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The Project TOERN - Unlocking the Potential of Open Educational Resources on the German “(digital) networked infrastructure for education”

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Zusammenfassung

Die *Digitale Vernetzungsinfrastruktur für die Bild*ung soll ihren Nutzer*innen einen personalisierten und selbstorganisierten Zugang zu lebenslanger Bildung ermöglichen, indem sie digitale Bildungsangebote bündelt und mit zusätzlichen Funktionalitäten und Services zu einer bundesweiten Lehr-Lern-Infrastruktur ausbaut. Damit birgt die Infrastruktur ein großes Potenzial für die Etablierung und Verbreitung von Open Educational Resources (OER) in allen Bildungsbereichen in Deutschland.

Das Hauptziel des Projekts TOERN ist die Anbindung des OER-Repositoriums für die Hochschullehre www.twillo.de und des zentralen OER-Suchindex OERSI an die Digitale Vernetzungsinfrastruktur für die Bildung. Dazu werden die OER-Infrastrukturen nutzer*innenzentriert weiterentwickelt und international anschlussfähig gemacht. Darüber hinaus fokussiert das Projekt die Entwicklung eines digitalen modularen Weiterbildungsprogramms zu technischen Aspekten der OER-Erstellung, das über ein Badge-System an die Digitale Vernetzungsinfrastruktur für die Bildung angebunden werden soll.

Dieser Artikel fasst die Hauptziele des Projekts, die Zwischenergebnisse und die derzeit laufenden Arbeiten zusammen.

Stichwörter: e-learning; Digitale Vernetzungsinfrastruktur für die Bildung; Open Educational Resources; TOERN Projekt; Hochschulbildung; Weiterbildung; OER Repositorium twillo; OER Suchindex OERSI; Internationalisierung von OER; Semantifizierung von OER; digitale Kompetenzen

Abstract

The *(digital) networked infrastructure for education* aims to bundle digital education offerings and expand them with additional functionalities and services to create a nationwide teaching-learning infrastructure, in order to enable users to access lifelong education in a personalized and self-organized way. Due to this, the infrastructure holds great potential for the establishment and dissemination of Open Educational Resources (OER) for all of Germany's educational sectors.

The main objective of the project TOERN is to connect the OER repository for higher education www.twillo.de and the central OER search index OERSI to the (digital) networked infrastructure for education. For this purpose, these OER infrastructures will be further developed in a user-centered way and made internationally connectable. In addition, the project focuses on the development of a digital modular learning program on technical aspects of OER creation, which will be connected to the (digital) networked infrastructure for education via a badge system.

This article summarizes the main objectives of the project, the interim results and the work currently in progress.

Keywords: e-learning; (digital) networked infrastructure for education, Open Educational Resources, TOERN Project, Higher Education, Further Education, OER Repository twillo, OER Searchindex OERSI, internationalization of OER, Semantification of OER, digital skills

1. State of the Art Infrastructures for OER in Higher Education

With the advancing digitization of teaching and learning in higher education, university teaching staff are oftentimes confronted with the task of adapting their learning materials to meet the requirements of digital settings. Open Educational Resources (OER) can facilitate this process significantly, since these materials can be reused and adapted to specific teaching and learning contexts. The foundations of OER is their openness in terms of licensing law as well as the utilization of technical standards that ensure their discoverability, reuse, and interoperability. For learners from the higher education sector (and beyond), open and freely available educational materials offer great potential to improve access and participation in education (cf. BMBF 2022, Ladwig 2022). According to the same study, with increasing numbers of international degree programs, multilingual learning materials are important to compete in the international education market. OER are excellent for multilingual, dynamic development of learning materials.

Throughout Germany, there are several decentralized platforms for the exchange of OER in higher education such as twillo , ORCA , HessenHub , HOOU but also internationally such as Merlot and OER Commons . However, as the number of sources on the web increases, so does the effort that educators and students have to make to find content that is helpful and suitable for them (cf. Wannemacher et al. 2023).

