Looking at AI for quality and sustainability in OER repositories through stakeholders' perspectives

Version 3.0 – February 2023

ENCORE+ OER Technology Position Paper No. 3

encore+

European Network for Catalysing Open Resources in Education

Coordinators of this work:

Paz Díez Arcón (K4A)

Participants:

Eleonora Pantò

(Fondazione Politecnico di Milano, Italy)

Sahan Bulathwela (K4A)

Co-funded by the Erasmus+ Programme of the European Union

This project has been funded with support from the European Commission. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Table of contents

Executive summary

This third technological position paper has aimed to explore stakeholders' perspectives on Artificial Intelligence (AI) solutions for ensuring quality and sustainability in OER repositories and also considers ethical issues related to the use of these systems in education. The ENCORE + Network aims to increase the dialogue among stakeholders and showcase good practices and strategies around Open Education, so this position paper has collected teachers, researchers, business and technological experts' perspectives to contribute to the growing body of evidence looking at these topics to enhance the discussion within OERs' communities of practice. Quality in OER repositories was found to be challenging, although some practical solutions were proposed related to the replication of successful initiatives and the human's leading role in quality assessment over technology, although supported by it. Evidence and discussion on sustainability in these spaces moved us to the existing business models for OERs explored within the ENCORE+ Network with insightful thoughts on new ways of revenue streams generation based on the creation of educational-related services for learners. Lastly, AI's role in OER repositories and education was explored by an overview of the work done so far within this community. Good practices aligned with the ethical recommendations by UNESCO on the use of AI in education were also explained with the case of X5Learn (AI powered OER repository) in terms of privacy and data protection, design and development of processes, ensuring human oversight and determination, and providing meaningful explanations for users' understanding of algorithm decisions.

Co-funded by the
Erasmus+ Programme
of the European Union

Introduction

The ENCORE+ network aims to address educational challenges by catalysing Open Educational Resources (OERs) in a harmonised manner and proposing viable solutions at technological, innovation, policy, and quality levels. This involves gathering evidence from different stakeholders, showcasing good practices, and increasing dialogue opportunities with and among the existing communities. The purpose of this position paper is aligned with these objectives and specifically deals with the potential of technology-supported solutions for OER repositories, focused on Artificial Intelligence (AI) systems.

This third technological-focused position paper is especially relevant for both educational and business sectors as it offers a practical overview of the topic considering business stakeholders, educational experts, and system developers, as well as it addresses an issue of current interest such as ethical issues raised by the use of AI. The use of AI in education has been addressed by the creation of ethical guidelines to support educators in an effective and conscious use of these systems. This is in accordance with UNESCO recommendations which state that digital societies require new educational practices, ethical reflection, critical thinking, responsible design practices, and new skills to be acquired, since "high-risk" AI systems do exist.

This principle assumes education and training on AI-related issues as the key to progress, and so, some misconceptions about the use of AI systems need to be addressed. The Ethical Guidelines for Educators (2022) highlight some of the most recurring ones such as the difficulty to understand how a system works, the widespread idea that these systems have no place in education, that they are not trustable, or that AI will undermine the role of the teachers, among others. Once these barriers are overcome, new informed users should be able to consider issues about the use of these systems at human agency, fairness, humanity and to make justified choice decisions (UNESCO, 2021). This paper reflects on these guidelines and explains how system developers (X5Learn) have considered complying with the recommendations from the design to make information clear and transparent for users.

This way, this paper follows on from the work started in the first and second versions of this series, which firstly explored the possibilities of technology for the development of a sustainable and competitive space for open education (Technology Position Paper nº1), and continued with the identification of key factors to consider in creating a new OER ecosystem fulfilling stakeholders' needs (Technology Position Paper nº 2). Technological-aided solutions are developed at three levels of inquiry, namely: OERs

Co-funded by the Erasmus+ Programme of the European Union

quality management, OERs sustainability, and the application of AI systems in OER repositories.

What makes OER repositories work?

