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Educating for Longevity: The Role of Immersive Technologies in Service Learning

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Educating for Longevity: The Role of Immersive Technologies in Service Learning

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As education adapts to the realities of a longevity society, new approaches are needed to engage learners in preparing for their long-term futures, particularly around financial well-being. This preliminary study explores how immersive technologies can enhance educational experiences in longevity planning by combining augmented reality (AR) with tangible artifacts, the Longevity Planning Blocks (LPBs). We designed and prototyped three longevity coaching experiences—using projection AR, tablet AR, and wearable AR—to investigate their effectiveness in communicating abstract longevity planning concepts. Nine Boston-based participants aged 35–45 engaged in a 30-minute coaching session using one of three AR modalities, followed by reflective feedback captured through the Think Aloud method. Drawing from constructivist learning theory, we assessed how each immersive experience supports key pedagogical conditions: contextual relevance, social negotiation, multimodal interaction, self-direction, and metacognitive awareness. Our findings suggest that projection AR encourages facilitator-led trust-building; tablet AR offers accessible, self-paced exploration; and wearable AR supports private, self-reflective assessment. In all three modalities, AR enhanced the use of the LPBs, as tangible artifacts, helping participants externalize abstract concepts and personalize their learning experience. This research contributes to the field of design education by demonstrating how different immersive, service-based experiences can be structured to support deeper engagement with complex, sensitive topics. Ultimately, we demonstrate that immersive educational services—grounded in tangible interaction and thoughtful facilitation—can empower learners to better prepare for the multidimensional realities of aging and longevity.

Keywords: Longevity Planning; Service Design; Augmented Reality; Immersive Technologies

1 Introduction

Due to demographic shifts, techno-economic transformation, advanced healthcare systems, emerging AgeTech cities, and changes to policy and social infrastructures (Lee, 2023c; World Health Organization, 2022; Etkin, 2021), people have increased their life span, and want a sound health span in their later years (Coughlin, 2017). Having a good quality of life has always depended on strategic

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financial planning (Coughlin, 2019; OECD, 2016). The traditional three stages of learn, earn, and retire no longer fit within these transformational, complicated, and systemic challenges. Multistage has become a new norm, encompassing multistage cultures, environment, organizations, and other social infrastructures that we need to reconsider (Golden, 2022).

1.1 Design for Longevity (D4L): service design

D4L is a multidisciplinary concept that arises from fields such as product and service design—focusing on product life cycles (Carlsson et al., 2021), service systems—emphasizing circular economies (Ellen MacArthur Foundation & IDEO, 2019), and financial planning—centering on longevity planning (Lee, Coughlin, Balmuth, Lee, Cerino, Yang, Klopfer, et al., 2023). The growing longevity economy (Gratton & Scott, 2017) has heightened the need to incorporate longevity considerations into various aspects of design and development, including financial wellbeing. In this study, we shift the focus of retirement planning, from conventional financial planning to wholistic approaches of Design for Longevity (D4L) (Lee, 2023a). Expanding beyond money and finance, D4L targets participants across various life stages, including younger generations, to consider themes such as of family, education, mobility, and community. This helps D4L service recipients comprehensively prepare for their futures (Lee, Coughlin, Balmuth, Lee, Cerino, Yang, et al., 2023; Lee, 2023b).

1.2 Longevity Planning Blocks (LPBs): tangible artifacts

With the D4L longevity coaching services, the MIT AgeLab launched 12 Longevity Planning Blocks (LPBs) to help financial advisors understand client needs and foster confidence (Lee, Coughlin, Yang, de Weck, Lee, Klopfer, et al., 2023; Lee, 2022). The set of acrylic blocks (Figure 1), featuring eight questions and imagery adapted from Coughlin's (2019) 8,000-Day framework consisting of four stages of retirement: managing ambiguity, making big decisions, managing complexity, and living solo. These LPBs serve as physical props to facilitate conversation between an advisor and a participant.

Figure 1. The 12 Longevity Planning Blocks (LPBs) used for longevity coaching experiment. Source: Sheng-Hung Lee.

