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# More Than a Headset: Building XR Literacy in Higher Education

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**Abstract.** We invite you to explore our initial framework, designed to enhance understanding of XR literacy and establish a foundation for further conversations in this underexplored area of XR implementation in education. By addressing the roles of developers, educators, and learners in XR production and use, the framework bridges gaps and highlights strategies for effective learning through XR. We propose two approaches to promoting XR literacy, supported by example strategies derived from our institutional experience. We aim to refine these strategies through audience interaction, discussion and collaboratively develop a comprehensive and inclusive roadmap for leveraging XR in education during our iLEAD oral presentation.

**Keywords:** XR Literacy, Digital Literacy, Higher Education.

## 1 Introduction

For centuries, the concept of literacy has referred to an individual's ability to read, write, and comprehend [1–3]. As technology advanced, this definition expanded to include forms like media literacy— the ability to access, understand, analyze, use, and create information across various formats— and digital literacy which applies these abilities to digital tools and platforms [4]. Today, digital literacy extends beyond technical skills and includes critical thinking to utilize, cognize, and process digital information [1, 5] across tools such as computers, mobile devices, XR, and artificial intelligence (AI) tools [2, 6]. Building on digital literacy using media literacy as a foundation, this framework focuses specifically on XR literacy, warranting its definition and exploration.

Despite living in a technology-driven era, XR remains one of the least explored tools in terms of literacy [2]. While mastering XR as a tech tool is not the primary goal when implementing it in education, it acts as a catalyst for acquiring intended skills and knowledge. Rather than considering it a replacement for actual experience, it should serve as a supplementary tool to foster learning and, in some situations, reduce cost or risk (e.g., field trips, hazardous experiments), ultimately preparing learners to transfer these knowledge and skills to real-life contexts [7].

This framework bridges the gap between XR stakeholders by defining each key role involved in developing an XR experience —from production to end use— to eliminate barriers that frame XR as a tech-heavy tool and position it as a medium for achieving learning objectives. By key roles, we refer to developers who produce XR experiences, educators who implement them in teaching, and learners who engage with them to achieve desired outcomes.

With these key roles in mind, we recognize that XR literacy does not manifest equally across all roles. Broadly, XR literacy can be defined as critically understanding, ethically engaging with, and actively participating in the production and consumption processes of XR experiences [8]. From an educational perspective, it is the ability to understand, interact with, and navigate the XR interface that aids meaningful engagement with [educational] content. A lack of XR literacy skills—whether in development, implementation, or use—often results in XR tools failing to meet their learning objectives, turning them into burdensome or merely a tech tool rather than effective educational mediums. Hence, it is critical for all roles to develop these skills to remove barriers, reduce inequalities for educators and learners, and increase the effective use of technology to support its adoption in [higher] education.

This flexible and adaptable framework centers the human factor at its core regardless of rapidly evolving technology. While educators are our primary audience, the framework also addresses developers and learners, as

their roles are interconnected and essential for creating effective XR learning experiences. Below, we explore these three roles in depth, examining what XR literacy means for each and how it contributes to a seamless XR integration into educational contexts.

In the context of literature examining the implementation of XR in educational settings, our work shifts the discussion away from physical technology (e.g., headsets) and interface issues as viewed through a user experience lens—where the focus is on how tool design impacts individuals [e.g., 9]—toward an XR literacy lens, which instead asks whether individuals have the foundational knowledge required to successfully engage with new XR experiences. The goal of this work is to share our perspectives on XR literacy, informed by our institution's efforts in developing XR experiences, with the aim of connecting with other practitioners to establish a common language and further refine the practical application of literacy-based strategies within the development and implementation cycles.

## 2 XR Literacy in Practice – the Role of Developers, Educators, and Learners

### 2.1 Developers

**Developers** are experts fluent in the technical, complex language of XR software, but as designers of XR environments, they need to find common ground with educators and learners to create effective XR experiences. Collaboration with educators during preproduction is essential to identify the right XR tools and simulate real-world environments using visual design elements that enhance learner motivation and engagement, and simplify the overall experience for both educators and learners.

Just like in app design, developers must understand the target audience to ensure the delivery of intended learning content. XR literacy skills for developers include designing clear instructions and intuitive interfaces to optimize learner benefits, integrating relevant learning pedagogies into the design process, and gaining an understanding of the learning content to simulate it in realistic, engaging, and motivating ways for all users. To achieve this, developers need to make intentional design choices that align with learning objectives and maintain clear communication with educators to ensure that the XR experience is both effective and meaningful.

### 2.2 Educators

**Educators** act as a bridge between learners and developers and play a significant role in developing the XR space and learners' XR literacy skills. XR literacy skills for educators include having a sufficient understanding of XR and its capabilities to collaborate with developers, facilitate learners, and bridge the gap between the two. As the theoretical architects of educational XR ecosystems, using their expertise in learning pedagogies and content, they inform and guide developers to design effective XR experiences. For example, when designing a culturally responsive XR space, educators utilize their awareness of learners' backgrounds to guide developers in crafting effective and engaging XR experiences.

While educators do not need to be XR experts, they need to have basic XR literacy skills and work closely with developers to design and deliver impactful XR experiences, minimize potential barriers, and optimize its benefits for learners. To cultivate a smooth experience, educators can provide initial guidance or structure a step-by-step process, adjusting their involvement as needed. They should also recognize whether learners' struggles arise from the experience design, tool, or content difficulty. Simplifying and optimizing XR experiences facilitates better engagement and helps develop XR literacy skills [10].

