Future Learner Experiences with AI and Open Educational Resources

Stefan Kreitmayer
s.kreitmayer@ucl.ac.uk
University College London

Sahan Bulathwela
m.bulathwela@ucl.ac.uk
University College London

ABSTRACT

We present the ongoing design of the X5GON platform, a novel type of online learning platform that encourages users to explore and navigate an ever-growing landscape of Open Educational Resources (OER). In order to help learners find suitable content and efficient pathways among millions of possibilities, we are designing user interfaces in combination with tailored machine-learning algorithms for user modelling, content recommendation and quality assurance. The joint design effort between HCI and AI researchers has revealed various challenges regarding Responsible Innovation, leading us to rethink the learner experience with AI and OER.

KEYWORDS

responsible innovation; interface design; education; open educational resources; artificial intelligence; web interface; social justice; sustainability; equity; cross-modal learning

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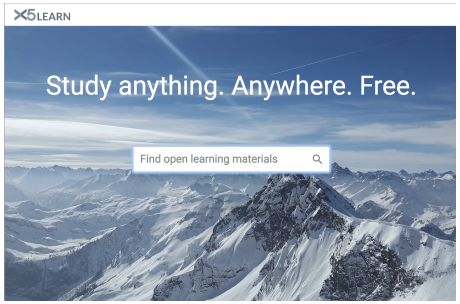

Figure 1: Landing page containing a search field for topics.

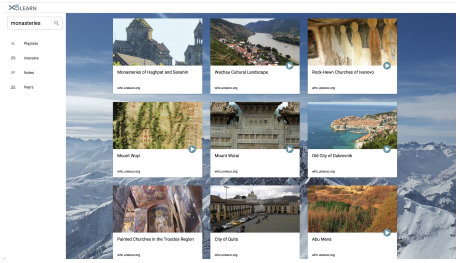

Figure 2: OER search results are displayed as cards with thumbnails. Play icons indicate audio/video content. Instant previews appear when the user hovers over a resource.

THE X5GON PLATFORM

Open Educational Resources (OER) create social impact in developing and industrialised countries [9]. X5GON (www.x5gon.org) is an international research collaboration, dedicated to the challenge of making OER more accessible, usable, reusable, and discoverable for educators and the general public. OERs come in various formats, including lecture videos and slides, e-books, tutorials, and podcasts. X5GON aims to collect links to millions of OERs from trusted repositories, such as universities, academic conferences, NGOs and other organisations such as the UNESCO World Heritage Committee. While the files remain with the provider, our platform extracts rich content representations which enable new possibilities for users to find information within OERs. While typical search engines and platforms treat the OER as the smallest atomic unit, our platform aims to provide meaningful fragments of OERs. This allows users to access information with a wider degree of freedom, and to frame their requests for information in a more personal and targeted fashion. Through initial interviews and participatory design, we identified a number of recurring user needs which future interfaces should aim to address, such as:

- How is concept X defined in domain Y?
- Are there any examples of concept X in any of the domains that I am familiar with?
- This bit is too hard for me. Can it be explained differently?
- This content is too easy for me. I already know X. Give me something more challenging!
- Person X (another user) and I would like to study topic Y together. Would we be a good match? If not, what other topics would be suitable?
- I want to study topic X in a pair or group. Which of my contacts (other users) should I ask?

In order to address these needs, a novel approach to cross-topic knowledge tracing was devised, enabling the user to maintain and continuously refine a human-and-machine readable profile of their knowledge. Our ongoing design aims to enable this in a way that naturally augments the learning experience, provides transparency to the user, puts the user in control and respects GDPR.

PROTOTYPING THE LEARNER EXPERIENCE

Based on initial interviews and participatory design with users [5], a number of hypothetical user scenarios were devised, serving as the basis for mockups and prototypes. Figures 1-5 illustrate relevant aspects of the latest version, particularly the emphasis on topic extraction [1] and integrated previews. The screenshots show only a small fraction of the system's functionality. Planned features include:

- Situated AI-support when viewing a section of text or video; including multilingual support
- Creating a learning journey (study plan) across multiple resources, alone or with peers
- Adjusting the AI's understanding of one's background knowledge and interests in the context of a learning journey. Different visualisations are currently being evaluated.