In this respect the OERSI (Open Educational Resources Search Index - a search engine for free educational materials in higher education) supports both educators and students. As a central search entry point, OERSI connects OER repositories of distributed state initiatives as well as institutional repositories of universities and libraries. No content is held in OERSI itself, only the metadata is merged and homogenized for a uniform search. Due to its open interfaces, OERSI can be integrated into other platforms to search for OER. The first examples of this are the integration into the Lower Saxony OER portal twillo and the North Rhine-Westphalian OER portal ORCA.nrw. The OERSI is operated by TIB and the entire development is open source and can be accessed on https://gitlab.com/oersi .

The OER repository twillo (funded by the Lower Saxony Ministry of Science and Culture) is also developed and operated by the TIB in cooperation with five other partners in the field of research and higher education. It provides a reliable infrastructure / repository for

university teachers to publish openly licensed educational materials. In addition to material hosting and search functions, the portal also offers a variety of consulting and support services on legal, didactic and technical matters related to OER and their creation.

Despite the above-mentioned advantages of OER for university teaching, existing infrastructures and numerous initiatives that address the topic, the establishment of open educational materials remains hesitant among university personnel (cf. Arndt et al. 2021, Riar et al. 2020, Deimann 2020). The reasons for this, apart from problems in finding high-quality OER, are individual uncertainties of educators in dealing with OER. These are particularly evident with regard to legal and technical issues (cf. Ladwig 2022, Ovadia 2019, Plank, Beutnagel 2022).

2 The TOERN project

The TOERN project (Teilen von Open Educational Resources auf der Nationalen Bildungsplattform) is funded by the German Federal Ministry of Education and Research and conducted by the TIB (September 2022 - August 2024). The project pursues three main objectives:

1. Improving the findability of OER by further developing the OER repository twillo and the OER search index OERSI and integrating them into the networking functions of the emerging *(digital) networked infrastructure for education*.
2. Internationalization of the OERSI infrastructure by establishing a multilingual search and suitable multilingual filters as well as providing the metadata for all OER in OERSI by an open API.
3. Didactic and technical design of a modular training program to promote digital literacy in the technical production and use of OER. The program’s integration into the structures of the *(digital) networked infrastructure for education* will be achieved by a badge system that allows learners to showcase their learning progress and acquired competencies in their profile.

The project is processed along two different work packages: Firstly “Internationalization / Integration” and secondly “Training Program Technical OER Skills”. In the following project report the work programs as well as the achieved results and ongoing work are described.

Project Report

1. Work Package: Internationalization / Integration

Description:

This work package focuses on internationalization through enrichment resp. semantification: In the course of increasing internationalization, both by students from other countries and by students who plan on staying abroad, there is a growing demand for teaching and learning materials in different languages. While foreign language teaching

usually focuses on learning day-to-day language, learners often lack subject-specific vocabularies and their use in written and spoken word. A good example of multilingual knowledge representation is Wikipedia, where comparable articles in different languages can be displayed for the same topic. In many cases, this already provides an introduction to the vocabulary in written form. In collections of Open Educational Resources, there is usually no direct translation of the materials and thus no one-to-one link between materials in different languages. In order to establish the reference to comparable materials in different languages, the OERSI’s search terms are extended via existing links of terms from Wikidata and Wikipedia.

Interim results:

In a first step, individual subject areas with their translations were read out from Wikidata on the basis of a subject classification. The resulting multilingual subject classification was used for mapping subjects for existing and new sources. It was then made publicly available as terminology both for the OERSI and for the use in twillo. A module was developed to describe the materials with fixed keywords and translations in different languages, which will make suggestions based on Wikidata when assigning keywords. It can now be used in the context of OER portals to label published materials. In the context of the search index, Wikidata was tested and implemented for the extension of the search space to include content in different languages. Both the OERSI user interface and the cross-lingual search now exist in English, Ukrainian and Dutch in addition to German.

Ongoing work

Support for additional languages is planned, and Wikidata-based keyword mapping can already be tested for French, Spanish, and Danish. In the medium term, OERSI aims to support at least all European languages for mapping of keywords. The translation of the user interface, however, will focus on selected languages, as this requires manual maintenance of the translations and therefore depends on the cooperation with international partners.

