ENGAGEMENT GLOBAL
Service für Entwicklungsinitiativen

OER and ESD

Potentials, Challenges and Perspectives of Open Educational Resources (OER) and Education for Sustainable Development (ESD) for Schools

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1. Context

The aim of this publication is to make it clear that Open Educational Resources (OER) and Education for Sustainable Development (ESD)[1] are complementary supporting elements of a school for the digital age. The focus is on the teaching opportunities that arise in schools from OER and ESD.

UNESCO defines OER as educational material of any kind and in any medium that is licensed under an open license (e.g. Creative Commons or GNU General Public License). Such a license allows free access as well as free use, editing and redistribution by others without or with minor restrictions (UNESCO, 2017).

The Ljubljana Action Plan adopted at the UNESCO World Congress "OER for Inclusive and Equitable Quality Education: from Commitment to Action" emphasizes the transformative potential of OER for the exchange of knowledge and cooperation between teachers, institutions and countries, as well as for improving the quality of education and facilitating access to knowledge (UNESCO, 2017). This reflects the great importance that UNESCO attaches to OER for achieving the Sustainable Development Goal (SDG) 4 of Agenda 2030[2] and thus also for ESD.

As a comprehensive educational concept, ESD is geared towards an open-ended model of sustainable development. In formal education, ESD is promoted in particular by active, pupil-oriented forms of learning and teaching, and its action orientation is geared towards the acquisition of competencies for the transformation towards a sustainable society. Implications for OER can be found in the school sector, particularly in the areas of educational culture, didactics and school development.

These are the areas that will be examined below with regard to their mutual complementarity between ESD and OER. First of all, opportunities and conditions for success are presented. Challenges and perspectives arising from this are examined in a concluding chapter.

This publication is not an exhaustive description of the subject of ESD and OER. It aims to offer an initial collection of ideas and suggestions concerning the common potential of OER and ESD in the school sector and to present examples of success. Another concern is to stimulate the joint exchange between OER and ESD communities.

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[1] Education for Sustainable Development (ESD) in this sense encompasses numerous educational approaches with different focal points, such as Environmental Education, Global Learning, Global Citizenship Education, Peace and Human Rights Education, Intercultural Education and others - as well as cultural contributions to Education for Sustainable Development.

[2] S SDG 4: "Ensure inclusive and quality education for all and promote lifelong learning", see: http://www.un.org/sustainabledevelopment/education [20 March 2019].

The impetus to produce this paper came from the workshop "OR goes OER - Interfaces of Open Educational Resources and ESD" as part of the 9th KMK/BMZ [3] Conference on the Curriculum Framework Education for Sustainable Development, which took place from December 6 - 7, 2018 in Cologne. The results and ideas developed collaboratively by the participants[4] of the workshop are summarized and prepared in this paper.

Since the paper itself is published under a free license, invitations are to retain, reuse, revise, remix and redistribute it - in the spirit of the "5Rs" (see Chapter 2).

It also sees itself as a contribution to the discussion on the mutual complementarity of ESD and digital education, which was initiated by Engagement Global with the discussion paper "Orientation needed – ESD in a digital world" published in 2018 (Engagement Global, 2018).

2. Closed vs open

The possible uses of OER can be summarized as "5 Rs" (Muuß-Meerholz, 2015):

- **Retain** – the right to make, own and control copies of the content (e.g. download, storage and reproduction).
- **Reuse** – the right to use the content in different contexts (e.g. in the classroom, in a learning group, on a website, in a video).
- **Revise** – the right to edit, adapt, modify or transform the content (e.g. to translate content into another language).
- **Remix** – the right to combine original or edited content with other open content and to create something new from it (e.g. by incorporating images and music into a video).
- **Redistribute** – the right to share copies of any content with others, in the original or in their own revisions (e.g. to give a copy to a friend or publish it online).

Unlike with traditional educational materials, the author decides under which license the work will be published. As a result, users are granted extensive rights ("some rights reserved") in contrast to the usually very limited options for using traditional materials ("all rights reserved"). The following overview illustrates the difference between traditional materials and OER[5]:

[3] Standing Conference of the Ministers of Education and Cultural Affairs (KMK)/ German Federal Ministry of Economic Cooperation and Development (BMZ)

[4] Participants of the workshop included players from administration, science, civil society, business and schools with an ESD and/or OER background. All participants in the position paper are listed in the imprint.

