to educational providers and institutions (Comic Life 3 for Mac & Windows | Plasq.Com, n.d.).
Websites	
WordPress	It is a widely used content management system for websites and blogs. The creators also offer a free online solution for those who do not have their own domain or want to quickly set up a blog for a course (WordPress, n.d.).
Collaborative Writing	
YoPad	This allows setting up free Etherpads (a collaborative writing tool). The offer is a joint project for the promotion of digital participation of the German Children and Youth Foundation (DKJS), the German Federal Youth Council (DBJR), and the International Youth Exchange (IJAB) (Deutscher Bundesjugendring (DBJR), n.d.).
Courses / Course Material	
OpenCourseWorld	A platform that allows setting up free open online courses (MOOCs). Educational institutions or coaches, trainers, course educators, and lecturers can also offer courses themselves free via the platform (OpenCourseWorld - Front Page, n.d.).
Storage	
DriveOnWeb	This is an online storage service from Germany and is committed to the comparatively strict German data protection standards. The basic package with 5GB storage volume and a maximum of two users is free. Here you can store working materials and files and make them available to your course participants permanently or temporarily (DriveOnWeb - der sichere deutsche Cloudspeicher für Unternehmen, 2021).
Link-Shorteners	
kurzelinks	Long links can be shortened with the help of the short links webpage, for example, when referring to the source of an image (Kurz-URLs - sicher & datenschutzfreundlich, n.d.).

Figure 1. OER cycle
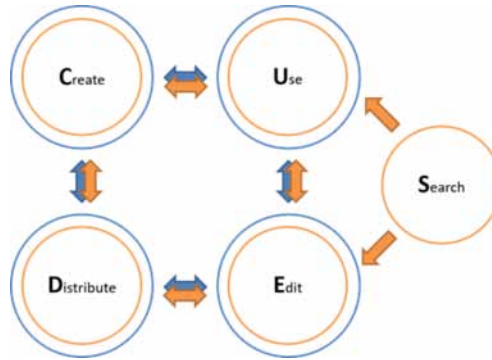
In the first session, they discover the world of OERs by searching for freely open resources in OER portals and platforms. Searching for the appropriate material can be daunting for many potential OER users. To support the participants in this process, they are given specific handouts covering a variety of OER portals and a collection of links for finding OER materials.

The second practical session enables the participants to hone their editing skills by combining different resources and licenses cards together. Examples of the cards are shown in Figure 2. Working in teams, the participants identify ways to combine the cards representing different OERs to generate new value-added collages or OER compositions. The participants then discuss and decide under which license to publish the new mixed OERs and why. For this purpose, other cards covering the different types of Creative Commons licenses have been prepared and are shared with the participants. During the workshops, the instructor is available to support the participants and teams. In the workshops, participants learn to increase their efficiency finding and editing appropriate OER material. Figure 2 shows some of the resources and licenses cards used within the workshops.

Figure 2. Resources and licenses cards

Due to the pandemic, the workshops were restructured to be held digitally. Additionally, all of the introduced materials were uploaded in two Moodlerooms. The first room addresses the students directly, who are given admission to the room during their teacher-in-training studies. With the help of tutorial videos and uploaded materials, students without previous knowledge about OERs can be sensitized and qualified. Students with limited or inaccurate perceptions about OERs can use the available resources to rectify these deficits. Similar to the workshops, the self-study units are structured following the OER cycle. The cycle works as a common thread that connects the different units. Additional handouts and various tasks and quizzes provide an opportunity to expand the theoretical knowledge.

Moreover, the room contains two interactive educational games. One is an interactive Escape Room (Rüter, 2020) developed by Bochum University of Applied Science to improve knowledge of copyrights and Creative Commons licenses. The second game (Tran, 2021), developed by the Learning Technologies Research Group enables students to practice OER editing based on the idea of cards introduced previously.

The game was developed as a web-based game that can run in most modern browsers. The architecture behind the game consists of three main components: the frontend, the backend, and the database. The frontend controls and presents the user interface, and the backend serves as a bridge connecting the frontend and the database. The database is used to store the leaderboard information and user data. The game has been utilized in different online OER workshops and as a practical assignment to practice OER editing. Figure 3 shows a screenshot of the game interface.

As the game received very good feedback and positive responses from the participants, it was extended to cover the remaining states of the OER cycle, such as creating, using, and distributing OERs (Phung, 2021). Moreover, some sections of the game were enhanced to deliver a better learning and gaming experience for the target group (educators and students). Furthermore, the concept was further developed to award the players a certificate of completion, which grants them access to a more advanced OER Moodle course at RWTH Aachen University. Figure 4 shows a screenshot of the extended version of the game (OER Cycle Game).

