Immersing Students in XR Technology

Adding an "Apply It" Element to the "Own It, Learn It, Share It" Framework

Cherner, T. & Dickerson, J.

360° Video
AR
Extended Reality
Extended Reality Technologies
Instructional Design
Praxis
VR

As extended reality (XR) technologies become more ubiquitous, there is a need to evolve instructional design (ID) frameworks to support their integration for teaching and learning. This article argues that while Lee and Hannafin's (2016) "Own It, Learn It, Share It" (OLSit) framework provides a student-centered approach, there is an opportunity to evolve it by adding an "Apply It" element. This paper describes the OLSit framework and explains the need for an "Apply It" element *grounded in experiential learning theory. An example of a module designed using the new framework and recommendations for future research are provided.*

Introduction

The effective integration of emerging technologies in teaching and learning starts with high-quality instructional design (ID), meaning clearly defined learning objectives, instructional strategies, and interactive content are aligned with accessible, student-centered approaches to create impactful learning experiences. This need is especially true when leveraging extended reality (XR) technologies for instructional purposes because of their propensity to amaze, captivate, and even confuse students. Without a well-structured ID framework – a systematic, contextualized approach to delivering learning experiences aligned to evidence-based practices rooted in the learning sciences – the value of XR technologies in the learning experience may be jeopardized, which risks the learning environment becoming a form of entertainment, misuse, or disengagement. A well-structured ID framework provides the foundation for effectively leveraging XR technologies to demonstrate concepts, offering experiential learning opportunities, and immersing students in content (İbili, 2019; Pellas et al., 2021).

When using XR technologies for teaching and learning, a primary goal is to provide "simulated real-world environments that allow learners to practice skills in low-stakes contexts" (Saca, 2023, p. 78), and a crucial element is to immerse students in those environments. For the simulated environment to be immersive, users must feel present in them (Nilsson et al., 2016), which is achieved by engaging their senses of sight, hearing, and touch. Hence, users perceive they are immersed in a simulated digital environment (Bordegoni et al., 2023). In addition, the depth of immersion is affected by the caliber of the hardware and software being used for the simulated learning experience. High-quality XR hardware and software provide crisp resolution and display outputs, nearly instant loading times for content, a wide field of vision for viewing content, comfortable ergonomics when wearing equipment, clear audio, and easy-to-use interfaces for interacting with digital content (Davis, 2023; Draschkow et al., 2024; U.S. Government Accountability Office, 2022). When leveraging XR technologies for immersive learning in simulated environments, the environments need to integrate experiential learning activities into them, so they are fully developed learning experiences, not standalone simulations.

XR technologies of all kinds can provide opportunities for experiential learning. As Kolb (2014) explains, experiential learning requires students to have a concrete experience that they then reflect on and use to make meaning of future experiences. Though researchers have identified the benefits of XR technologies for teaching and learning (Hayes et al., 2022; Philippe, 2020; Quintana & Quintana, 2023), they have not yet formalized a well-developed framework for experiential learning that maximizes those technologies. For example, Yang et al. (2020) put forward the XR-ed framework that consisted of six dimensions: (1) Physical Accessibility of Learning Content, (2) Formality of the Learning Scenario, (3) Social Interactivity, (4) Agency, (5) Virtuality Degree, and (6) Evaluation of Learning. The issue is that each dimension was positioned as a scale to measure the degree to which it existed within the XR learning experience. The dimensions did not guide the development of learning experiences that harness XR technologies. In another instance, Castelhano et al. (2023) systematically reviewed ID frameworks focused on VR for teaching in higher education. They found that none of the frameworks included all the necessary elements needed to provide a sound, experiential-based experience when using XR technology, such as providing feedback, ensuring the sequence of activities, providing time for independent learning, and assessing student learning. As a result, Castelhano et al. (2023) recommend that further frameworks be developed.

In addition, we considered the potential for how other frameworks could be used to integrate learning experiences that harness XR technologies. We identified that frameworks like the Analysis, Design, Development, Implementation, Evaluation (ADDIE) (Peterson, 2003) and Successive Approximation Model (SAM) (Jung et al., 2019) focus on the refinement of a developed course. They do not focus on the initial development of a course or the purpose of a learning activity, especially ones that include XR technologies. Other ID frameworks we considered included Merrill’s (2012) First Principles of Instruction, Al Mamum et al.’s (2020) Predict, Observe, Explain, and Evaluate scaffolding structure, and Czerkawski and Lyman’s (2016) ID framework for fostering student engagement in online learning environments. Though each model has strengths, we found them rigid, leaving little opportunity to integrate experiential learning experiences that utilize XR technologies.

To create experiential learning experiences that leverage XR technologies, instructors need an ID framework that balances structure and creativity. In this context, the structure provides specific divisions where certain learning elements or phases in a lesson should occur, such as beginning a lesson by activating student schema or concluding a lesson by having students complete a formative assessment. These structures create a flow to the learning experience that supports instructors when deciding which elements to include. However, those structures, if overly defined, can limit creativity. Ultimately, we selected to expand the "Own It, Learn It, Share It" (OLSit) framework (Lee & Hannafin, 2016) because it provides a logical structure for creating learning activities, which is ideal for maximizing the affordances of XR technologies to actualize experiential learning experiences.

As will be discussed, expanding the OLSit framework's structure allows instructors to be creative while designing experiential learning experiences that harness XR technologies. The rigidness of the other frameworks required defined tasks at each stage in a lesson, such as designing lessons around a central problem (Merrill, 2012) or using predictive analysis (Tabor, 2021). The OLSit framework's flexible structure makes it ideal for integrating experiential learning with XR technologies.

In addition, emerging evidence suggests that instructors can use the OLSit framework across in-person and online modalities (Baird, 2021; Tapor, 2021). When working with immersive technologies, the OLSit framework provides opportunities for in-person instructors to design blended learning lessons that include physical and digital components in the learning process and flipped classrooms where students engage content before the class meeting (Schmid, 2023), along with implications for synchronous and asynchronous courses. Each of these modalities presents opportunities to further develop the framework.

While the OLSit framework has been well-received in the context of student-centered learning (Dai et al., 2023; Marin, 2022; Sato, 2024), researchers have alluded to connecting XR technologies with it (Garcia-Robles et al., 2024). However, researchers have not updated the OLSit framework to infuse it with XR technologies. We address that gap by presenting a revised version of the OLSit framework and providing a detailed example of it. Future researchers can build on this paper by testing the updated OLSit framework across modalities and with various learners to identify the best practices needed for further development.