[5] Below: Muuß-Meerholz, 2018, pages 43 f.

	Open materials	Closed materials
Retain	I can download the material and save it on my hard drive. I can store it in as many places as I want, at home, elsewhere, on a school server, in Dropbox, on the public Internet. Forever.	I can only use the material on the given platform. This platform only works with certain computer systems. When my subscription/ license expires, I can no longer access the material.
Reuse	I can use the material for any purpose. I can use it in a private setting, in class, for tutoring, at a public event or on the web.	I am only permitted to use the material in a defined area and only for a defined purpose, typically only in school classes or in a certain class.
Revise	I can change the material. For example, I can shorten and supplement it, digitize and print it out, translate it into another language or edit it in another way.	I cannot change the material at all, or I can only make changes for myself privately.
Remix	I can mix the material with other materials, for example in a collage or a remix.	I can and may only use the material in its present form.
Redistribute	I can pass on the material - even if it has been modified and/or mixed. For example, I can share it with my colleagues and publish it on a website or in a book.	I am not allowed or able to pass on the material.

For OER, Creative Commons (CC) is the most widely used open content licensing model. CC offers a total of six licenses. Each license includes one or more of four basic license modules, each represented by pictograms and abbreviations (see appendix). OER licenses in the narrower sense include CC BY and CC BY SA as well as the release under Public Domain (CC 0).

A basic definition of openness can be found in the international Open Definition. This definition not only focuses on legal openness, but also on technical and didactic openness[6].

[6] See: Open Definition 2.1. Available at: https://opendefinition.org/od/2.1/en [March 20, 2019].

3. Educational materials

In terms of ESD, learning projects and topics are to be linked to relevant, problem-oriented challenges that are related to everyday life and which pupils themselves bring in or which motivate them to analyze the protagonists and the causes behind the contradictory goals (Engagement Global, 2017, p. 9).

In this context, OER offer the possibility of providing quickly, flexibly and legally adaptable materials on ESD topics[7] The resulting open ESD educational materials can be adapted to the specific educational context or to different learning needs and levels. Already existing materials can be extended with additional open materials, for example to adapt them to new curricular challenges or current developments.

OER can be changed. The didactic claim of ESD to promote empathy and a change of perspectives, by raising awareness of one's own and other people's values and their significance for one's own way of life and finally reflecting on them, can be well met by OER. Different perspectives can be enriched in educational material or information can be updated. Thus, learners are challenged to recognize diversity, and to analyze and evaluate information.

OER can be multiplied. In this way, a variety of subsequent materials can be created based on one material, for example translations into other languages or adaptations for a specific target group.

Open ESD materials can be designed and shared together. This is where dialogue with partners in the Global South offers potential for ESD, in particular. In this way, open ESD educational materials support global learning and global cooperation (see also Didactics).

Open materials and content offer opportunities for cooperation between the classical education sectors. This is the case with Open Data[8]. Open Data is produced and used at various levels in science, politics and civil society and can also be used in the school or further education sector. Although Open Data is not always OER, it becomes OER if it is created accordingly and used in pedagogical contexts. Working with Open Data that serves as the basis for scientific and political decisions and, if necessary, for justification, can enhance learners' ability to critically analyze information from various sources and formats. In the field of ESD, topics such as Open Government Data (www.govdata.de), Open Street Map (www.openstreetmap.de) or the open data of the German Weather Service (opendata.dwd.de) can be used[9].

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[7] ESD topics and the criteria for selecting ESD topics can be found in: KMK/BMZ/Engagement Global (Ed.), 2016, pages 96 – 99.

[8] Definition according to Open Knowledge: "Open Data is data that can be freely used, re-used and redistributed by anyone – subject only, at most, to the requirement to attribute and share alike", available at: http://opendatahandbook.org/ guide/en/what-is-open-data [March 20, 2019]. For Open Content see Muuß-Meerholz (2018), p. 45 f.

[9] For more examples of Open Data as OER see: Atenas/Havemann (Ed.), 2015.