Most financial advising sessions rely on digital tools—screens filled with charts and numbers. While these digital platforms are essential, they lack the rich, embodied experience of touch (Krop, 2018; Sonneveld, 2018). As a scholar and designer Peters (2018) notes, digital interfaces cannot fully

replicate the sensory and emotional resonance of tactile engagement. Touching LPBs give recipients a sense of control as they navigate the vulnerable and intimate experience of planning their future finances. This study explores how integrating digital media, such as immersive technologies—augmented reality (AR)—with tangible artifacts—LPBs—can deepen engagement and make financial learning more memorable. The research question in this study is: *Can immersive technologies amplify the communicative role of touch through tangible artifacts in longevity planning services?*

1.3 Immersive media and technologies

A fourth Industrial Revolution has blurred the lines between physical, digital, and biological spheres (Schwab, 2016). Financial planning has become more sophisticated and clients have higher expectations; they want tailor-made products, integrated services, and supporting systems (Lee, Yang, de Weck, Lee, Coughlin, Klopfer, et al., 2023; Lee, Yang, de Weck, Lee, Coughlin, & Klopfer, 2023; Pine & Gilmore, 2020). Therefore, this study explores suitable immersive technologies for longevity coaching services for clients who have limited financial knowledge.

We designed and prototyped three longevity coaching experiences using the LPBs to test different types of AR (Figure 2). Each coaching experience aims to identify clients' longevity needs and pain points and facilitate building trust with a longevity coach, an experiment facilitator, akin to a financial advisor with an expanded scope of practice. Since the study is a preliminary two-month research experiment, we covered a partial early-stage research prototyping process.

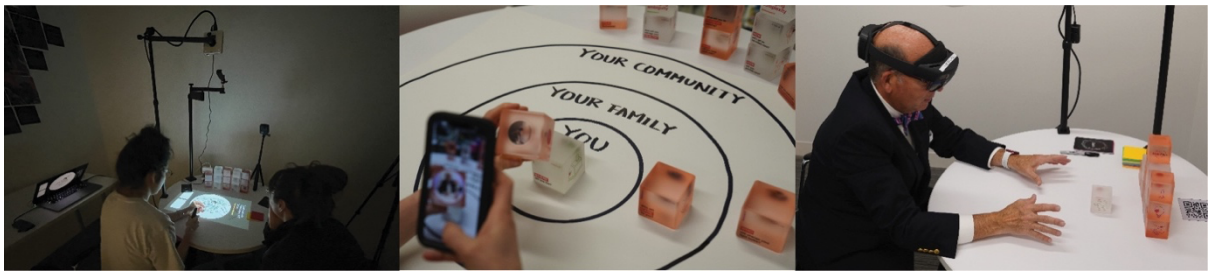

Figure 2. Projection, tablet, and wearable AR-based longevity coaching service experiment (from left to right). Source: Sheng-Hung Lee.

1.4 Research goal and educational purpose

In the context of an emerging longevity society (Scott, 2024; Gratton & Scott, 2017) and an increasingly experience- and service-oriented economy, this preliminary study examines the effectiveness and user experience of three AR modalities interacting with tangible artifacts (LPBs) to deliver longevity coaching services. The primary objective is to inform designers and researchers on how to more effectively integrate immersive media and service-based approaches within educational contexts, from a constructivist learning perspective. Notably, education is undergoing significant transformation (Dizikes, 2022), marked by the seamless incorporation of digital tools and platforms (e.g., Zoom, Miro) to facilitate interdisciplinary collaboration, alongside a growing emphasis on sustainability and longevity as core educational values.

2 Literature review

The literature review (1) introduces a brief history of immersive technologies and defines three forms of AR, (2) examines the intersection of education and immersive technology, and (3) provides case studies of relevant and innovative financial planning education services.

2.1 Virtuality spectrum and immersion

Ever since Kishino and Milgrim introduced the virtuality continuum in 1994, there have been many academics and industry experts who have worked on defining a spectrum of reality. The continuum is a theoretical framework that explores levels of technologically mediated environments, ranging from entirely real to entirely virtual. The center of the spectrum (Figure 3) consists of mixed reality (MR), which contains an "environment in which real world and virtual world objects and stimuli are presented together within a single percept… including across different senses." (Skarbez et al., 2021) In this study, we look at three forms of AR that fall into the MR section of the spectrum: projection AR using a portable projector, tablet AR using a mobile phone, and wearable AR using Microsoft Hololens 2 (Ciampa, 2022).