In this paper, we first provide an overview of Lee and Hannafin's (2016) original OLSit framework, followed by a discussion of experiential learning. Next, we make the case to add an "Apply It" element to OLSit so XR technologies can be better incorporated into the learning process through focused student engagement and experiential learning. The revised framework – "Own It, Learn It, Apply It, Share It" – will then be presented in the context of reflective practice, which includes an authentic example along with recommendations for future research.

Description of the “Own It, Learn It, Share It” framework

Designed in three elements, Lee and Hannafin’s (2016) OLSit framework supports learning by having students (a) develop ownership over the topic and set personally meaningful learning goals, (b) learn autonomously through scaffolded instruction, and (c) generate artifacts and receive feedback about them. Table 1 shows how OLSit’s elements are tiered to achieve that outcome.

Table 1

Overview of the “Own It, Learn It, Share It” Framework

Component	Theoretical Underpinnings
Own It	Rooted in self-determination theory, students make an authentic connection with the topic based on their background experience and learning goals
Learn It	Using constructivist techniques paired with scaffolds, information is transmitted to students about the topic
Share It	Steeped in constructivist theory, students craft a learning artifact connected to the topic that they distribute for feedback

Own It

To begin the learning experience, instructors should directly connect students' background knowledge to the upcoming topic of the lesson. As Lee and Hannafin (2016) explain, the "Own It" element focuses on students' "personal ownership" (p. 722) of the topic, and that ownership can be developed by them setting goals for their learning and creating authentic connections to it. For that purpose, instructors can directly state the benefits students will gain from the learning experience and how it will advance their knowledge base. In addition, they can preview the upcoming lesson to help students identify the specific outcomes or goals that are relevant and meaningful to them. To structure this element, instructors should first introduce the topic and then use a method such as a graphic organizer, open-ended prompt, or pre-assessment to activate students' background knowledge about the topic and then work to have students establish their own learning goals.

While instructors can use various methods, the emphasis is on students connecting the upcoming lesson with their background knowledge and experiences. That way, students' ownership of their upcoming knowledge acquisition or skill development adds value to the lesson, which sets the stage for providing instruction on the topic.

Learn It

Lee and Hannafin (2016) explain that the "Learn It" element uses multiple scaffolding techniques to develop students' knowledge and abilities about the topic. Table 2 provides an overview of those scaffolds.

Table 2

Four types of scaffolds for the "Learn It" element in the OLSit framework

Scaffold	Description
Conceptual	Extending students' background knowledge with new ideas and information
Procedural	Providing students with directions for completing a task
Strategic	Challenging students to identify alternative methods to achieve a goal
Metacognitive	Prompting students to reflect on their learning and set future learning goals

When delivering learning experiences aligned with these scaffolds, instructors can use multiple methods. For a conceptual scaffold, instructors can activate student schema by asking them about their experiences related to a phenomenon that aligns with the lesson's topic. Instructors can then refer to that experience as they share new ideas and information about the topic. For a procedural scaffold, instructors can video record themselves completing a process. Next, they can add voice and text overlays to the recording, where they explain each part of the procedure. This way, instructors can plan their comments for the video, and once posted to the course website, students can download and view the video as needed to complete the process at their own pace. For a strategic scaffold, instructors can use ideation techniques to experiment with their thought processes as they respond to a challenge (Liedtka et al., 2024). Using these techniques expands the perspectives students will consider when strategizing methods for addressing challenges. For a metacognitive scaffold, it requires students to take ownership of their learning. Instructors can facilitate this process by previewing an upcoming unit with students and allowing them to propose their own independent project about it, complete with learning goals and outcomes. This proposal can generate ownership in students through self-directed study (Robinson & Persky, 2019). In addition, with each scaffold having a specific focus, instructors can strategically combine two or more of them as part of their instruction, like using a procedural scaffold to present a method for completing a task and then a metacognitive scaffold for students to decide when it is appropriate to use that method.

Share It

The “Share It” element concludes the learning experience, and it is “designed to enhance student engagement by presenting and sharing products with authentic audiences” (Lee & Hannafin, 2016, p. 726). To share, students create a learning artifact (e.g., infographic, presentation, prototype) for their classmates and other class community members (e.g., instructors, industry experts) to view. It is important to emphasize that sharing learning artifacts is a formative, low-stakes assessment between the students and the learning community. These moments occur when students begin using their developing knowledge and skills to complete a task, share an insight, or do something else, and there are two components: the learning artifact and feedback. For the learning artifact, instructors need to provide students with clear, concise, and measurable expectations, such as written descriptions and examples, if applicable, along with opportunities to ask clarifying questions. For the feedback, instructors should set expectations for how the class community responds to the learning artifacts, like the key areas where feedback is sought and the desired length and format for the feedback.

Since it was first published in 2016, the OLSit framework has become a valuable resource for instructors and IDs to use when designing student-centered courses and encourages them to take chances in their classrooms (Baird, 2021; Cherner, 2020; Wong, 2021). With its foundation grounded in constructivist teaching practices and methods, the framework activates students' schema before building their knowledge base and then developing artifacts to showcase their learning. However, experiential learning opportunities that leverage XR can advance the framework to provide students with experiences to drive their learning.

An Overview of Experiential Learning

Experiential learning theory (ELT) argues that students develop knowledge by directly engaging the phenomenon they are studying and then reflecting on it. Kolb (1984) pioneered ELT and famously stated that "learning is the process whereby knowledge is created through the transformation of experience" (p. 38). This transformation is the leveraging of experience to construct knowledge. Kolb grounded ELT in the work of prior theorists, namely Dewey, Lewin, and Piaget. This section will first provide an overview of how they influenced Kolb, followed by a description of ELT. It will close with studies demonstrating ELT's impact on student learning and a suggestion for updating it.

Three Influences on Kolb and ELT

A primary influence on Kolb's (1984) theory was John Dewey's explanation of the role experience plays in students creating their own knowledge. Throughout Dewey's (1938, 1966) career, he argued that providing students with quality learning experiences is the cornerstone of a meaningful education. While traditional educators provide students with theories, facts, and figures about a topic of study, Dewey countered that progressive educators need to provide students with experiences about the topic. In this way, students construct their knowledge about the topic based on their observations and interactions with it, instead of only being informed about it. For example, when learning to play basketball, a traditional educator, according to Dewey's theory, would emphasize the rules and procedures of the game. Progressive educators would have their students learn by scrimmaging each other. The result is that students learn by "doing" rather than being told (Dewey, 1934).