Open ESD educational materials should contain meaningful metadata[10] so that they can be found online. This may require the specific adaptation of existing metadata standards to ESD or the development of new suitable metadata standards. The Sustainable Development Goals (SDGs) of the UN can offer a starting point for the standardization of ESD metadata.

Open ESD educational materials

- Engagement Global will provide at least one OER for each subject in the Curriculum Framework. These open ESD materials should be implementable without long preparation time for the teachers (e.g. within one substitution lesson). The teaching materials will be available for downloading from September 2019 at Engagement Global (ges.engagement-global.de) or on the Global Learning Portal (www.globaleslernen.de).
- EWIK as a repository for ESD-OER: In the long term, there are plans to gather all relevant ESD-related OER in the educational materials database of the Global Learning Portal (www.globaleslernen.de).
- The MakOER (ebildungslabor.github.io/makoer) mini online course offers support in creating OER materials for ESD.
- Edutags (www.edutags.de): The basic principle behind edutags is called "social bookmarking". Social bookmarking services allow you to bookmark websites and make these bookmarks available to others. Bookmarks that were previously only stored locally in the browser will now have social functions: Users can link bookmarks with tags, add comments or rate the material.

[10] For further information on metadata or metadata standards, see: https://www.forschungsdaten.info/themen/aufbereiten-und-veroeffentlichen/metadaten-und-metadatenstandards [March 20, 2019].

4. Didactics

In themselves, OER are "only" materials with an open license. They are used appropriately within the framework of Open Educational Practices (OEP). These are didactic concepts and methods that are particularly suitable for teaching and learning with OER. These can also be found in a similar form in an ESD. Much of this is known, for example, from progressive education or learning-related constructivism[11].

For the role of the teacher this means (Engagement Global, 2017, p. 13f. and Reich, 2018):

- less specifying and imparting,
- creating space for self-directed student activities,
- observing, advising and encouraging,
- going beyond the boundaries of the subject area wherever necessary and possible,
- enabling varying collaborative learning situations,
- encouraging critical reflection and practicing social negotiating of positions,
- promoting self-organization and independent acquisition of knowledge,
- project orientation.

As we have seen, OER can be further developed and updated on an ongoing basis. At the same time, materials from different perspectives can be combined. Corresponding metatags make it possible for authors of materials to be traceable. In this way, OER can promote the acquisition of competencies in the sense of ESD, as learners are encouraged to take responsibility for constructing their own knowledge, to reflect critically and to look at and adopt different perspectives.

OER can strengthen the role of learners in the learning process. Learners are encouraged to create their own materials, continue working with existing materials or publish their own learning outcomes as OER. In doing so, learners should not only see themselves as "transmitters" of OER, but to enter cooperatively and "at eye leve" into the exchange with learners from other countries in order to deepen mutual understanding. OER thus promote learning with and from each other (peer-to-peer learning) and can also be used in combination with research-based learning approaches.

In linking OER and ESD, it can be beneficial to use and help shape virtual space as an educational space. Here we find not just impetus for teaching and learning in terms of content, but also tools that can be used, for example, for collaborative forms of learning.

[11] Newer learning theories are based on the constructivist assumption that learners can only comprehensively grasp and apply ESD if they actively incorporate it into their constructions of reality of the world and sustainability. This places understanding-based learning before mere memorization, which cannot produce sufficient retention performance and produces scarcely any change in mindsets and attitudes. Together, this approach can be promoted with greater effectiveness in the interest of contemporary education for all.

The software Etherpad Lite (www.yourpart.eu), which enables synchronous writing, is one of the tools worth mentioning here.

When creating OER materials, didactic hints should always be given. In learning and teaching materials, instructions could be given to teachers and learners on how to implement or use them in the classroom. It also makes sense to describe methods that promote the acquisition of competencies in accordance with the Curriculum Framework ESD. Digital products that can be easily and dynamically further developed are particularly suitable for OER.

Through an exchange of OER and ESD teaching examples, the didactic approach of both concepts can be further sharpened and improved. The competency model of the Curriculum Framework ESD[12] provides a good basis for consolidating the content of open educational practices (OEP). On this basis, concrete teaching examples can be developed in the OER community.