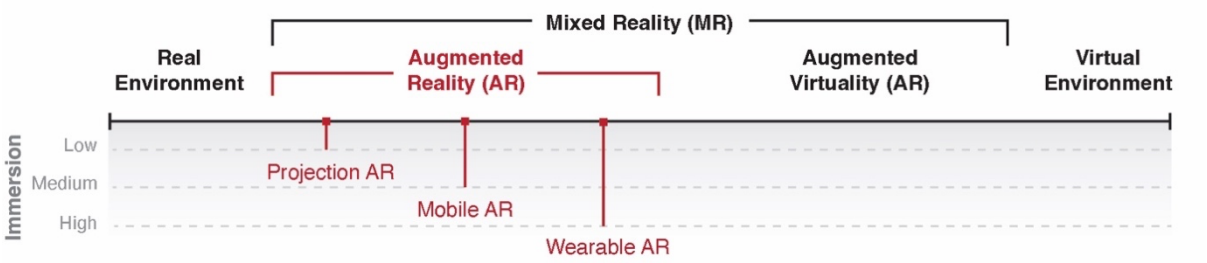

Figure 3. Kishino and Milgram's Reality-Virtuality continuum (1994), adapted to include projection, mobile, and wearable AR on an immersion spectrum.

In Figure 3, projection, tablet, and wearable AR are plotted on the Kishino and Milgrim continuum and on a spectrum of immersion, the sense of being surrounded by a completely other reality (Murray, 1998) from low to high. For this study, immersion was defined by dimensionality: projection AR is fixed and two-dimensional, tablet AR is portable and two-dimensional, and wearable AR is spatial and integrates responsive, three-dimensional digital content in the physical environment.

2.1.1 Projection AR

Projection AR is a form of light-based augmentation. Projectors and other sensors overlay imagery to transform real-world surfaces of physical objects and spaces. This approach is commonly applied in industrial environments, such as factory settings for worker training and assembly, where it supports clear, step-by-step guidance (Ciampa, 2022). Because it transforms existing surfaces without requiring handheld or wearable devices, projection AR offers an accessible, hands-free form of immersion. It also has growing relevance in creative domains.

In the arts, projection mapping combined with additional sensors and physical props can dramatically reimagine architectural spaces, creating visually rich, responsive, and immersive environments. Experiences such as those produced by Meow Wolf (Figure 4) or TeamLab exemplify how projection AR can turn static environments into dynamic, multisensory spectacles to elicit embodied engagement. In the study, this form of AR offered a fixed and facilitator-led experience, fostering face-to-face interaction and supporting trust-building between a longevity coach and a participant.

Figure 4. Meow Wolf Denver installation exemplifies how projection mapping, responsive lighting, and spatial storytelling can transform physical space. Source: Daniel Gillaspia (2023).

2.1.2 Tablet AR

Tablet AR uses video passthrough display, often on a mobile phone, to superimpose digital content onto a live view video display of the physical environment. It works in three different ways: (1) marker-based tracking, where visual images trigger digital overlays in a process resembling scanning a QR code; (2) location-based activation using GPS; and (3) plane detection, which anchors content to physical surfaces using the device's camera. This approach to AR is most accessible, and its familiarity makes it especially well-suited for educational contexts.

Beyond entertainment applications like social media filters and interactive exhibitions such as scholars and artists Hodara and Rettig's (2018) *Pursuit of Happiness* (Figure 5), tablet AR has been widely adopted in retail and education. In learning environments, it supports exploratory and tailor-made interaction, enabling learners to engage with complex topics through sensory and spatial interaction.

Figure 5. Example of tablet AR from Pursuit of Happiness at Bromfield Gallery. Source: Sofie Hodara (2018).

2.1.3 Wearable AR

Wearable AR (headsets) uses see-through displays, like a pane of glass, to merge digital content into the physical world. In this study, we prototyped a wearable AR coaching experience using Microsoft HoloLens 2 to test whether head-mounted AR could create a more private, self-directed environment for exploring sensitive financial topics (Figure 6). Within the context of education, we see wearable AR as a tool for self-reflective learning—particularly well-suited for topics involving personal or vulnerability information, such as a longevity planning service.

Figure 6. Student using wearable AR, Microsoft HoloLens 2, at Northeastern University's Immersive Media Lab (Boston MA). Source: Sofie Hodara (2023).