A second influence on Kolb (1984) was Lewin's (1947, 1951) Change Management Model for organizations, as it directly pairs experiences with reflection. Using a three-step approach, Lewin enacts his model by first providing individuals with a phenomenon using concrete experiences, which can happen in laboratory and real-world settings (Bazerman, 1984; Schein, 1996). Next, Lewin supports individuals as they reconsider their pre-existing behaviors, knowledge, and norms about the phenomenon based on the new experience they had with it. Examples of these supports included independent reflection and analysis of the experience as well as group discussion, in which the group members provide each other with feedback (Smith, 2001). From these experiences, a feedback loop is created, which allows the individuals to provide their insights about the phenomenon they experienced back to the organization and for the organization to respond to them. The result is that organizations can make a change based on the individuals' experiences.

A third influence is Piaget and his work on cognitive development. Piaget (1952) argued that individuals – starting at birth and lasting to adulthood – advance through a series of four stages, and each stage is characterized by distinct ways of thinking and understanding the world. At the Sensorimotor Stage (birth-2 years), children understand that objects exist even when they are not being viewed, known as object permanence, a necessary skill for developing memory and the ability to form mental representations of the world. At the Preoperational Stage (2-7 years), children begin to express themselves through language and understand that symbols can be used to represent objects, actions, and ideas. At the Concrete Operational Stage (7-11 years), children can classify and order objects, which creates the foundation for them to understand and reason about concrete events. At the Formal Operational Stage (11-adulthood), they can think abstractly from multiple perspectives, reflect on experiences, and apply those skills to solve problems. From these stages, Piaget (1954) argues that children learn by interacting with their surroundings, and those interactions are learning experiences for them. As children have these experiences, they *assimilate* new information to their pre-existing knowledge about the topic or *accommodate* it by changing their pre-existing knowledge to align with the new information.

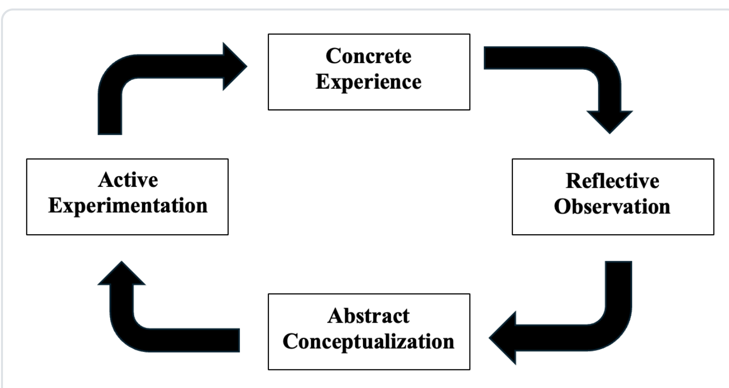
From Dewey, Kolb keyed on the role experience plays in constructing knowledge and that educators must find ways to provide students with authentic experiences with the phenomena they are studying. From Lewin, Kolb identified the importance of reflection as part of the learning process and that stages provide the space individuals need to reflect on their experiences. From Piaget, Kolb adopted that learning is an active process that happens over time as individuals develop their cognitive ability, and meaning is impacted by the experiences individuals have with phenomena. These three perspectives provided Kolb (1984) with a robust foundation for his theory. Building on these foundational ideas, Kolb developed a comprehensive model of experiential learning that has become widely influential in education.

Description of Kolb's Experiential Learning Theory

Kolb's ELT consists of four stages, illustrated in Figure 1, through which learners cycle as they gain new experiences and reflect on prior ones.

Figure 1

The Four Stages Kolb's Experiential Learning Theory



While learners can enter the cycle at any stage, the Concrete Experience stage is often recognized as a starting point (Baasanjav 2013; Morris, 2020), and it provides an opportunity for learners to engage with a phenomenon and have an initial reflection on that engagement (Fry & Kolb, 1979). Learners then advance to the Reflective Observation stage, where they consider their initial engagement with the phenomenon from the preceding stage and begin interpreting their experience (Kolb & Kolb, 2007). As learners progress to the Abstract Conceptualization stage, they transform their interpretations into conceptual ideas and logical theories about the phenomenon based on their prior experiences and reflections (Kolb, 1984). At the Active Experimentation stage, learners apply their newly forming ideas and theories about the phenomenon to solve challenges and make decisions (Kolb, 2015). Kolb's theory provides a structure for learners to engage with a phenomenon and make sense of that engagement, and researchers have studied its effectiveness across educational disciplines.

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Kolb's theory provides a structure for learners to engage with a phenomenon and make sense of that engagement. In the next section, we will highlight ways researchers from across discipline have studied ELT in their context.

Examples of Kolb's Experiential Learning Theory Used Across Disciplines

Researchers from multiple disciplines have successfully integrated ELT into instructional methods and assignments to promote student learning. For example, from social work, Silverman et al. (2021) used ELT with Control Value Theory, an approach that posits students’ motivation for completing assignments will increase by allowing them more control over the learning activities (Pekrun et al., 2007), to enhance the agency of 19 students in a graduate-level training course. For the concrete experience, the instructors partnered with community organizations to provide students with an authentic context to complete their assignments of (1) researching the history and current status of a community, (2) designing an intervention for the community, and (3) profiling an organization in the community. As students completed the assignments, the researchers identified that the students’ reflections on their experiences aligned with ELT’s stages of abstract conceptualization and active experimentation. Regarding ELT, the researchers found that the experiential learning component allowed the students to feel more like social workers while in the class, which reshaped the relationship they had with their instructors and reduced the power differential. Regarding the Control Value Theory, they found that allowing students control of the assignments (e.g., picking the organization and type of intervention) did increase their motivation for completing them. These findings demonstrate the potential of integrating ELT with other pedagogical approaches to enhance both the learning experience and outcomes for students, particularly in fields like social work where practical application of knowledge is crucial.