Practical challenges:

As the size of the index and thus the volume of aggregated content increases, so does the requirement for a stronger focus on the needs of the users and thus the challenge of finding precisely fitting materials. As one approach to meet these challenges, further development is planned to identify appropriate materials based on module descriptions in module handbooks instead of single search terms.

2. Work Package Training Program Technical OER Skills

Description:

The second work package focuses on the development of the above mentioned training program to support university educators as well as other interested parties, such as continuing education staff, in the use and creation of OER. Although there are already a variety of training courses on OER offered by established providers (e.g. Future Learn Lab, eBildungslabor, WirLernenOnline), these usually only deal with legal and didactic topics. However, outside of technical fields, the design of OER with the help of open systems (e.g. the Markdown markup language or technical applications based on it and the Git services)

is given little attention. Yet their use has great advantages for creating open educational materials, as they are free of charge and allow to collaboratively edit materials, flexibly convert them into different formats, and manage different versions (cf. Ovadia 2019; Schröder, Pfänder 2020). The TOERN educational offering focuses primarily on these technical aspects of OER development. In addition to basic topics on the legally compliant use of OER and the licensing of one's own materials, its main goal is to show the participants what digital tools exist for creating educational materials as well as making them openly available not only in terms of licensing law, but also technically. Within different lessons, the participants get to know the interfaces of specific software or digital tools and get the chance to try out its most important functions.

The training program will be made available via a digital learning environment, which is integrated into the TIB infrastructure and will be designed as a modular digital setting that can be worked on in self-study. Each lesson is structured as a self-contained learning unit that covers the levels of beginners to advanced learners. In order to work through the entire course, knowledge from the preceding modules is required. However, to take the individual educational needs, motivations and interests of potential participants into account, all lessons are self-contained and can therefore be worked on independently of one another.

In order to stimulate an active learning process of the participants, the training program is designed according to the principles of action-oriented didactics (cf. Jank, Meyer 1994). Within the individual lessons, the participants are guided through the creation of their own OER in their respective subject area along practice-oriented tasks.

At the end of each module, a self-assessment is available that allows the participants to reflect on the content learned and to check their learning success. After successfully completing the self-tests, participants receive a digital learning badge as proof of their performance achieved and the competencies acquired. The reason for awarding learning badges, is that they have been shown to be particularly effective in motivating participants and provide a strong incentive to complete educational opportunities (cf. Mazarakis, A.; Bräuer 2023)

As figure 1 illustrates, the ideal journey for the Users of the *(digital) networked infrastructure for education* is as follows: They find the TOERN-educational offering on the (digital) networked infrastructure for education and can access the TIB learning environment via single sign-on (SSO). After completing the educational offer, they receive a digital badge that they can retrieve via an app called Enmeshed. The users can then decide whether to save the badge in the app or to share it on their profile of the *(digital) networked infrastructure for education*. From there, the certificate can be showcased whenever needed (i.e. in the context of an application procedure).