At the ENCORE+ Network a Proof of Concept (Poc) was designed to analyse the key features of OER repositories having a clear effect on the OER infrastructure. The PoC explored different dimensions such as OER providers' features and goals, the identification of success indicators on existing repositories like Merlot, OER Metafinder, Nanohub, and OASIS, among others (e.g., quality assurance, community, and facility of use, etc.), and applicable technologies to enhance the uptake of OERs, to finally propose possible scenarios of technology integration supporting a new infrastructure of OERs. This desk research and resulting practical applications can be considered an up-to-date and solid reference framework, however, the discussion needs to be broadened to make room for different perspectives derived from experiences and practices. This position paper precisely collects insights from a dedicated focus group with experts and practitioners from the Open Education Italia network, a start-up (Viblio), which uses AI powered mentors to help workers craft and take on insightful learning paths by running educational content, and a system developer. The practical perspective from teachers, researchers, business, and technological experts is set out below.

Quality

The focus on OER-related quality issues led to the discussion about how to manage it at a practical level. AI supporting human curation processes, and the peer-review system were raised as viable solutions. However, it still had to face relevant challenges such as training AI systems efficiently, encouraging stakeholders to carry out curation tasks, and dealing with financial constraints. Sustainable quality assurance suggestions were:

- Re-evaluation of the role of publishers to propose the creation of ethical agreements considering digital formats that allow new ways of distribution, fruition, and innovative business models.
- Look at successful initiatives potentially aligning OERs, and businesses' needs such as the cases of LINUX, Scribd, Wikipedia, or MLOL.
- The creation of a global standard OER system to homogenise practical principles, communication nodes, and the promotion of OER initiatives for sharing experiences and resources.

Co-funded by the Erasmus+ Programme of the European Union

- Find an efficient balance between human and AI's interactions, so decision-making is led by experts' judgment and supported by technology.

Sustainability

The Sustainability of OERs has long been a topic of discussion in the Open Movement and literature. There are different approaches to this topic, see for instance dedicated research by Darwish (2019), Konkol et al. (2021), Titli et al. (2020), or Farrow's (2022) (ENCORE+ Network) recent OER business model typology as cited in Farrel et al. (2022) . The most relevant insights from stakeholders considered ethical issues about getting revenues out of OERs, the role of the editorial services and publishers, and innovative business strategies based on services provision, instead of content-based educational offerings. Main conclusions drawn around OERs sustainability related to:

- Need of institutional support
- Need of business to create services that can generate revenue streams (e.g., mentoring, additional support system, personalised learning provision, etc.), instead of generating them directly out of the OERs.
- Look at success publishing modes, such as the ones complying with the segmentation model proposed by Farrow (2022) and others, where revenue is generated by commercialising a service relating to OERs such as printing open textbooks, by instance.

The role of AI in OER repositories

The feedback from stakeholders clearly stated that AI is needed to aid professionals' work but should not be used in isolation. This assumption not only covers purely educational needs, where the focus of AI is on the qualification functions (allowing learning personalisation by providing students with the knowledge and skills), but socialisation and subjetification are still neglected (Holmes & Tuomi, 2022). It is also concerned with the use of AI systems to support OERs accessibility, interoperability, accessibility, discoverability, and language issues (Uggeri et al., 2022).

Within the ENCORE+ Network, specific strategies have been proposed to gather all the OERs scattered all over the world using to provide equal accessibility to all, to match content with appropriate lifelong learners, and modelling learners via content understanding, and quality assurance. AI systems can lead to feasible integration scenarios at different levels, for more information see the Proof of Concept and the upcoming showcase of the analysis of OER repositories and communities for a future integrated European OER ecosystem (https://encoreproject.eu/).

Co-funded by the Erasmus+ Programme of the European Union

AI ethical issues in the educational context: the case of X5Learn

In the framework of the ENCORE+ project, a technological solution using AI, X5Learn (https://x5learn.org/), has been proposed to centralise OER content that is intended to solve some detected barriers for OERs adoption and use such as interoperability, accessibility, discoverability, and language issues (Uggeri et al., 2022). To exemplify transparency and accessibility processes that should be provided to users, the prototype of this platform will be used to answer some of the most relevant questions proposed by UNESCO (2021), revealing an example of good practice in this regard.