From athletics, Bower (2013) created an assignment where her participants, a mix of undergraduate students majoring in sports management and taking an event management course, planned and implemented a golf scramble, a tournament consisting of four-person teams, over 16 weeks. Bower (2013) prepared her students by aligning her instruction and course assignments with the four stages of ELT. For example, she used a series of lessons to build her students' abstract conceptualization about this type of golf event. Based on those lessons, the students engaged in abstract experimentation as they planned the event, and Bower (2013) positioned the golf scramble as the concrete experience for her students. To assess her instructional effectiveness, Bower (2013) used course evaluations and open-ended questions to gauge the impact of this approach after the students had planned and implemented the event. Bower (2013) found that the students were very satisfied with her course, and they commented about the value of the "real-life" experience and instructional strategies used to facilitate their learning. Bower's (2013) study demonstrates how ELT can enhance student engagement, satisfaction, and acquisition of practical skills in event management.

From digital media studies, Baasanjav (2013) integrated ELT into an introductory digital media course taught online to 92 undergraduate students, primarily juniors and seniors, over four semesters. The course aimed to develop students' understanding of the socioeconomic and cultural implications of using the internet, critical literacy skills for evaluating online information, and the ability to create online content and web pages. Designed to align with ELT, the course utilized the students' prior online experiences as their concrete experience and then had them draft a paper about gaming, copyright infringement, socializing, and the Digital Divide as a form of reflection. Next, the instructor provided class activities to facilitate students' abstract conceptualization. Finally, for active experimentation, students use that knowledge and experiences to create a website for their family and friends. Using a mix of course evaluations, questionnaires completed by students, and reflections by the instructor, Baasanjav (2013) found that integrating ELT enhanced students' engagement and understanding of digital media concepts, increased their self-efficacy for evaluating and creating online content, and gave them a larger sense of community and collaboration when engaging in online learning. By leveraging students' prior experiences and providing opportunities for active experimentation, the course effectively fostered a more profound learning experience aligned with their interests and real-world applications.

Along with these specific examples, other scholars have conducted reviews of research that focus on ELT. Schellhase (2006) reviewed literature about ELT and learning styles in the context of athletic training education and found a need for more information about the topic. Seaman et al. (2017) reviewed articles about ELT and identified that scholars have drifted from focusing on its theoretical underpinnings to more technical aspects (e.g., measuring the impact of ELT on learning, the contextual factors that might impact a study, and the integration of traditional teaching methods [e.g., lectures] within experiential learning activities). Seaman et al. (2017) recommended a return to the foundations of ELT and less emphasis on technical issues.

More recently, Morris (2020) reviewed literature about the meaning of concrete experience and found that to qualify as such an experience, learners must be "involved, active, engaged, participants in the learning process" (p. 12). Moreover, learners must be critical of the experience, meaning they reflect on and assess their experience individually and with peers. Following the review, Morris (2020) suggests revising the name of the concrete experience stage to contextually rich concrete experience stage to represent that "knowledge is situated in context: fluid across time and place… in which learners are immersed in learning experiences that contain the fullest contextual information possible, in which the experiential learning process takes place" (p. 20). This revision opens the doors to boundless opportunities for what an actual concrete experience truly is.

With this broader notion of concrete experiences, XR technologies can play a significant role when designing learning activities that utilize ELT. Specifically, they are well-suited to provide simulated environments that can fully depict all the pertinent information needed for contextually rich concrete experiences, potentially enhancing the effectiveness of ELT-based learning activities. To actualize this use of XR technologies, it necessitates the need to update the OLSit framework.

Evolving the OLSit Framework

Innovation is a hallmark of quality educational practices, which extends to ID and the OLSit framework. Over time, researchers have had positive results when using it for teaching and learning (Baird, 2021; Morel, 2021), and that evidence helps credential OLSit as a valuable ID framework. However, “there is a need for more exemplars of how the model (OLSit) can be used at different grade levels with diverse students” (Edyburn, 2020, p. 115), and Tabor (2020) recommended that the OLSit framework should provide students with more freedom and time to explore the topic being studied. These critiques suggest that the OLSit framework is more theoretical than practical. In addition, Castelhano et al. (2023) called for more examples of using XR technologies, particularly VR, for instructional purposes. Taken together with Morris’ (2020) recommendations about concrete experiences, there is an opportunity to evolve the OLSit framework to one that integrates practical applications situated in XR technologies.

For the “Learn It” element, instructors use scaffolds to provide students with knowledge and information about the topic. However, the scaffolds are not intended for students to contextualize their knowledge about the topic in an authentic setting. Instead, they provide ways for students to understand and use information about the topic to create the learning artifact and reflect on their learning. Students are not authentically experiencing the topic, or, in other words, they are not “doing” the topic. Moreover, in practice, the need for instructors to provide direct instruction about the topic can overshadow the opportunities students have to engage with it (Petersen et al., 2020). The lack of situating the topic in an authentic context coupled with the instructor’s need to “cover” it can limit how students rehearse knowledge and develop skills connected to it before creating their learning artifact. These concerns present another opportunity to evolve the OLSit framework with an “Apply It” element.

The "Apply It" element offers students a way to experience educational praxis, the practical application of theoretical knowledge for an authentic purpose (Mahon et al., 2020). Without praxis, students' ability to transfer their learning about a topic meaningfully is limited. For example, when medical students are developing their skills for triaging patients in emergencies (e.g., natural disasters, active shooter scenarios), they need to practice those skills in a safe environment. Alternatively, when pre-service teachers are developing their classroom management skills, they need opportunities to monitor students in a classroom setting to practice appropriate intervention. In a third example, when engineering students study radar and global positioning systems (GPS), they must be familiar with the satellites that broadcast data back to Earth, so they are prepared to repair them. While the "Learn It" element is intended to develop their knowledge about the various topics and procedures for working within those contexts, it does not provide them with the experiences they need to apply their learning, which limits their opportunities to experience educational praxis. The "Apply It" element can infuse an experiential component into the learning process (Kolb, 2014), which builds student knowledge and skill development through practical application and real-world scenarios, fostering a deeper grasp of the subject matter. According to Kolb (2015), experiential learning includes providing a concrete learning experience, a common experience that all students will have. Students then consider and reflect on that experience from their background knowledge before working to make sense of their learning through abstract conceptualization, where they analyze the reasons that resulted in the experience existing in the first place. They should then transfer what they have learned from that experience to future ones. Based on that process, students use active experimentation to apply the new knowledge to future experiences. XR technologies can be used in each of the prior examples to create the common experiences students need to apply their learning, and it requires matching the type of XR technology with the type of experience needed.