2.2 Immersive technologies opportunities for education

Though many pedagogical theories could be relevant to financial education, we look specifically at theories that are directly relevant to immersive technologies in this context. Constructivist learning posits that knowledge is constructed based on an individual's beliefs, experiences, background, and context. Meaning is formed by the learner, rather than existing independently in the world waiting to be learned by the learner (Dede, 2008). According to researchers Dunleavy and Dede's (2014) constructivist instruction can be enhanced by five distinct conditions:

1. **Embed learning within relevant environments:** Education should happen in a setting that's tied to how the knowledge will be applied (Dunleavy and Dede, 2014).
2. **Integrate social negotiation:** Learning does not happen in isolation. Instead, it is reliant on conversation, collaboration, and feedback from others, including peers, educators (Vygotsky, 1978).
3. **Provide multimodal representations and multiple perspectives of new knowledge:** Learners should be able to explore new concepts in multimodal formats. This gives learners multiple entry points to understand and connect with the material (Dunleavy & Dede, 2014).
4. **Self-directed learning opportunities:** Learning is facilitated by allowing self-directed exploration of new concepts (Dunleavy & Dede, 2014).

5. **Support and facilitate metacognitive strategies:** Learning is supported by activities that promote self-reflection and self-awareness, especially surrounding one's own cognitive processes (Culatta & Kearsley, n.d.).

Immersive technologies, such as AR, can encourage these five conditions. The technologies offer (1) dynamic, self-directed learning contexts by providing 1:1 student:device ratios; (2) they immerse learners within specific contexts to develop or apply knowledge; and (3) they provide opportunities for guidance via external facilitation, social observation, or individual reflection.

2.3 Innovative financial planning education

Low financial literacy in the United States has adversely affected individuals' quality of life and heightened concerns regarding retirement preparedness, particularly as increasing life expectancy necessitates more comprehensive longevity planning (Lee et al., 2024). As individuals aim to extend not only their lifespan but also their healthspan, effective financial strategies become essential.

In response to these challenges, IDEO and MassMutual (2014) collaborated on a financial planning service initiative, *Society of Grownups*, aimed at enhancing financial literacy among younger adults, particularly recent college graduates seeking financial guidance. This initiative integrated both online experiences and offline activities, with a focus on holistic branding and marketing strategies. One notable slogan, "You are grown-up. Don't panic," exemplified their effort to create a relatable and supportive environment for financial education among younger adults.

Similarly, Capital One (2023) partnered with Petts Café to reposition their retail spaces as community hubs, encouraging local engagement. These spaces facilitated in-person interactions between customers and brand ambassadors, providing personalized guidance on financial concerns.

Furthermore, Dolata et al. (2019) conducted a controlled experiment to examine individuals' behavioral responses when engaging with financial advisors, comparing technology-mediated (e.g., projector and interactive devices) and traditional touch-based (e.g., pen and paper) service encounter (Lee et al., 2025). Their findings contribute to understanding how different interaction modalities influence the understanding of financial knowledge and their financial decision-making processes.

3 Research method

3.1 Research overview

The experiment explores how the longevity coaching experience changes across three media (projection, tablet, and wearable AR). In-person pilot testing was conducted in a 300-sq. ft. lab space with controllable lighting to accommodate the needs of the different types of AR, and was documented with a 360-GoPro and DSLR-camera, to capture participants' conversations and derive insights from behavioral analysis.

We recruited nine Boston-based participants, aged 35 to 45, six female and four males, with academic backgrounds through personal connections to serve as clients in an individual 30-minute longevity coaching session with facilitator, the LPBs, and one form of AR. The experiment concluded with a 10-minute follow-up session to collect participant feedback using the Think Aloud method (Figure 7).

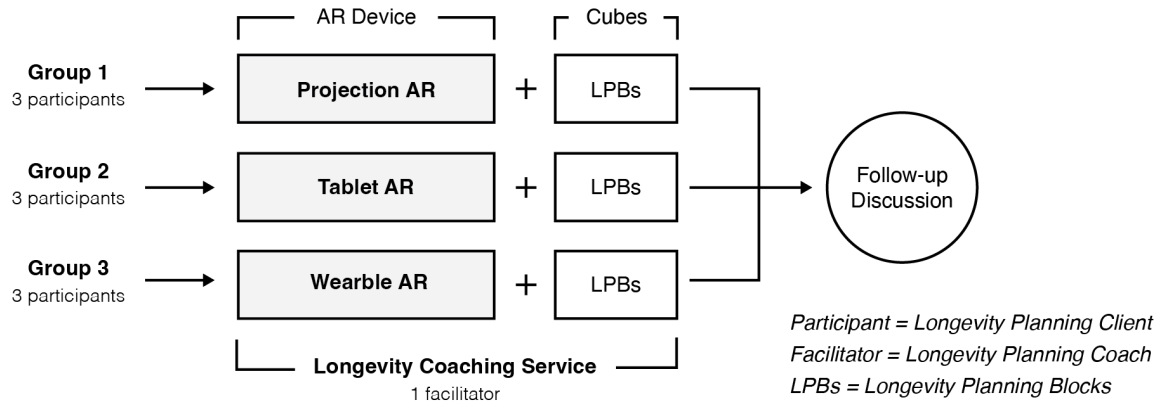

Figure 7. Overview research flow.