The joint implementation of OEP and ESD requires further training concepts that focus on the didactic necessities and possibilities. This means that OER are not primarily concerned with the legal and technical perspective, while ESD does not only focus on the content aspect.

Continuing education and networking opportunities on ESD/OER

- In cooperation with the World University Service (WUS), Engagement Global is developing a training course for multipliers in teacher training on OER and ESD. The focus is on the OER potential for teaching design and development of schools in terms of ESD. Didactic, legal and technical aspects are addressed. Pilot events will take place until the end of 2019. The training with video tutorials will then be available at Engagement Global (ges.engagement-global.de) or the Global Learning Portal (www.globaleslernen.de). The tutorials and the training itself are OER and can be distributed and developed accordingly.
- The annual OERcamps (www.oercamp.de) are good opportunities for exchange and networking. The invitation to the camps is especially aimed at players from the field of ESD. The open design of the camps allows them not only to participate, but also to enrich the program with ESD items. BarCamps ("Unconferences") have proven their worth in Germany for the development and dissemination of knowledge and experience about OER and can also be used for the further dissemination of ESD. A BarCamp is an open conference or workshop format. Participants decide at the beginning about the contents and the course of events themselves. The organization of a joint BarCamp "When ESD meets OER" seems promising.

[12] In the Global Development Framework, the 11 ESD core competencies are used as reference points for subject-related competencies in the respective technical papers. Cf. KMK/BMZ/Engagement Global (Ed.), 2015, pages 111 – 400.

5. Educational culture and school development

In the sense of Whole School Approach (WSA), ESD is understood not only as a teaching topic but also as a challenge for school development (Engagement Global, 2017, p. 15f.). Learning locations, such as schools, unfold their full innovative power when they work holistically. When a school pursues a WSA, ESD isn't just a cross-cutting topic in the classroom. Learning processes and methods are also geared to sustainable development, as are, for example, the management of the learning location (care, procurement, resource management and the design of the learning environment). OER offer direct points of contact here.

The education system in Germany is largely characterized by the individual responsibility of the teachers. This is shown in particular by the fact that teachers generally prepare their own lessons independently. There is often only limited exchange and cooperation, restricted to short periods and selected learning groups, subject-specific and primarily at the respective school. OER can support interdisciplinary work. Teachers from different subject areas can be motivated to jointly develop teaching sequences with ESD topics at their school on the basis of available OER. It is not always necessary to resort to finished material. Teachers should be empowered to create their own materials. Through the joint process of creating materials, starting from different subject-specific perspectives, high-quality open ESD materials are created in this manner, with interdisciplinary approaches applied from the outset. Learners can also be involved in such creation processes.

The advantage of the uncomplicated updating and individualization of learning materials means that important and current topics such as climate change, exhaust gas emissions and traffic volumes can be dealt with in an interdisciplinary and action-oriented manner. Through the active role of learners in the learning process, lessons can be designed to be more competency-orientated, project-orientated, result-orientated and age-mixed.

Schools also have more opportunities to develop a specific profile by compiling the materials they use in a targeted manner. The use of open ESD teaching materials can be anchored in the school profile. Materials of this kind can be developed by learners, as well as by or with extracurricular partners.

Activities for school development can be published as OER in the form of best-practice reports and as entries in competitions and thus promote the exchange between schools with regard to school development.

Special activities such as project days on ESD topics or international exchanges with other schools can be accompanied by OER. Thus, it is conceivable to create OER together across borders as well as to use OER as tools to write project diaries for pupils or to use communication instruments for international exchange.

OER projects such as the SenseBox (www.sensebox.de) make it possible to carry out Citizen Science projects. Pupils can, for example, take part in measuring pollutants and publish their results on a collaborative map.

OER can contribute to an educational culture of sharing and cooperation within and across schools. The promotion of the culture of sharing and collaboration, which is supported, for example, by the creation of OER, can also have a positive effect on cooperation with parents and school partners. Together, both communities can develop these potentials even better and benefit from mutual exchange.