In the first scenario about triaging patients during an emergency, VR experiences can be designed to simulate an earthquake or tsunami striking and then have students practice attending to the wounded and hurt individuals. In the second scenario, instructors can capture footage using 360° videos and have their pre-service teachers monitor the classroom to identify when and where intervention is needed. In the final scenario, AR and digital twins can be used to introduce engineering students to GPS satellites so they can become knowledgeable of the satellites’ mechanics before learning how to repair them. Based on prior research (Kotcherlakota et al., 2023; Lowell & Ilobinso, 2023; Turan & Atila, 2021), there is plentiful evidence that XR technologies can support student learning. However, to fully harness them, instructors still need to prepare their students for those experiences and be ready to evaluate their learning based on them. To that end, the researchers will explain their revision to the OLSit framework.

Leveraging the OLASit Framework’s “Apply It” Element to Support Immersive Learning

The “Own It, Learn It, Apply It, Share It” (OLASit) framework provides an ID structure that allows students to have an immersive learning experience where they can apply the information or skills they are developing using XR technologies. However, that experience must build on the lesson's activities that lead up to it. When designing a learning experience using the OLASit framework, the researchers support taking a backward design approach (McTighe & Thomas, 2003; Richards, 2013) because it begins with identifying the content students should know and the skills they should develop by completing the lesson, and then work from those points to design the learning experience. Table 3 provides critical questions for each element aligned with the framework to support instructors. The table first identifies the learning outcomes and then works in reverse order to create the learning experience within the lesson context.

Table 3

Steps for designing lessons using the OLASit framework

Step	Key Questions
1. Identify Learning Outcomes	• What should students know and be able to do following this lesson? • How will students' knowledge and skills be assessed in the lesson?
2. Share It	• What must students include in the learning artifact to demonstrate their knowledge or skills? • What type of feedback will be offered to students by the class community based on their learning artifacts?
3. Apply It	• What type of XR will students need to experience this activity? • What will students see or do within the XR environment to advance their knowledge base or skill development?
4. Learn It	• How will the information be scaffolded to students for building their knowledge or skills related to the topic? • What opportunities are provided for students to reflect on and make sense of the information by themselves and with their peers?
5. Own It	• How will students make an authentic connection with the topic? • What resources are available to support students who need to gain prior knowledge about the topic or who would like to review it?

These questions are tools for IDs and course instructors to consider as they use the OLSit framework to plan immersive learning experiences. To further support their development, the next section will provide details for using the "Apply It" element as space within the lesson to create an immersive learning experience.

Apply It

The "Apply It" element is novel to the OLASit framework, and its purpose is to create opportunities for students to immerse themselves in the topic they are studying. The theoretical underpinnings of the "Apply It" element are based on constructivist, experiential learning within a digital context where the learner has the agency to make decisions, and it requires instructors to match the XR technology based on its functionalities to the learning experience needed for the lesson.

To learn about a topic or develop a skill means that students must authentically engage it in some way or, as Lewis and Williams (1994) said, be immersed in it. Children do not learn to play a sport by only reading about it and seeing it played; instead, they need to play the sport. While instructors can provide some experiences to their students in their school environment, like conducting a simple laboratory experiment or practicing public speaking, the immersive experiences instructors can offer their students are often limited by cost, location, and safety, among other concerns. XR technologies can substitute for physical experiences, and instructors must align the desired experience with the functionalities of the XR technologies. Table 4 provides examples of these alignments.

Table 4

Examples of Aligning Immersive Experience to XR Technologies Based on Functionality

XR Technology	Example Functionalities	Examples of Applied Engagement
Augmented Reality	Interact with digital objects overlayed onto the physical environment	• Evaluate the size, shape, and movements of objects (e.g., machinery, furniture) • Manipulate an object to complete a task (e.g., make a repair, perform a procedure)
360° Hypermedia	View and interact with a replication of the physical world from fixed points	• Enter a scenario and make choices based on it (e.g., workplace conflict strategies) • Tour a location and select places to explore (e.g., virtual field trips)
Virtual Reality	Enter a digital environment and safely interact with it, based on parameters	• Explore a distant or inaccessible place (e.g., spacewalk, inside the human body) • Practice a skill (e.g., complete a surgical operation, flying and landing a helicopter) • Interact with a community (e.g., meeting in virtual spaces, making a presentation)

The ideas shared in Table 4 are representative, meaning that they are springboards that IDs can use to innovate creative ways for integrating these XR technologies into the learning experiences they are developing. To select the appropriate technologies, IDs should first identify the learning outcomes, knowledge, and skills students should gain and develop from the "Apply It" element. Next, they must consider the following areas to create an immersive learning experience.

Available Hardware

When designing immersive experiences, it is important to evaluate if students have access to the hardware needed for the experience. For AR, students would need a mobile device (e.g., tablet, smartphone). Mobile devices and laptops can often also access 360° videos and images. VR is more complex than the other forms of XR technologies because of the variety of ways it can be structured. While VR headsets are typically needed to engage this modality, less immersive VR experiences can be accessed via laptops and mobile devices, affecting the type of experience. To explain, there are stores with applications (apps) that can be downloaded to VR headsets, like the Oculus Quest and SteamVR (Statista, 2024). However, if VR headsets are not available, cardboard or inexpensive headsets are available where a smartphone is inserted into them, and the smartphone becomes the viewer (Arango, 2024), though these types of headsets reduce the level of immersivity. Then, for a less immersive experience, there are VR platforms that can be accessed by a laptop, like FrameVR (www.framevr.io) and Mozilla Hubs (https://hubs.mozilla.com). A critical decision for selecting the XR modality is understanding the hardware available to students for accessing it, which leads to creating the "Apply It" experience.

Choosing the Platform for the Experience

After identifying the hardware based on student access to it and understanding the XR technologies' functionalities, it is essential to identify the platform for building the immersive learning experience. While IDs with technical skills can use tools like Unity and the Unreal Engine to create deeply immersive experiences for students, designers who are not technical can use a series of "no-code" platforms to create and host the "Apply It" activity. For example, to create an AR-based experience, designers can use MyWebAR (www.mywebar.com), Adobe Aero (www.adobe.com/products/aero.html), or a similar platform to build the experience. These platforms allow designers to upload different assets (e.g., images, text, audio) to create the experiences. They should spend time exploring the platform before committing to use it, as these platforms have different functionalities and options (Cherner & Russo, 2022), and understanding the platforms holds true for the other XR technologies as well.