3.2 Experiment flow

For each experiment, two researchers served as longevity coaches to facilitate the 30-minute experiment, which consisted of four steps in Figure 8: (1) set up, (2) introduction, (3) longevity coaching, and (4) discussion. For consistency, the longevity coaching consisted of one standardized exercise to be completed in each of the three different media.

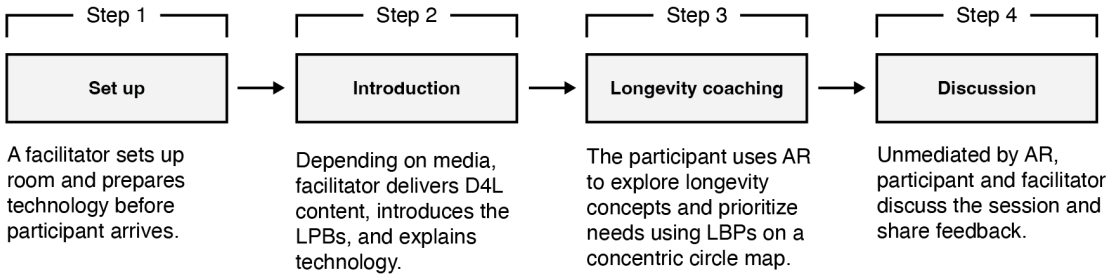

Figure 8. The four steps of the experiment.

3.3 Longevity coaching overview

Once the participants learned the LPB's content, they were asked to prioritize the blocks using the three concentric circles exercise (Figure 9). The intention was to help participants explore the relationship between themselves, their extended families, their communities, longevity planning, and their social systems.

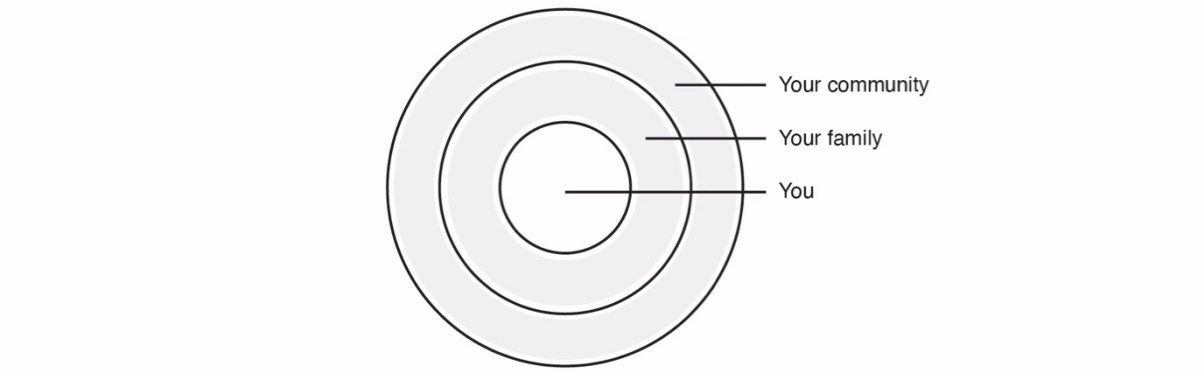

Figure 9. The three concentric circles: you, your family, and your community.

3.4 Longevity coaching in projection, tablet, and wearable AR

For Group 1 longevity coaching experience (Figure 10), we projected an animated Keynote presentation with a KODAK Luma 350 Portable Smart Projector onto a meeting room round table, creating a simple projection AR experience. The table gave the illusion of being transformed into a dynamic display, with visuals advancing based on behavioral cues. The projected canvas guided participants through the coaching experience. The longevity coach worked directly with the participant for the entirety of the session to deliver content and facilitate the three concentric circle exercise.