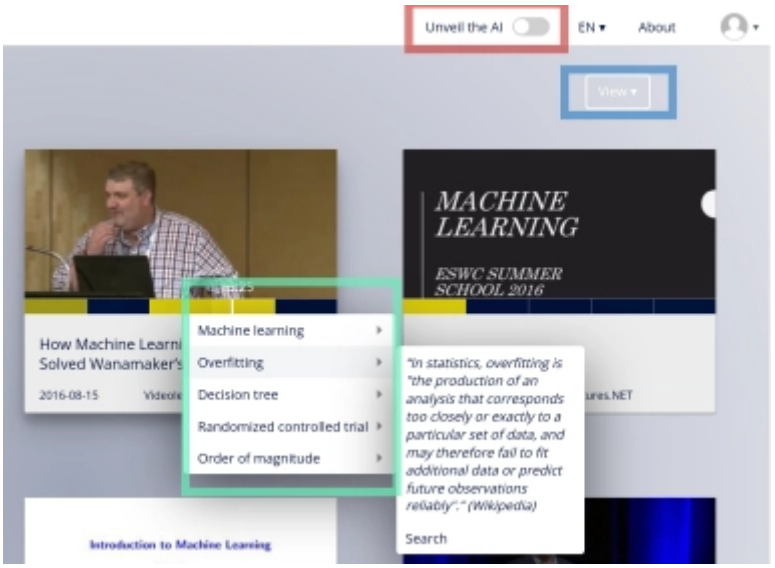
The first question arising deals with privacy and data protection and how those can be promoted throughout the life cycle of AI systems. The X5Learn system is explicit about how the data is used in the system and what other organisations have access to the data as 3rd parties. All of this is outlined in the privacy policy which is relatively short promoting users to read it (https://x5learn.org/privacy_policy). This privacy policy explicitly outlines "how" users commit personal data and "who" has access to it and "for what". The data is stored in encrypted servers while providing "identifiable data '' is kept to a minimum where only the email is mandatory. Other details such as name, and education level are optional data that the user can withhold. Just because the user agrees to the privacy policy doesn't mean that they consent to scientific research data. The user is guided to consent to this separately allowing the user to make more granular choices regarding data sharing.

Another common concern deals with ethical considerations for the design and development processes. In the case of X5Learn Privacy by design is considered through research and production of various features. The X5Learn system only supports personal note taking where the comments and notes users put on OER materials in the system are not visible to other users. The TrueLearn family of models that provide personalisation in X5Learn exclusively uses the individual user's activity to train the personalisation model for each user. In other words, user A's activity is not used to train the personalisation model for user B keeping the interaction data of users separate and avoiding data leaks. Whenever we release new datasets to the public, we carry out critical analysis of possible privacy and ethical violations to only release heavily anonymised datasets (e.g., VLE datasets and PEEK datasets).

Human interaction with systems has also been a concern in terms of how human oversight and determination can be assured and how users are informed when a decision is made based on AI algorithms. In the case of X5Learn the recommendation

Co-funded by the Erasmus+ Programme of the European Union

models used are humanly intuitive models that can support explainable rationalisations. Models and findings are published to provide users more information about what drives the system. The "unveil the AI" (Figure 1) feature allows the user to experience and learn about the AI technologies used in the system. The "unveil the AI '' feature shows "where" in the system AI techniques are used with hyperlinks that guide to detailed information pages that contain the "know-how" and working demonstrations for the AI technologies used. This allows the user to get hands-on experience with AI technologies that shape their experience. These details are also outlined in the privacy policy and the terms of use (https://x5learn.org/privacy_policy).



UNESCO (2021) also recommends AI systems to provide meaningful explanations supporting the understanding of the input, output and functioning of each algorithmic building block and the decision it takes. In this line, X5Learn dedicated research provides extended technical information in this regard (see Pérez-Órtiz et al., 2021; Bulathwela et al., 2022). Finally, UNESCO recommendations underlines the importance of the systems to receive ethical impact assessments to ensure accountability for AI systems and their impact throughout their life cycle. X5Learn has not gone through an ethical impact assessment at this point as it has not been used in scientific research. However, its variants used have gone through ethical reviews (Pérez-Órtiz et al., 2022) at the University College of London where they were approved.