After successfully playing the OER cycle game, the participants receive a certificate indicating that they have acquired the basic knowledge about OERs in different domains (i.e., finding, using, editing, and distributing). This allows them to continue practicing OERs within their specific subject-related didactics in another Moodleroom. There, they get the opportunity to produce, edit, and distribute their own OERs within specific practical sessions related to their area of specialization.

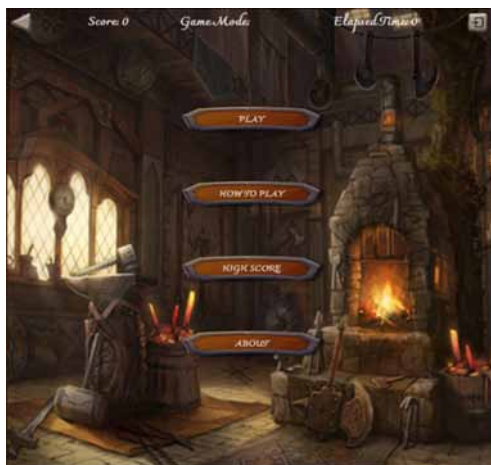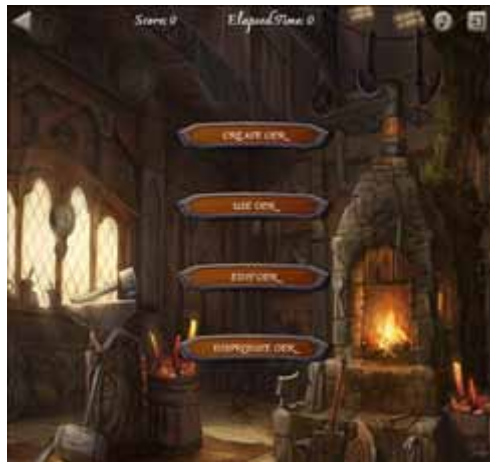**Figure 3. Screenshot of OER Editing Game**

Figure 4. Screenshot of OER Cycle Game

The second main Moodleroom is intended for educators. In addition to all the materials available in the student room, this room contains a training manual for OER trainers to support educators when qualifying their students. For instance, hints are provided regarding how to adapt and integrate materials into domain-specific teaching. These materials are available as Microsoft- or Open-Office documents on the dOER Project web page (dOER, 2021). Therefore, they can be freely downloaded, adapted, and utilized by all. Lastly, the lecturers' room contains a Forum that allows lecturers to share their experiences. In addition to the aforementioned options, students and educators can also attend the regular advisory hours offered by the dOER Project team to answer their questions about OERs. Figure 5 illustrates an overview of the qualifying procedure within the project.

Approach 2: Technical Support for Producing OERs – convOERter

The OER conversion tool (convOERter) is a web-based tool that supports educators in converting their existing educational materials into OERs (Ali & Schroeder, 2020). It is designed to read a file, extract all images and possible metadata, and substitute them with OER elements in a semi-automated manner. As such, the tool supports educators during the production of OERs. It enables them to benefit from the skills and previously produced images of other OER authors.

By providing access to more professional OER images, the conversion tool can help mitigate perceptions about OERs having lower quality than commercial sources. The detailed workflow of the tool can be summarized as follows: After receiving the input file in the first step, the system extracts the images and provides the user with the opportunity to search for keywords related to this image. After searching in different OER portals, the tool presents viable replacements that do not violate copyright. The user can then choose the most suitable replacement among the suggested options. This step will be repeated until all images in the input file have been processed. In the last step, the selected images are replaced automatically. The file is then exported with the requested changes and with a proper license for each image and the whole file. Figure 6 shows a screenshot of the latest deployed version of the tool.

The web-based analysis tool consists of two main components: The frontend provides the user interface that realizes the educational materials' import, conversion, and final download. The backend records which concrete substitution operations take place (i.e., which original images in the presentation file are replaced by new images from the available external sources). Later, this information can be used to convert successive materials with the same images in a semi-automated way. Figure 7 shows a screenshot of the frontend of the tool with different options to search or substitute an image.