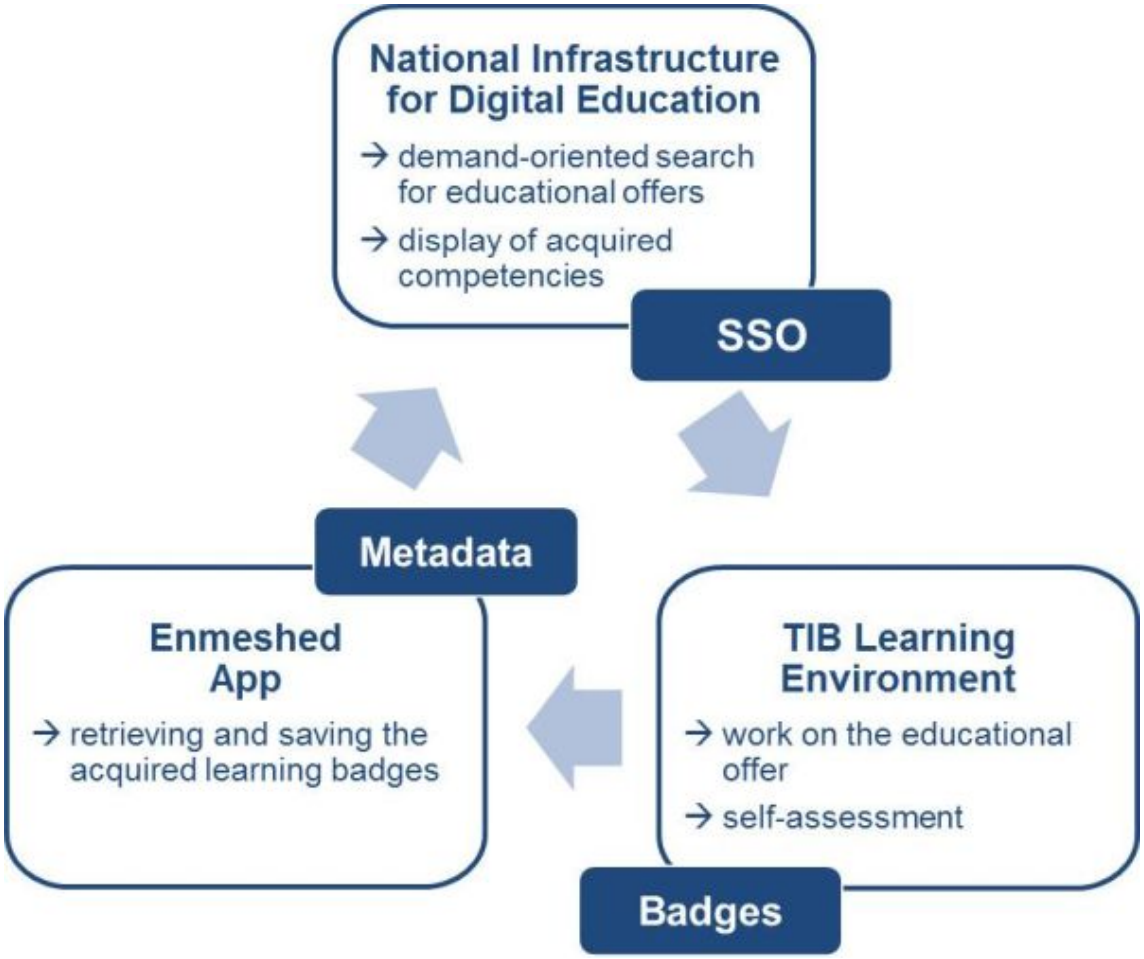

Fig 1: User Journey

Interim results and ongoing work:

In order to set up a suitable learning environment, the functionalities of various technical systems were tested. After some internal evaluation, it was decided to use the learning management system Moodle. The visual design of the Moodle systems was adjusted and first considerations for connecting the learning environment with the *(digital) networked infrastructure for education* were made. At the same time, the detailed planning and methodical design of the training concept was initiated and is still ongoing. It primarily includes the creation of teaching materials (e.g. texts, interactive quizzes, videos) for the use in the educational offer, the adaptation and further development of contents from courses previously conducted by the twillo team, and the search for supplementary teaching materials by other authors (e.g. videos, literature) that allow reuse.