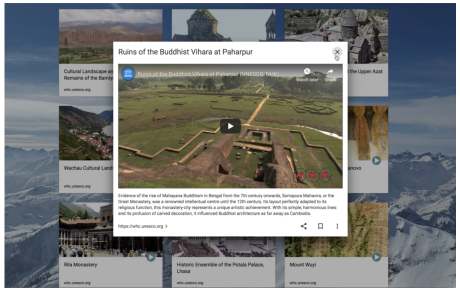

Figure 3: Clicking or tapping on a resource opens a larger preview and, where applicable, an embedded view of the content, such as a video player or PDF viewer.

SOCIAL AGENDA

X5GON perceives education as a right, not a business. The project intends to do good, in addition to doing good science. With this goal in mind, funding has been secured in order to maintain and develop the platform beyond the lifetime of the research project. Further goals are:

(1) To provide access to education beyond political, cultural and language barriers
(2) To support the social fabric by encouraging informal learning in pairs and groups
(3) To facilitate connections between learners of different backgrounds and situations
(4) To use AI and machine learning responsibly and transparently
(5) To prioritise the user's interest and put the user in control of their own learning

FROM PRESCRIPTION TO COLLABORATION

Rather than predefined curricula or behaviour change, our platform offers opportunities for learners to pick and choose. Enabling the learner to make informed decisions is the primary goal of our UX design and use of AI. In contrast to the prevalent use of Recommender Systems (RS), whereby suggestions are presented in one direction from the system to the user, our approach encourages a mutually productive dialogue between the user and the system, taking inspiration from Decision Support Systems (DSS). We conjecture that both sides (the user and the AI) can benefit from a *shared understanding* of the user's current background knowledge and interests. In addition to the tremendous research challenges, this goal also requires a certain level of trust from the user towards the platform. We hope that this can be achieved by demonstrating transparency and integrity in all regards, and by steering clear of any business models that might compromise the trust relationship with users.

SCALABLE QUALITY ASSURANCE

In a society that encourages OER, ensuring quality at scale is paramount. Since manual quality checks are not always sustainable [3], efforts have shifted towards automated methods [2] which, although promising, have their limitations. They can be biased and unfair. There is responsibility for training and testing them, and explaining the predictions. Whether these explanations will be simple enough for most learners is however doubtful [6]. We aim to conduct further research in this area.

SUPPORT FOR EMERGING PEDAGOGIES

While most of the current OER landscape comprises static formats (such as e-books, presentations, HTML and video), interactive formats (multimedia tutorials, modules, games, and simulations), although less common, deserve attention for pedagogical reasons [8]. They aim to engage learners, rather than merely deliver information. Digital face-to-face activities, such as Embedded Phenomena [7] and Participatory Simulations [4] are particularly suitable for teaching sustainability-related topics, due to

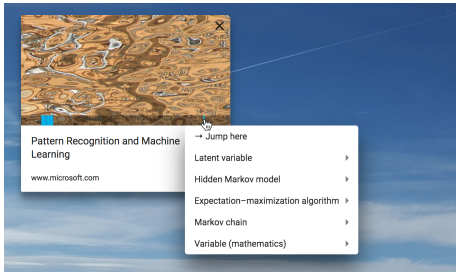

Figure 4: In this example, the user has read the second chapter (blue area) of an e-book. Hovering over a horizontal bar shows a summary of key topics in the corresponding section of the text (or transcript in case of audio/video).

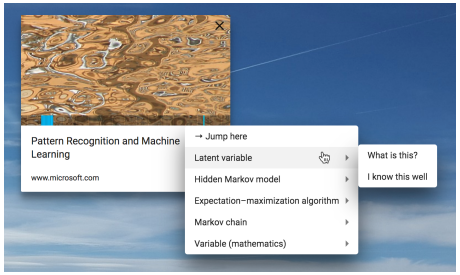

Figure 5: For each identified topic, the user can ask for a definition or indicate prior knowledge.

their emphasis on aspects of complexity, discovery, critical discussion and problem-solving. Integrating such formats in X5GON would be challenging, due to their structural diversity and questions around providing previews and scalable quality assurance. However, it is certainly desirable (for society and research) to further promote learning methods of this kind through OER.

ONGOING CHALLENGES

We would like to invite discussion among the CHI community about the following questions:

- How might we identify unintended stakeholders or unforeseen impacts of our platform?
- How can we know whether what we are doing might harm education?
- How should we prioritise between conflicting responsibilities, such as majority versus minority user groups? Speculative design versus iterative prototyping and evaluation in the wild?

We hope that the X5GON project contributes significantly to the ongoing discussion regarding Responsible Innovation in the wider context of HCI research.

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