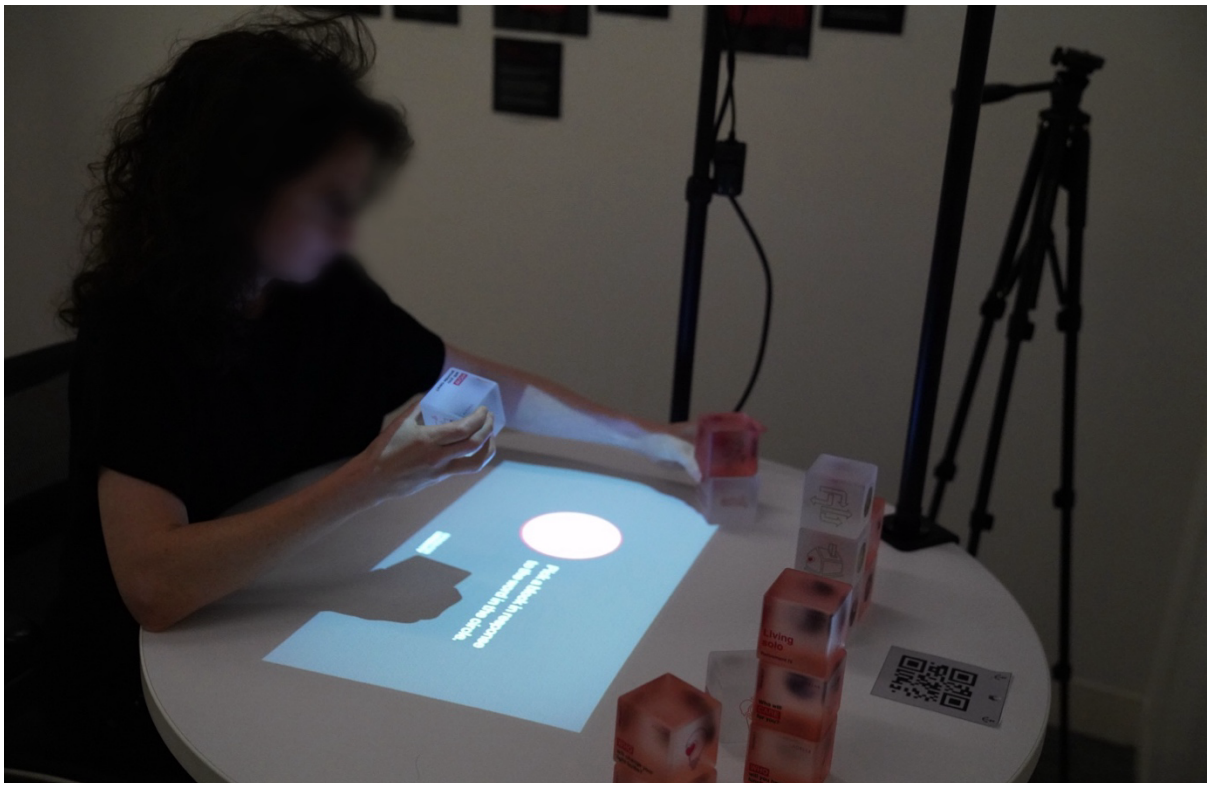

Figure 10. Group 1 participant using projection AR to learn about D4L concepts during the longevity coaching experiment. Source: Sheng-Hung Lee.

For Group 2, longevity coaching was delivered using tablet-based AR alongside supporting materials, including a laptop and a paper canvas. Facilitators began with a brief longevity presentation shown on the laptop, then invited participants to independently explore the AR-enhanced LPBs using a tablet. The AR content was delivered using an online marker-based AR platform, *Artivive*. When participants used the tablet to view the LPBs, the images on the blocks would trigger relevant video footage to overlay atop the blocks. Once the participant understood the content, the coach facilitated the exercise and asked participants to arrange the cubes on the paper canvas.

For Group 3 (Figure 11), longevity coaching was designed for wearable AR. We used Microsoft HoloLens 2 to deliver a self-guided longevity coaching experiences with the LPBs. Facilitators helped participants set up the headset before leaving the room. Using the headset, participants explored educational content at their own pace, navigating through the experience using gesture, and completed the exercise using the LPBs.

Figure 11. Group 3 participant using wearable AR to experience the longevity planning service during the experiment. Source: Sheng-Hung Lee.

3.5 Constructivist instruction in immersive longevity services

In each experiment, participants were guided by a facilitator through video content, lectures, and a self-reflection activity (Figure 12); And AR was used to enhance interactions with the LPBs. In Group 1, the continuous guidance from the facilitator around the shared, projected AR canvas enhances social negotiation in an educational experience (See 2.2, Constructivist Learning Condition 2). In Group 2, the tablet AR allowed researchers to embed videos directly into relevant environments (See 2.2, Constructivist Learning Condition 1). And in Group 3, the headset creates a private space to explore content independently, allowing self-directed and autonomous education (See 2.2, Constructivist Learning Condition 4) and facilitating self-reflection and supporting metacognition strategies (See 2.2, Constructivist Learning Condition 5). In all three experiments, AR content offered an additional representation and entry point for understanding key longevity concepts (See 2.2, Constructivist Learning Condition 3).