As can be deduced, a conscious and efficient use of AI systems in the educational context requires efforts from all stakeholders involved. However, recent research (Holmes & Tuomi, 2022) states ethical principles addressing AI in education in terms of regulations are lacking, and the existing ones are not centred on pedagogy. This fact raises questions about what should be assessed and how, or what counts on knowledge and who should be in control (student and teacher agency). These unexplored

Co-funded by the Erasmus+ Programme of the European Union

teaching-learning processes may be another challenge to be considered as a barrier in the adoption of AI in education. The same authors point out that existing systems do not cover all educational needs either, as efforts are focused on qualification function, leaving aside, for the time being, also necessary elements such as socialisation and subjectification or individuation. These facts permit us to observe the challenges for future research, although the steps are being taken in the right direction. On the one hand, there are great efforts trying to normalise (Bax, 2003) its use in educational contexts by the publication of related guidelines and recommendations. On the other hand, technological advances based on AI systems have been consolidated as efficient and viable solutions to enhance quality and sustainability in Open Education, and to cater for lifelong learners' needs.

About the ENCORE+ Network

The European Network for Catalysing Open Resources in Education (ENCORE+) responds to the priorities of opening up and modernising the European education and training sector through a coordinated European OER ecosystem.

ENCORE+ brings together meaningful and focused human networks; technological solutions for sharing and discovering OER; policy reviews; quality criteria; and generating business models which draw on the affordances of OER to support innovation. ENCORE+ supports uptake of OER through business and academia by formulating value propositions for using OER in education, training and business.

ENCORE+ directly addresses several European and international policy priorities:

- ***Stimulating innovation in businesses*** through learning and training innovation
- ***Reducing barriers to education*** affording learners the opportunity to up-skill or re-skill at a lower or nearly no cost, and in a flexible way
- ***Supporting the modernisation of higher education in Europe***, including digitalisation
- ***Bridging non-formal & formal education*** by advancing recognition of open learning

ENCORE+ Network

ENCORE+ uses "Network" to describe the key stakeholders who contribute to the European OER ecosystem of tomorrow. Our four Network represent overlapping communities of practice: technology; policy/strategy; quality and innovation.

A total of 16 Network events will be held over the lifetime of the project; these bring together stakeholders for consultation and networking. Events are free to attend! In 2023, a series of integration events will consolidate the Networks into one integrated and sustainable ENCORE+ community by integrating perspectives and best practice from across the Networks.

ENCORE+ is designed around five challenges which are addressed through the Networks.

Needs	ENCORE+ actions	Outcomes
Need 1: De-fragment the OER stakeholders community in Europe	Mapping the OER ecosystem and its stakeholders; modelling future scenarios; consultation exercises; whitepapers; integration events; guides for innovation; integration across education and training; entrepreneurialism; reporting	ENCORE+ network, strengthening and connecting existing OER communities
Need 2: Strengthen collaboration and interoperability among European OER repositories	Providing a centralised hub for OER content; new paradigms for repository technologies (interfaces; implementations; protocols; content creation & re-use; networking) authenticated by the relevant communities to support best practice	Integrated architecture of a European OER repositories infrastructure
Need 3: Support development of OER institutional strategies in European businesses and academia	Working with diverse stakeholder base to identify, synthesise and share strategies and business models across business and higher education	European guidelines for developing effective OER strategies in business and academia
Need 4: Integrated European **OER quality paradigm** and assurance mechanisms	Identifying the key quality concerns for future OER repositories, communities and users; piloting a new quality framework focused on harnessing and enabling OER innovation	European open & community-led Quality Review Framework for OER

Co-funded by the Erasmus+ Programme of the European Union

Need 5: Entrepreneurial **innovative approaches and business models** based on OER	Supporting innovation through information exchange; appropriate software and services to enable pathways to innovation; understanding of the drivers of innovation; meaningful interactions between relevant stakeholders; providing a showcase for innovation	European business and start-up community, empowered to innovate and improve operations by leveraging OER

Co-funded by the Erasmus+ Programme of the European Union

OER - Open Education Resources

Open education refers to an approach to learning that utilizes open educational resources (OER). [1]

UNESCO, OER Commons and Hewlett Packard Foundation are actively involved in promoting OER and provided different definition of OER, with slightly differences; following Creative Commons definition: OER are teaching, learning, and research materials that reside in the public domain or have been released under an open license that permits their free use and re-purposing by others. The idea of OER is strongly advocated by a broad range of individuals, organizations, and governments, as evidenced by documents like the Cape Town Open Education Declaration (2007) and Cape Town +10 (2017), the UNESCO Paris OER Declaration (2012), UNESCO Ljubljana OER Action Plan (2017), and the UNESCO OER Recommendation.