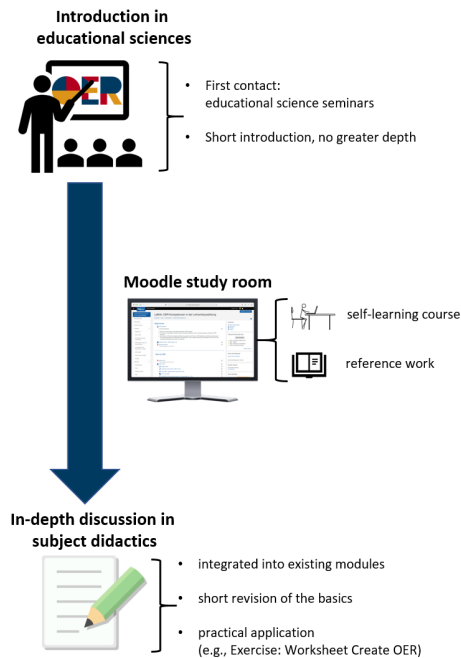**Figure 5. dOER Project qualifying procedure**
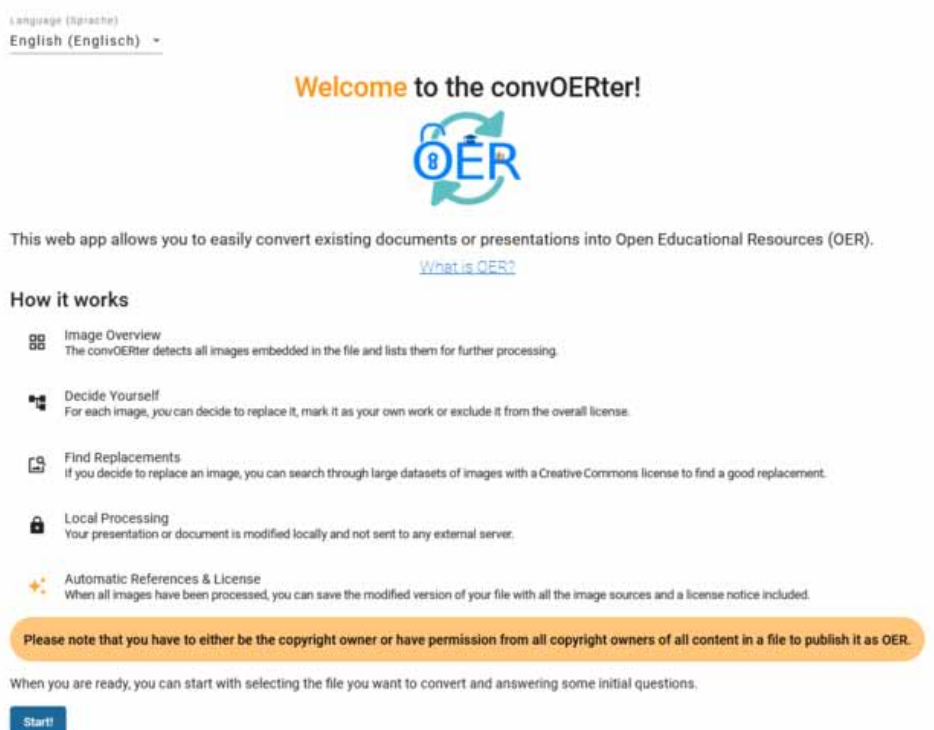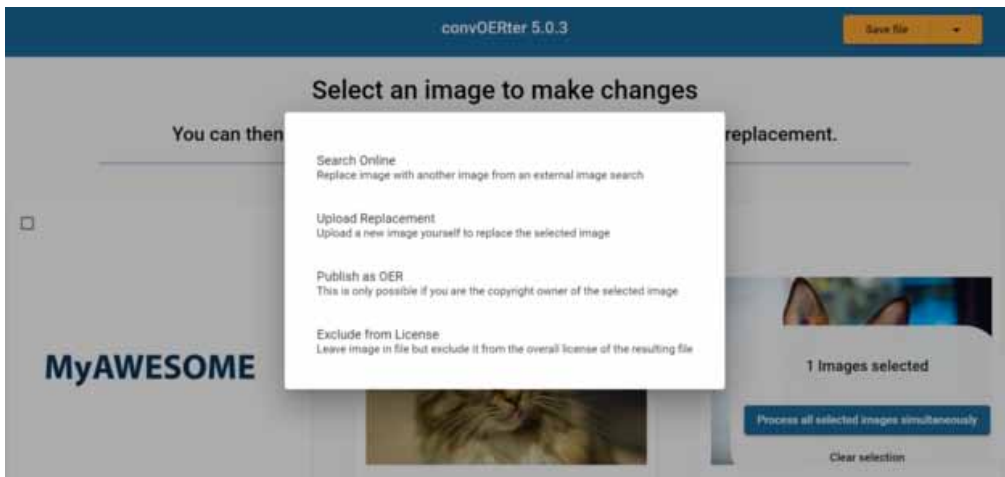