To build learning experiences using 360° videos and images, designers need to either record the footage using cameras that can record in 360° like the Go3 by Insta360 (www.insta360.com) and the Max360 by GoPro (www.gopro.com), or download content from sites like Unsplash (www.unsplash.com) or the 360° Exchange (tarheels.live/360exchange). (If downloading the content, IDs and instructors must correctly license or attribute it to avoid copyright infringement.) To create the experience, IDs need to choose the platform for building and hosting the experience, and example platforms suitable for 360° videos and images include WondaVR (www.wondavr.com) and ThingLink (www.thinglink.com). These platforms often use a drag-and-drop interface, which allows for arranging the 360° content and adding interactive and branching elements to it. The interactive elements can include preloaded question templates, symbols, and text, and the branching system is a choice-based system where a scenario is provided. In it, students are prompted to make a decision that leads to a subsequent scenario, like a "choose your own adventure" book (Wilson, 2020). The limitation with 360° content of most kinds is that it only allows for 3 degrees of freedom (DOF), meaning students can only look around from the perspective of where the camera recorded the content, which means that students cannot freely explore the environment (Rosenthal, 2021). Designers need to consider this limitation when working with 360° videos and images.

VR allows designers to create more deeply immersive experiences, and they are entirely created within a digital environment. Whereas 360° videos and images replicate the physical world, VR is a fully digital environment, and designers can use platforms like Mozilla Hubs (www.hubs.mozilla.com) and FrameVR (www.framevr.io) to develop them. Like those for 360° content, VR platforms also use a drag-and-drop interface, and designers can import their assets or use preloaded ones when creating the environments. Without coding, they can also plan the movement of characters and objects in the experience, which includes interactive elements needed for dialogue and other exchanges. Regarding movement, these platforms support 6DOF (Rosenthal, 2021), so students can look and move about the scene; they are not bound to one vantage point like in 360° videos and images.

Another option for the immersive "Apply It" learning experience is to adopt an existing piece of AR, 360° content, or VR. The advantage of this option is that the XR technology needed for the experience is already built, and IDs should select the technology based on the hardware accessible to students. For AR, designers can browse the App Store and Google Play for apps suitable for the topic and experience. One strategy for locating these apps is conducting online searches and prompting large language models for recommendations. Once apps are identified, designers should assess them for fit, functionality, and overall quality.

Building the Experience

When developing the immersive learning experience, the XR technology will impact the experiences students have during the "Apply It" element. Therefore, IDs need to test working with the technology in correct and incorrect ways so that they can develop the scaffolds, resources, and models students will need for success. In addition, instructors should ensure that the ways students engage with the technology align with the lesson's learning outcomes. While they will vary by technology, articulating how and why the experiences align with the learning outcomes and explaining this alignment within the context of the lesson is essential, as it will communicate the value of the lesson to students. To further facilitate the integration of these technologies using the OLASit framework, IDs and instructors need to focus on safety, structured environment, and access.

Safety must be a top priority, and it focuses on the physical environment where students are when engaging in the immersive experience. Depending on the type of XR technology, instructors may need to take different precautions. For example, if students are using VR headsets, it is recommended that they first view their physical environment before putting them on. That way, they will have a mental semblance of their physical location while immersed. Students should also be seated during the immersive experience, if possible, to avoid bumping into analog objects. If movement is required, students should be paired with another student so the student who is not wearing the VR headsets can spot the student who is wearing them.

Additionally, instructors should ensure a well-ventilated physical environment to minimize feelings of anxiety and motion sickness among students during immersive experiences. Suppose students are using XR technologies independently as part of an online course that incorporates immersive experiences or as part of a flipped classroom lesson. In that case, instructors can provide a safety checklist that includes precautions for students before using the technologies. While context and purpose will inform the use of immersive technologies, safety must be a top priority to help prevent accidents.

A structured environment is necessary so instructors can support students entering, engaging, and exiting the immersive virtual learning experience. When entering an XR environment, instructors should provide specific directions or procedures for launching the experience. This can include websites to visit, apps to download, and ensuring wearable equipment is correctly adjusted and fitted (Davis, 2023). It also includes supporting students acclimating to the environment by understanding how to move and function within it. While the directions and procedures will vary, providing time for students to orient themselves helps prepare them for a successful experience. Then, when engaging the XR environment, instructors must communicate the specific missions or tasks for students to complete. The context of the environment, type of technology, and objective(s) for the lesson should all be addressed when communicating this information to students. Finally, after completing the experience, instructors must support students exiting the XR environment. While it might be as simple as closing an app or web browser, deeply immersive experiences can be more disorienting when transitioning from the virtual to the physical world. Having students exit the experience by closing their eyes and breathing for a few moments before opening their eyes can be beneficial.

Tied to the safety and structured environment dimensions is accessibility. While it is a still-developing area of research (Mott et al., 2019; Simon-Liedtke & Baraas, 2022), we operationalize accessibility with XR technologies to mean how students experience immersive learning, including the hardware they need for it along with the way they engage the environment and its features. For example, while VR experiences often require specialized headsets, alternative platforms can be accessed using two-dimensional computer screens, tablets, and smartphones, along with headsets, such as Mozzila Hubs. Alternative control inputs for VR are also available, which allow users to control the experience using their eyes and voice (Hombeck et al., 2023). In addition, 360° content can often be accessed across devices and platforms. With AR, it typically requires an app to be downloaded or a quick response (QR) code to be scanned to activate the experience. Then, once launched, the accessibility of the experience needs to be assessed, with further considerations based on student needs within the learning context. Though a full conversation about accessibility and XR technologies is beyond the scope of this article, we recommend Lowell and Ilobinso (2023), Herskovistz et al. (2020), and Hughes and Montagud (2021) for further conversation on this topic.

These principles – safety, structured environment, and accessibility – work together to help ensure the quality of an immersive learning environment needed for the “Apply It” element.

When in unison, they allow students to experience the praxis of the concepts through experiential learning, topics taught during the “Learn It” element, and how they will use them. The following section will provide a detailed example to further exemplify the OLASit framework in action.