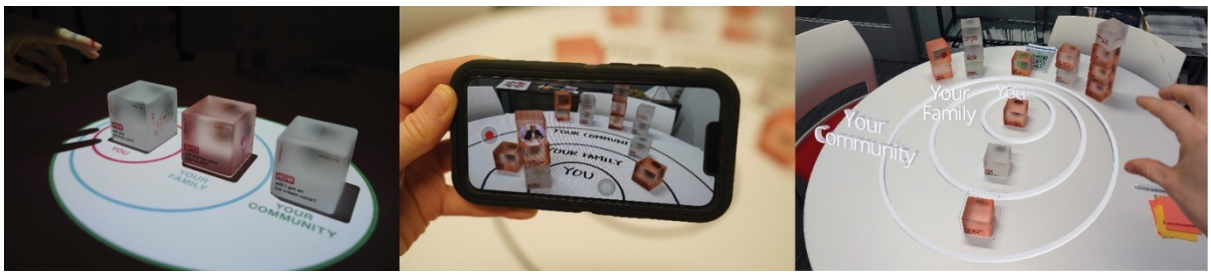

Figure 12. Documentation of longevity coaching experiment using LPBs and concentric circles with three different immersive technologies: projection, tablet, wearable AR (from left to right). Source: Sheng-Hung Lee.

4 Research result

This preliminary study tested three groups exposed to different forms of immersive media, evaluating the advantages and limitations of each technology. The preliminary findings (Table 1) underscore the need for design educators to emphasize the careful design of service encounters, ensuring that facilitators are equipped to navigate sensitive contexts involving personal information and moments of vulnerability. The study considers factors of privacy and autonomy, trust, immersion, and memorability in relation to these different technologies.

Table 1. The overview of longevity coaching experiment result

Group	Group 1	Group 2	Group 3
Medium	Projection AR + LPBs	Tablet AR + LPBs	Wearable AR + LPBs
Hardware	KODAK Luma 350	iPhone 12 Pro	Microsoft HoloLens 2
Software	Keynote	Artivive	Dynamics 365 Guides
Autonomy	n/a	LPBs video content	Longevity coaching content and activity
Advantages	- Intimate experience between facilitator and participant. - Strong sense of immersion with little participant effort.	- Participants have freedom to initiate and direct the delivery of content. - Most accessible and familiar form of AR. - Minimal setup for facilitators.	- Novel experience is exciting and exclusive for participants and facilitators. - Headset affords a sense of privacy and allows for personal reflection. - Potential to create a remote, collaborative experience.
Limitations	- Site-specific set-up is static and unportable. - Longevity coach facilitates conversation creating an implicit power asymmetry between themselves and participant.	- Time-consuming to create augmented content for LPBs prior to implementation. - Limited virtual functions and interaction on *Artivive* application.	- Participants have varying levels of comfort with unfamiliar technologies. - Accessibility is limited due to high costs for hardware and software license. - Complex facilitator user experience, including onboarding participants with new gestures and interfaces, and troubleshooting technical errors.
Summary	Projection AR is engaging and memorable and creates opportunity for trust-building with longevity coaches.	Mobile AR is relatively accessible, low cost, and easy to seamlessly integrate and scale with the LPBs.	Wearable AR offers more privacy and personal space, useful to reflect on sensitive, personal topics.

Ease of facilitation is important to create a viable product, so reliability of the technology and equipment is important criteria when designing longevity coaching experiments. In one case, the

facilitators struggled to log into the HoloLens, and had to reschedule with a participant. Projection and tablet AR created more viable, and therefore scalable, user experiences.

5 Research discussion

Three experiment goals were to (1) create a longevity coaching experience to identify participants' desires and understand their pain points, (2) build a sense of trust and more transparent relationships between facilitators and participants, and (3) apply immersive technologies to further enhance tangible artifacts in an educational context.

5.1 Mapping AR types to constructivist learning conditions

The three different types of AR can support the five different constructivist learning conditions (Dunleavy and Dede, 2014) at varying levels of relevance (Table 2). This demonstrates how immersive media can support different types of learning conditions when applied in other educational contexts.