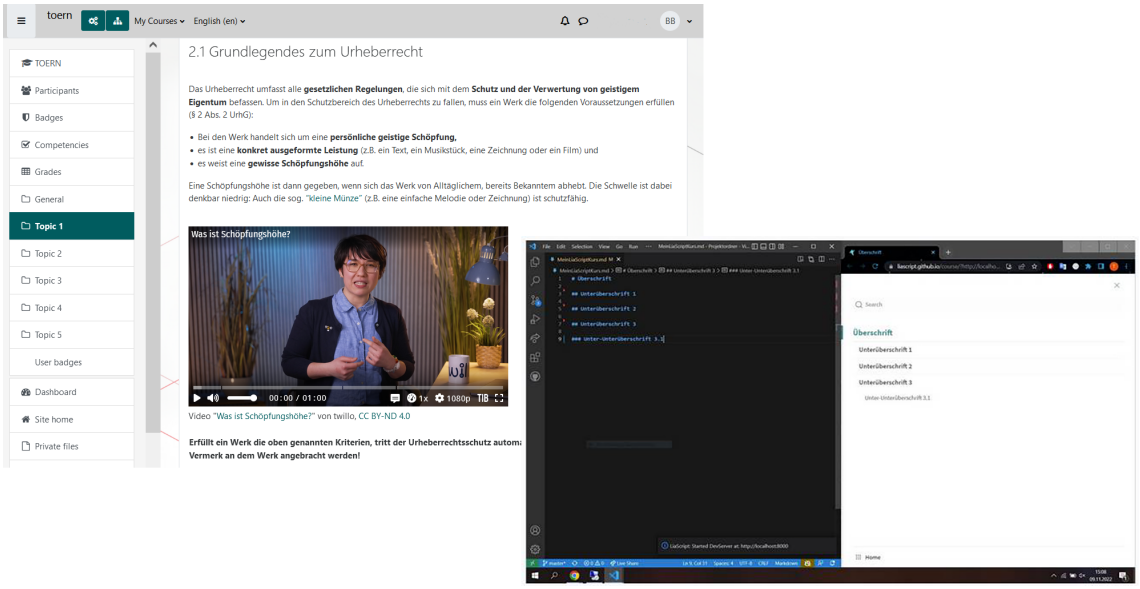

Fig 2: Screenshot of the Moodle learning environment and the user interface of the LiaScript program for creating open courses with extended Markdown

Practical challenges:

The interfaces for connecting the continuing education offering to the *(digital) networked infrastructure for education* (SSO connection and automatic account creation upon initial login via SSO, establishment of the infrastructure for data transfer between the course environment and the data wallet in the Enmeshed app) were initially developed and implemented with a course pilot in the Wordpress content management system.

However, during the extensive testing of different plugins of the content management system for designing the educational offering in the implementation phase, limitations in their functionalities became apparent. For example, the integration of interactive learning objects was not possible as planned and the visual design options of the course were limited in the free versions of the plugins. Due to the goal of TOERN to promote free access to education and to make all developed materials openly available, the purchase of the paid extended versions of the plugins was refrained from. Since the providers of the plugins are located in the USA, data privacy hurdles became apparent. Against this background, the use of the plugins was abandoned and Moodle was set up. However, the choice of a new technical system necessitates the revision of the interfaces developed in the conception phase to connect the training environment to the *(digital) networked infrastructure for education*.

3. Conclusion

In conclusion, the TOERN project has the potential to significantly improve the findability of OER for higher education especially also across language borders by providing a central entry point into a whole range of aggregated OER via the search index OERSI. The project demonstrates that by enriching and semantifying OER with related terms from Wikidata and Wikipedia, learners can easily find comparable materials in different languages. Currently

the cross lingual mapping exists for German, English, Ukrainian and Dutch and the mapping of keywords will be extended to other European languages in the course of the project. With the integration of twillo also a high quality OER repository and hosting service is provided for educators.

The training program with a focus on the technical development of open format learning materials will provide educators and other interested parties with the necessary resources to understand, create and publish OER. To provide access to the training program, a learning platform (Moodle) was set up, integrated into the TIB infrastructure and published. The training platform will gradually be filled with further courses from the TIB, e.g. in the area of open access, digital literacy or visual analytics. In this way, the system is sustainably maintained and further developed. All these courses can then reach a wide potential group of participants through the *(digital) networked infrastructure for education*.

The next steps for the project include the finalization of the training program, the transfer of the badges as well as connecting twillo and OERSI with the *(digital) networked infrastructure for education*. Furthermore, the evaluation of the project and its results will be conducted to assess the success of the project and to identify further opportunities for improvement.

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