Example of the OLASit Framework Being Used to Teach DEI in Business Courses

In recent years, there has been an increase in the focus on diversity, equity, and inclusion (DEI) in business, and colleges of business have been integrating those topics into their coursework. However, readings and activities provoke thought and reflection about DEI’s role in business. They do not provide students with experiences to ground their thinking, especially as they prepare to enter the field. The OLASit framework can leverage immersive technologies to provide that experience. The following example will provide an overview and discussion of the OLASit framework coupled with how 360° videos were used to create that experience.

For background, to provide business majors with experiences based on DEI principles, a series of modules were developed that could be infused into various business courses and trainings. In total, five modules were designed, and the first module provided an overview of DEI. The following three modules each focused on a different element: one on diversity, the next on equity, and then on inclusion. The final module summarized key elements and recommended future steps students could take to continue their commitment to DEI as they become professionals. This example will focus on the fourth module about inclusion, and Table 5 provides an overview of how the OLASit framework was used to design it.

Table 5

Overview of the Inclusion Module

Component	Purpose	Example of Component from Module 2
Own It	Activate schema by having students reflect on a time when they felt included compared to a time when they felt excluded	Students explain the scenario and emotions they had when they felt included and excluded
Learn It	Provide direct instruction about inclusion and its benefits for businesses	Students view a video that explains the role and benefits of inclusion in business
Apply It	Engage students in an immersive scenario where they experience the benefits of inclusion and the	Students are immersed in an interactive 360° video where they make decisions about inclusion and

	challenges that arise when it is not part of the workplace culture	experience the results of their choices
Share It	Reflect on their experience and offer three ideas for how they can practice inclusion in their future workplace	Students complete a 3-2-1 graphic organizer that includes 3 takeaways from the experience, 2 active listening strategies they used in the 360° scenario, and 1 question they have

Own It

For the "Own It" element, the purpose was for students to reflect on times when they were and were not part of a group and how they felt in each setting. This reflection is critical because they use their background knowledge and affective reflections to make authentic connections with the upcoming topic, and examples may include being invited or not invited to a social gathering, an important meeting, or another happening. To structure this activity, Flip (www.info.flip.com), a video-based discussion tool, was used, so the instructors first recorded themselves presenting the prompt to students, and students recorded themselves responding to it on the platform. Because the prompt was based on their background knowledge, it allowed students to reflect on their experiences before sharing them.

Learn It

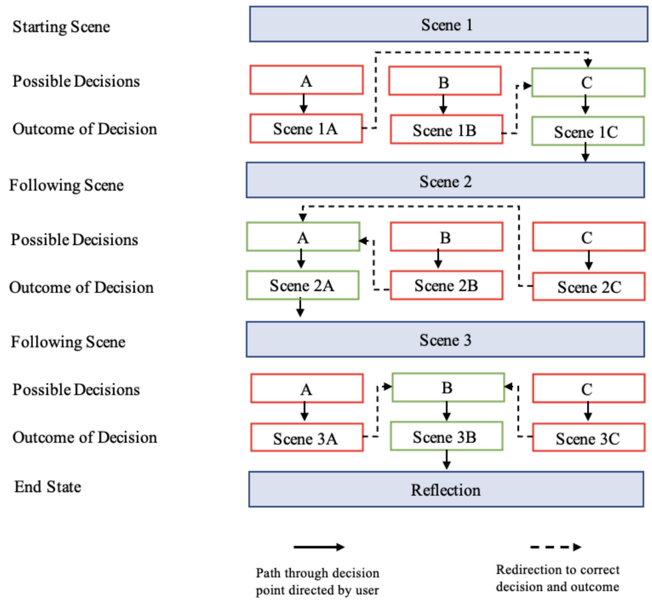
Next, for the "Learn It" element, the instructor recorded a mini-lesson as a short video that draws from Younger's (2023) explanation that describes active listening as "taking the time to embrace curiosity and listen with an open mind and open heart to better understand someone else's emotions, values, and lived experiences" (p. 10) followed by examples and non-examples of it in the workplace.

Apply It

Following the mini-lesson, students move to the module's "Apply It" element, where 360° videos were used to create a simulation that required students to use active listening skills to be part of a workplace. The videos focused on Jessica, a pregnant professional, and how her colleagues treated her. The issues ranged from assigning Jessica a workload, her ability to balance her time between doctor appointments and job responsibilities, and the length of her upcoming maternity leave. The ID team used 360° videos to provide the most authentic simulation of an actual workplace. If VR had been used, the workplace would have been a digital replication, which would not have been as authentic as a real one. To create the actual simulation, the IDs created the branching map shown in Figure 2.

Figure 2

Branching Map Used for Planning and Structuring the 360° Simulation



** Reproduced with permission from Willard et al. (2023)*

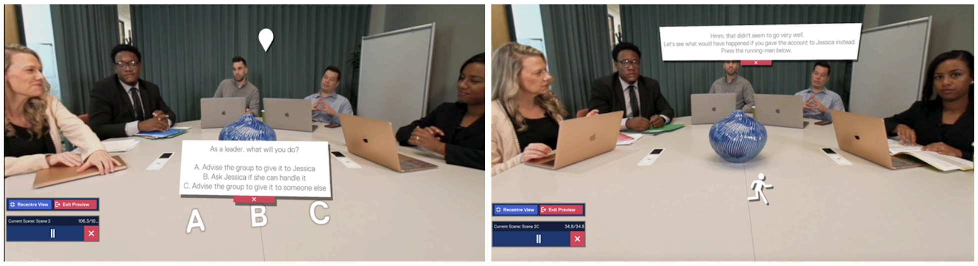
By using the branching map, it allows students to apply their knowledge. If they make a favorable decision, the scenario advances. If the decision is not favorable, they receive feedback and can revisit the scenario and decide again, which is known as productive failure (Sinha & Kapur, 2021). In the branching map, decisions resulting in feedback are in red, and the feedback is provided in the scene number and scenario letter. After the feedback, students are routed to the favorable decision in green and can see how their new choice plays out.