### 2.3 Learners

**Learners** are at the center of the XR experiences [11]. XR literacy skills for learners include interacting with the interface, and their ability to navigate seamlessly within the XR environment, from their initial exposure to becoming proficient with a specific XR tool and acquiring knowledge through it. This encompasses their ease of using hand controls and understanding how to interact with design elements to ensure a smooth experience. For instance, identifying what a hotspot means or looks like in an XR environment can simplify learners' navigation. These actions can also predict their engagement, motivation, and curiosity to learn further [3, 8].

In a typical XR experience, where learners engage in multiple real-time interactions with the tool and content, simplicity remains crucial for acquiring and developing new knowledge and skills. Given that the content and XR environment consist of numerous design aspects, learners must engage with and navigate these elements to participate actively in the learning process. However, learners' interactions can vary based on their prior knowledge and experience with the XR tool and levels of their XR literacy competencies. For instance, a learner

familiar with the XR or a similar environment is likely to transfer existing skills to the new tool and may spend less time than one without such knowledge, possibly due to the complexity of the XR design or the learner's familiarity with the tool.

## 3 Approaches To Promote XR Literacy

Thus far, we have discussed XR literacy skills for three distinct groups. The section below proposes two example approaches to promote and strengthen XR literacy for these groups. It should be noted that the success of implementing these approaches depends on institutional or organizational support, including the allocation of space, time, and resources to build strong foundations. As part of submitting our framework to ILRN/ILEAD, we aim to further develop the strategies outlined in each approach here. While the current strategies are based on our institutional knowledge, we hope to expand this list through conversations and collaborations, promoting XR literacy across diverse contexts and developing more inclusive approaches.

Although cost and access to XR tools is an issue itself [12], here, we address those who already have access. The strategies center on both educators and learners, emphasizing their ability to interact with and navigate XR interfaces while meaningfully engaging with the content. Strategies to promote XR literacy fall into two approaches: 1) building knowledge and providing guidance on the virtuality spectrum [13], and 2) creating opportunities for non-expert users to explore XR tools and environments. Although developers are not directly addressed in these approaches, their role is crucial for successful implementation. By orchestrating the development of literacy in educators and learners, developers also enhance their own understanding, enabling them to simplify the interfaces for these groups.

### 3.1 Building Knowledge and Providing Guidance on the Virtuality Spectrum

Similar to research investigating XR implementation that calls for the need of targeted trainings [14], the primary goal of this approach is to introduce the XR tool broadly, acknowledging the wide range of XR tools and software available, each offers unique interfaces—ranging from basic functions like turning the tool on and off to mastering the navigation controls. Although the approach focuses on XR as a general topic, we still need to address users with different levels of experience with XR tools. This can be accomplished by:

- Developing a comprehensive resource that includes commonly used terms, phrases, symbols, and icons in the context of XR spaces benefits individuals from all roles and provides an opportunity to build common ground.
- Hosting introductory workshops or webinars to help educators familiarize themselves with the virtuality spectrum, understand where available XR tools fall on the spectrum, and empower them to select the most suitable ones for their teaching needs.
- Learners, on the other hand, do not require knowledge of the myriad platforms used to administer XR, as their focus is on interacting with and engaging in the XR environment. However, an initial introduction to XR tools and the features they have is required for smooth navigation and optimum benefits.

### 3.2 Creating Opportunities for Non-expert Users To Explore XR Tools and Environments

This approach aims to guide educators and learners in meaningfully interacting with content within the XR experience, fostering deeper engagement not only with the XR environment but also with the educational content. It also encourages and facilitates developers in providing hands-on training and demonstration sessions, one-to-one interactions with the environment, and instant feedback to enhance the learning experience. Key considerations when designing include:

- It is important to carefully consider the XR space being explored and its alignment with participants' (educators or learners) prior knowledge and experience [9]. Starting with highly complex XR environments may hinder the growth of XR literacy skills for novice users. To address this, establishing the foundations of XR literacy with broadly applicable XR tools allows participants to build confidence before focusing on their specific discipline or area of study to deepen their engagement.
- Pulling from implementation focused work that suggests rethinking assignments and assessments surrounding the use of XR experiences [14], educators can offer ungraded or exploratory activities, allowing learners to interact with the XR environment—or a similar one—before engaging in course-specific learning tasks. This

promotes genuine exploration, builds confidence with the tools, and helps accommodate diverse learners' needs.

- For instance, learners with visual impairments or motion sickness may require specific accommodations. Providing alternatives to the XR experience during the development process ensures inclusivity and equitable access for all participants.

As a rapidly advancing yet less explored technology, the implementation of XR in education brings both advantages and challenges. XR literacy helps bridge the gap between developers, educators, and learners—the key roles in an XR experience from production to implementation to eliminate the challenges. To address this gap, we developed a framework, and proposed example approaches to building XR literacy.

These example strategies are informed by applied work at our institution. During the presentation, we will share successes and challenges in implementing these approaches and create a space for audience engagement. Participants will have the opportunity to share their experiences and discuss any applications they have attempted. Through this active exchange, we aim to refine the strategies and collaboratively develop a more comprehensive XR literacy framework.

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