Ideas to initiate school development processes

- A BarCamp can be a good starting point for a school as a whole on the way to becoming a sustainable school in the sense of the Whole School Approach. The OER community has extensive experience in the design and implementation of BarCamps and can provide support.
- The contributions of civil society to ESD are presented on the Global Learning Portal (www.globaleslernen.de). In this portal, additional project offers in which civil society actors of the OER community support school development processes together with school stakeholders would be helpful.
- The biennial school competition on development policy "Alle für Eine Welt – Eine Welt für alle" (www.eineweltfueralle.de) under the patronage of the German President can not only be used for individual OER teaching projects, but also as a starting point for school development processes.
- Together with pupils, colleagues and/or partners, current topics can be developed collaboratively (e.g. idea and discussion papers for planning a project or action day, etc.).

6. Challenges and perspectives

Infrastructures and security

Improved online access to OER promotes individualized learning which, in conjunction with social networks and collaborative learning, offers opportunities for pedagogical innovation and knowledge building (UNESCO, 2017).

In the key issues paper Digitalpakt Schule [Digital Pact for Schools] by the Federal Government and the Federal States dated June 1, 2017, OER are named in two places. As part of the implementation of the Digital School Pact, digital infrastructures and school clouds will be set up and expanded. Furthermore, the Federal Government will promote accompanying measures for the dissemination of OER, e.g. through the OER Information Office, as well as the organization of regional transfer conferences to impart relevant competencies for the development, production and use of open educational materials (German Bundestag, 2018)[13]. Against this background, it is to be expected that there will be an increase in the demand for the use of OER and in the willingness to produce and disseminate OER.

The importance of mutually complementing ESD competencies and digitally supported education, including issues of support in the development, use and dissemination of OER content, should be given even greater attention (Engagement Global, 2018). This process would have a direct impact on improving access to and quality of education.

Quality

OER often collide with basic routines that are still prevalent in our education system. This applies, for example, to the issue of quality assurance. For many teachers it is initially very unusual to encounter materials that do not come from well-known education providers or a textbook publisher and whose incompleteness and need for further development is not a lack but a potential. It is also difficult to release materials and thus have no control over the context in which they are used.

Training courses that explain the use of OER and show the potential of quality development are helpful in overcoming these hurdles. Materials can be curated and made available with an appropriate assessment. The development and provision of minimum requirements for ESD learning and teaching materials (e.g. developed as part of the implementation of the Curriculum Framework ESD) can help. In addition, the support of experienced OER authors can help to achieve the objective.

[13] Further information on the development of OER in Germany: Orr, D./Neumann, J./Muuß-Meerholz, J., German OER Practices and Policy - from Bottom-up to Top-down initiatives. Available at: http://iite.unesco.org/pics/publications/en/files/3214746.pdf [March 20, 2019].

The link to the ESD sector may open up new perspectives for the development of new high-quality OER collections. At the same time, the OER community can contribute the knowledge it has built up in recent years in regard to publication strategies that offer alternatives to traditional publication approaches. In this way, it should be possible for governmental and non-governmental players from different countries to jointly build up a stock of high-quality ESD educational materials.

The users and those responsible for the already established OER platforms in German-speaking countries are called upon to take ESD into account in their offerings and to establish possible interfaces to ESD platforms. This applies both to material platforms such as the Zentrale für Unterrichtsmedien (ZUM) (www.zum.de) and to tools such as the comprehensive search engine OER-Hörnchen (oerhoernchen.de). The OER World Map (oerworldmap.org) is a comprehensive presentation of all OER offerings in which ESD can also be used as a keyword.

Access

State and private sponsors of (ESD) teaching materials should increasingly use and promote open licenses. This is based on the view established in the OER community: "Publicly financed educational materials should also be fully open to the public. The CC licenses "Attribution" (CC BY) and "Attribution-ShareAlike" (CC BY SA) as well as publication under public domain (CC 0) are recommended. These licenses enable a far-reaching distribution and subsequent use. They also comply with the Open Definition mentioned in Chapter 2.

As described in Chapter 3, high-quality, open ESD educational materials should have meaningful metadata; for example, through the adaptation of existing metadata standards to ESD. The United Nations Sustainable Development Goals (SDGs) offer an opportunity to standardize ESD metadata. In order to ensure traceability, machine readability should also be ensured.