To create the experience, the IDs drafted a script for the scenes that included intentional areas for active listening, reviewed the script and areas with subject-matter experts in business and DEI, and made recommended revisions based on their feedback. Next, they hired a team of actors who rehearsed the script and recorded them. The team then loaded the recordings into a tool that hosts 360° videos, has branching features, and allows interactive elements to be overlayed on top of the video, which was needed to connect the scene's sections based on student choices. At this point, the IDs tested it with student users, revised it based on feedback, and tested it again. The modules were deployed once all testing was positive and no glitches were found.

Figure 3 shows a screenshot taken from Scene 2. In it, the students are positioned as Jessica's manager, and they are in a conference room with her co-workers to discuss a strategy for engaging a new client. Jessica is late for the meeting due to a doctor's appointment running long, and her colleagues do not want to include her in the new opportunity because she is having challenges balancing her schedule. In the screenshot, Jessica has just arrived and explains her reason for being late and her desire to be responsible for the new client. In the 360° video, students can see the characters' gestures, hear their subtle expressions, and even their sighs. As the manager, students must decide whether to assign Jessica to this client.

Figure 3

Screenshot from Scene 2



** Reproduced with permission from Willard et al. (2023)*

When in the scene, the prompt appears as text, and students choose their response to it: A, B, or C. If they select an accurate response, a lightbulb appears. If they are incorrect, a running stick figure appears. (Before entering the experience, students complete a practice module to familiarize themselves with the symbols and their meanings.) Throughout this module, students have opportunities to create work environments that include or ostracize Jessica based on their decisions and see the impact of their decisions on Jessica and her colleagues.

Share It

After completing the scenes, students advance to the "Share It" element. For it, the students completed the 3-2-1 graphic organizer, replicated in Figure 4.

Figure 4

3-2-1 Graphic Organizer Used in the "Share It" Activity

THREE takeaways gained	3. ____ ____ 2. ____ ____ 1. ____ ____

	2. ____ ____
TWO active listening strategies	1. ____ ____
ONE question	1. ____ ____

The OLASit Framework’s Added Learning Value

In this example, the students could practice their inclusivity skills in the “Apply It” section, which was the basis for generating their learning artifact. Within the environment, students were immersed in the context of the 360° video, the meeting room, and could hear and see not only the main comments and gestures but also the subtle sounds (e.g., sighs, smirks) and movements (e.g., eye rolls, shrugs). These elements created authenticity and realness to the activity, a significant value and experience not available to students if they viewed the same scenes in two-dimensional videos and static images of the meeting.

Next, in the context of asynchronous classes, instructors are more limited in how they can teach their students. A synchronous or in-person classes can include discussions along with student-to-student and instructor-to-student interactions in real-time, but that is not possible in asynchronous settings. Moreover, if an instructor wants to provide students with guided practice, that is also limited. A second value of the “Apply It” element is that it creates the space for students to interact with the topic while getting instant feedback, as demonstrated in the example. The “Apply It” element provides students with the guided practice they need to improve and learn by immersing students in the topic and providing feedback as they engage in the activities.

Third, students can repeatedly engage in the activity from the “Apply It” element. For instance, in this example activity, the first-time students complete it, they gain awareness of the situation, interpret information, and navigate the scenario by making choices. After they complete it, students can re-engage but shift their focus from the larger issues at play to subtleties that can signal a character’s thoughts, motives, and intentions about the situation. This second level of knowing is another value offered by using the “Apply It” element to provide students with an immersive experience.

In all, the “Apply It” element can potentially increase the value of the learning experience for students, and the three aforementioned points are specific to the activity for this lesson. As the topics change and different XR technologies are used, it will have implications for teaching and learning, which paves the way for further implications and future research.

Implications and Future Research

The example presented here describes the OLASit framework in an XR learning context and illustrates the utility of the “Apply It” element as an addition to the framework. Several critical areas of future research can be built upon from this experience. First, researchers can investigate student engagement levels across the different elements of the OLASit framework. Does engagement build, maintain, or wane as students complete the different activities that comprise a learning experience designed using the OLASit framework? Moreover, does using different XR technologies for the “Apply It” element impact student engagement? These findings could help identify strategies for maximizing student engagement.

Second, researchers can analyze the value of the “Apply It” element by creating a learning experience that includes that element compared to one that does not. Using a control-group, experimental-group research design would allow for observations of students implementing the “Apply It” element and those who did not. For this study, researchers would design a learning experience using the OLASit framework and a similar learning experience that uses the OLSit framework. Next, they could gather data from both groups' observations, student evaluations, and interviews to analyze if and how the “Apply It” element added to their learning.

Third, researchers can focus on XR's value in the teaching and learning environment. For example, a study could be designed using the OLASit framework with two lessons. One lesson would use an XR technology for the “Apply It” element, and the other would not. Afterward, researchers could review student learning of the topic by analyzing work products and collecting qualitative data from the students regarding their immersive experience with the XR technology compared to those who did not have that experience.

Fourth, researchers can further differentiate the OLASit framework based on the XR technology used to create the immersive learning experience. For instance, are there best ID principles for leveraging VR to the “Apply It” element compared to AR or 360° content? Providing more specific strategies for using each type of XR technology would be helpful, especially as emerging technologies for digital twins, body doubles, and more become available.

Outside of these suggestions for future research, there are opportunities to integrate the OLASit framework with other existing frameworks used to evaluate technology usage and form learning experiences. For example, the Passive, Interactive, Creative - Replacement, Amplification, Transformation (PICRAT) framework (Kimmons et al., 2020); Technology Integration Matrix (TIM) (Welsh et al., 2011); and Technological, Pedagogical, and Content Knowledge framework (TPACK) (Mishra, 2019) can all be applied to the OLASit framework. While PICRAT and TIM can analyze how the XR technology functions within the immersive learning experience, TPACK can be used to consider how technology, pedagogy, and content come together to form the whole learning experience. Pairing OLASit with these frameworks will provide added layers for researchers to analyze the XR technology’s role and ways to integrate it with pedagogical practices and subject-specific content.

Conclusion

The field of educational technology is just at the beginning stages of the evolution of XR integration. XR technologies offer instructors many possibilities for reframing how students engage and experience the content they are learning. As XR technologies become more accessible, they will also become more integrated into the curriculum and less cumbersome. For that to happen, however, it requires thoughtful ID. The OLASit framework provides a scaffold that instructional designers and course instructors can use to craft those types of learning opportunities for students. While still nascent, the OLASit framework evolves the OLSit framework by continuing its focus on constructivist learning while integrating XR technologies into the learning experience.

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