Figure 6. convOERter home page

Figure 7. convOERter Frontend

To date, we have conducted a survey and collected feedback from 23 participants in different OER workshops to evaluate the functionality of the currently deployed version and its effectiveness in supporting educators in converting their educational materials to OER. The survey results were presented in Ali and Schroeder (2021). More than 90% of the participants indicated that convOERter is a valuable tool for educators in converting their materials to OERs. Additionally, over half of the respondents stated that the tool motivated them to produce OERs.

To qualify the educators at RWTH Aachen University for the concept of OERs, we have designed workshops to include a theoretical part and practical sessions. The theoretical session introduces the basic foundation of OERs and the OER cycle. The practical sessions provide participants with hands-on opportunities to play the games previously introduced and practice converting educational materials to OERs using the tool (convOERter). Combining these two approaches helps participants acquire a profound knowledge about OERs.

Evaluation Methods and Techniques

To evaluate to which extent our proposed methods enhance the utilization of OERs among the target groups, we have started to evaluate our concept using different procedures and methods. To assess the first approach (Concept for Sensitization and Qualification for OERs – LeBiAC), we have recently prepared an online survey for educators in teaching-training programs and uploaded it to the educator OER Moodleroom. The idea behind the survey is to collect educators' responses and feedback regarding the offered workshops, produced materials, and the whole qualification procedure. In the upcoming months, we will analyze the responses and plan to summarize the results in a separate publication.

Simultaneously, we have begun to analyze and evaluate the second approach (Technical Support for Producing OERs – convOERter). Accordingly, we have started to arrange a series of workshops to evaluate the functionality of the tool "convOERter." The workshops, which will be held during the upcoming months, contain three main sections:

1. A survey regarding the participants' preknowledge in OERs followed by an introduction to OER cycle and the Creative Commons licenses.
2. A practical session to convert a PowerPoint file to OER manually followed by a survey of manual conversion.
3. A practical session to convert a PowerPoint file to OER using the OER conversion tool (convOERter) followed by a survey regarding semi-automatic conversion.

The surveys will be filled out by the participants, educators at universities and other people interested in OERs. The analysis will compare manual versus automatic conversion and evaluate the overall functionality of the tool. Moreover, to complement our technical tool, we will develop a technical evaluation system. The system will be integrated within the tool and contain the following modules:

1. Logging module: to identify a defined set of user interactions.
2. Analytics engine: to perform various types of analysis on the user logs and compare user interaction pathways with a defined ideal task flow.
3. Dashboard system: to display the analysis results on a dashboard.

We are designing and implementing this evaluation system to be deployed and integrated within the tool in the upcoming weeks. We can determine the tool's effectiveness and technically analyze specific parameters upon achieving that. The results of both evaluation techniques will be published in a future paper.

Our goal in these evaluations is to understand what, why, and how users feel about our two approaches and how they impact their effectiveness in using OERs.

CONCLUSION

The idea of making education accessible to everyone by promoting the development of OERs is very promising. Moreover, OERs provide substantial financial and learning benefits for students. However, implementing this idea in the education system is not easy; many barriers still hinder the proper deployment of OERs.

In this paper, we have summarized some of these barriers and presented two approaches conducted at the Learning Technologies Research Group at RWTH Aachen University to help mitigate these barriers. The approaches are primarily targeted at school teachers, teachers-in-training, and university educators. The convOERter is a simple, semi-automated tool that was specifically designed for the purpose of converting available learning material into quality OER content. Helping authors choose appropriate images from OER portals can increase the motivation and confidence of potential authors to create and adapt OERs and reduce fears and violations because of limited copyright knowledge. It can also reduce the workload associated with producing and modifying OERs.

Future Work

Efforts will continue to evaluate the effectiveness of the approaches presented in this study. Accordingly, an extensive questionnaire conducted with more participating educators to identify the workshops' effect on qualifying them on the concept of OERs was started. Additionally, we have started developing an evaluation system for the OER conversion tool (convOERter) to analyze the interaction between the user and the system, in addition to determining the extent the tool supports the educators when converting their educational materials to OERs. The system is designed to understand and visualize the convOERter tool's usability using web analytics on logs and to display all desired interactions on a specific dashboard.

COMPETING INTERESTS

The authors of this publication declare there are no competing interest.

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