What you can do with OER

David Wiley, provides another popular definition, stating that only education materials licensed in a manner that provide the public with permission to engage in the 5R activities can be considered OER. The 5 Rs include:

- Retain– permission to make, own, and control copies of the content (e.g., download, duplicate, store, and manage)
- Reuse– permission to use the content in a wide range of ways (e.g., in a class, in a study group, on a website, in a video)
- Revise– permission to adapt, adjust, modify, or alter the content itself (e.g., translate the content into another language)
- Remix– permission to combine the original or revised content with other material to create something new (e.g., incorporate the content into a mashup)
- Redistribute - permission to share copies of the original content, your revisions, or your remixes with others (e.g., give a copy of to a friend)

Why is it important to use OER?

OER is important to use because:

- Textbooks costs should not be a barrier for education
- Students who use OER are most likely to do better in school
- Technology holds the potential to improve learning and teaching
- Better education=Better future

In addition to demonstrating that learners save money when their teachers adopt OER, research shows that learners can have better outcomes when their teachers choose OER instead of education materials available under all rights reserved copyright.

Co-funded by the Erasmus+ Programme of the European Union

References

Bax, S. (2003). CALL – Past, present and future. *System, 31*(1), 13-28. https://doi.org/10.1016/S0346-251X(02)00071-4

Bulathwela, S., Pérez-Ortiz, M., Yilmaz, E., & Shawe-Taylor, J. (2022). Power to the learner: Towards human-intuitive and integrative recommendations with open educational resources. *Sustainability, 14*(18), 11682. https://doi.org/10.3390/su141811682

Darwish, H. (2019). Open educational resources (OER) Edupreneurship business models for different stakeholders. *Education and Information Technologies, 24*(6), 3855-3886. https://doi.org/10.1007/s10639-019-09962-8

European Commission, Directorate-General for Education, Youth, Sport and Culture (2022). *Ethical guidelines on the use of artificial intelligence (AI) and data in teaching and learning for educators*. Publications Office of the European Union. https://data.europa.eu/doi/10.2766/153756

Farrell, O., O'Regan, M.m Whyte, A., Aceto, S., Brown, M., & Brunton, J. (2022). *Strategic support for OER value proposition.* Encore+ Policy and Strategy Report. https://doi.org/10.5281/zenodo.6720310

Farrow, R. (2022). No such a thing as a free lunch? Encore+ blog

Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. *European Journal of Education, 57*(3). https://doi.org/10.1111/ejed.12533

Konkol, M., Jager-Ringoir, K. & Zurita-Milla, R. (2021). Open Educational Resources – Basic concepts, challenges, and business models. Faculty of Geo-Information Science and Earth Observation (ICT), University of Twente. https://doi.org/10.5281/zenodo.4789124

Perez-Ortiz, M., Dormann, C., Rogers, Y., Bulathwela, S., Kreitmayer, S., Yilmaz, E., Noss, R., & Shawe-Taylor, J. (2021). X5learn: A personalised learning companion at the intersection of ai and hci. In *26th International Conference on Intelligent User Interfaces-Companion* (pp. 70-74). https://doi.org/10.1145/3397482.3450721

Pérez-Órtiz, M., Bulthwela, S., Dornmann, C., Verma, M., Kreitmayer, S., Noss, R., Shawe-Taylor, J., Rogers, Y., Yilmaz, E. (2022). Watch Less and Uncover More: Could Navigation Tools Help Users Search and Explore Videos?. In *ACM SIGIR Conference on Human Information Interaction and Retrieval* (pp. 90-101). https://doi.org/10.1145/3498366.3505814

Titli, A., Nascimbeni, F., Burgos, D., Zhang, X., Huang, R., Chang, T. (2020). The evolution of sustainability models for Open Educational Resources: insights from the literature and

experts. *Interactive Learning Environments*. https://doi.org/10.1080/10494820.2020.1839507

United Nations Educational, Scientific, and Cultural Organization (UNESCO) (2021). Recommendations on the Ethics of Artificial Intelligence. Retrieved from https://www.unesco.org/en/artificial-intelligence/recommendation-ethics

Website

For further and updated information about this project please see:
https://encoreproject.eu/

Contacts

Report Coordinator
Matteo Uggeri, FPM
matteo.uggeri@polimi.it

Project Coordinator
Juliane Granly, ICDE
granly@icde.org

Contact us
info@encoreproject.eu