If educational equity is one of the central values, this means that OER/BNE materials must also be designed to be barrier-free / inclusive, for instance to take into account the needs of people with various disadvantages, impairments or disabilities. If such supporting materials do not exist or are not accessible, then exclusion occurs.

Continuing education

The production of open teaching materials from simple worksheets to complex teaching materials by learners and teachers largely corresponds to the pedagogical approaches preferred in ESD (strengthening the role of learners, learning by doing, collaborative learning, culture of sharing, inclusion of different perspectives and orientation towards current developments).

To be able to exploit this potential, it is important for teachers to acquire basic legal, didactic and technical knowledge. Further training courses would seem worthwhile, for example, to demonstrate the possibilities of using and further developing OER in the field of ESD or to develop teaching materials aimed at the use of digital tools in specialist teaching or in project work on ESD topics. The implementation of OEP and ESD requires further training concepts that focus on didactic needs and possibilities.

Time

An educational culture of collaboration and solidarity requires structural changes. For example, more freedom is needed for teachers to exchange ideas and to jointly design lessons (e.g. through team teaching), as is the involvement of parents, school partners and other schools. A forward-looking educational culture of collaboration and solidarity is also a question of attitude. Good role models and a sense of appreciation for sharing are supportive.

All these steps need time and freedom, but also the courage to fail.

Appendix 1

Creative Commons licenses (plus CC Zero)[14]

By clicking on the respective license graphic or the license name you can access the short version of the license. For further information on the various CC licenses, please refer to the OER user manual and the checklist for creating your own OER materials.

CC BY This license allows third parties to distribute, remix, enhance and build on a work, even commercially, as long as the author of the original is named.

CC BY SA This license allows third parties to distribute, remix, enhance and build upon a piece of work, including commercially, as long as the author of the original is named and the new works based on his or her work are published under the same conditions.

CC BY ND This license allows third parties to redistribute the work, both commercially and non-commercially, as long as this is done without modification and in its entirety and the author is named.

CC BY NC like CC BY - with the additional restriction "only non-commercial".

CC BY NC SA like CC BY SA - additionally with the restriction "only non-commercial".

CC BY NC ND like CC BY ND - additionally with the restriction "only non-commercial".

CC0 (CC Zero) Waiver of all copyright and related rights.

[14] CC BY SA 3.0 by Jöran Muuß-Merholz for wb-web, below: https://wb-web.de/material/medien/die-cc-lizenzen- im-uberblick-welche-lizenz-fur-welche-zwecke-1.html [March 20, 2019].

Appendix 2
Further information about OER

- OERInfo (open-educational-resources.de): The OER information point (OERinfo) is a topic-specific online portal that provides the public and specialist target groups with comprehensive information on the subject of OER. The information point has been devised to encompass all federal states and education sectors.

- OER World Map (oerworldmap.org): The aim of the OER World Map is to document national and international players, projects and events related to OER as comprehensively and as up-to-date as possible.

- OER conferences and OERcamps (www.oercamp.de): Employees and activists from all areas meet for annual OER conferences and OERcamps. Here questions about OER are answered, new initiatives and projects are presented, and current developments are discussed. The OERcamp is the meeting of practitioners on digital and open teaching and learning materials in German-speaking countries. The OERcamps take place in different sizes and formats. Typically, a combination of pre-planned workshops and on-site BarCamp sessions is offered. The OER conference is a combination of a specialist conference and a BarCamp and offers participants the opportunity to exchange experiences and network.

- OER tools: Numerous tools support stakeholders in creating or using OER. These include the online workstation editor Tutory, Serlo - the 'Wikipedia for educational materials' or Memucho - a file card tool that allows questions on specific topics to be created, learned and shared, and OERhörnchen, the search engine for open teaching and learning materials.

  → **Tutory: www.tutory.de**

  → **Serlo: de.serlo.org**

  → **Memucho: memucho.de**

  → **OERhörnchen: oerhoernchen.de**

- ZUM e.V. (www.zum.de or unterrichten.zum.de/wiki/hauptseite): The Zentrale für Unterrichtsmedien im Internet (ZUM) aims to use and design the Internet as a learning and teaching aid for all types of schools and for extracurricular educational work in German-speaking countries. Teachers share teaching materials with each other in wikis.

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