Table 2. The five constructivist learning conditions defined and applied in projection, tablet, and wearable AR.

Constructivist Learning Conditions	(1) Embed learning within relevant environments	(2) Integrate social negotiation	(3) Provide multimodal perspectives	(4) Self-directed learning opportunities	(5) Facilitate metacognitive strategies
Experiment Application	Participants learn financial planning through tangible LPBs and immersive interactions (not just lecture)	A facilitator guides decision-making during coaching sessions.	Participants engage through video, facilitation, physical blocks, and hands-on tasks.	Personal devices allow participants to control pace and sequence of content.	Reflection exercises help participants prioritize and articulate their financial goals.
Projection AR	**Low Relevance** Participants explore lectures and LPBs in a predetermined sequence, and fixed, seated environment.	**High Relevance** Without a tablet or headset, participants easily build trust with facilitators.	**Medium Relevance** Projection allows participants to explore lecture content and complete a self-reflective activity with the LPBs	**Low Relevance** Participants experience content in a fixed, linear, and predetermined sequence.	**Low Relevance** Participants complete self-reflection on temporary projected canvas.
Tablet AR	**High Relevance** Participants trigger lectures based on their choice of LPBs	**Medium Relevance** Tablet acted as a temporary barrier between facilitator and participant.	**Medium Relevance** AR-enhanced blocks create freeform, mobile experiences.	**High Relevance** Participants could control pace and sequencing of content.	**Medium Relevance** Participants self-reflect using only tangible objects —LPBs and Post-Its—on physical canvas.
Wearable AR	**High Relevance** Participants explore digital content by placing it in their environment.	**Low Relevance** Headset prevented collaboration with in-person facilitator.	**High Relevance** Headset transforms the room into participant's canvas for both physical and digital content.	**High Relevance** Participants could control pace and sequencing of content.	**High Relevance** Headset seamlessly integrates digital content with blocks, and Post-Its on a digital map.

Therefore, these conditions can be applied in an educational environment to help support (1) autonomy and privacy, (2) trust, (3) immersion, and (4) memorable experiences.

- **Embedded learning *supports* autonomy and privacy:** When dealing with sensitive longevity planning information, it's important to give participants a sense of ease, safety, and agency. In addition to high-quality longevity coach, this can be achieved by proving participants with autonomy and privacy. Group 2 (tablet AR) had the ability to navigate content in any order they desired, giving them a sense of autonomy. Even before they touch an LPB, the wearable interface transforms the environment for Group 3 (wearable AR) participants, giving them a sense of privacy and control. In contrast, Group 1 (projection AR) was continuously led by the facilitator, the constant interaction and conversation can result in little autonomy and privacy for the participants.

- **Social negotiation *helps* build trust:** Without a tablet or wearable devices, Group 1 (projection AR) could build rapport with a facilitator, and therefore had the most potential for building trust with a potential longevity coach.

- **Multimodal content *creates* immersion:** Though using unfamiliar technologies can sometimes make participants nervous, the technology complemented the LPBs. Research suggests that AR can enhance embodied learning by situating content within learners' physical contexts, encouraging movement, participation, and meaning making (Dunleavy & Dede, 2014). Together, with the LPBs, this created a high-tech, premium, and multisensory experience.

- **Self-directed learning and self-reflection *support* memorable experiences:** Because of the limited role of a facilitator, Group 2 (tablet AR) and Group 3 (wearable AR) participants could explore and reflect on content and complete the longevity exercise at their own pace, creating personalized educational experiences and empowering participants to personalize the learning experience at their own pace and sequence. It is a shift away longevity planning as an omni-directional relationship, where the longevity coach presents the clients with solutions and answers.

5.2 Scalability and contextual considerations for AR in education

Based on this study, wearable AR is more relevant to supporting constructivist learning principles than tablet or projection AR. However, at this moment, it is the most difficult to implement as devices are still not widespread. Therefore, future study, could explore how to best harness tablet AR in the educational contexts, which is most scalable even with limited access to specialized hardware. If the AR industry continues to mature, device and software costs may decline, making AR more widely accessible and positioning such technologies as everyday computing tools—akin to or even a replacement for personal laptops. This shift underscores the need to rethink social interactions within the classroom, envisioning new, teaching practices and enabling more responsive forms of communication.

Beyond scalability, future studies should also account for cultural differences (e.g., Eastern versus Western contexts), social norms (e.g., new lecturer–student relationships), demographic diversity (e.g., facial dimensions), and personal preferences (e.g., learning habits), as these factors will further enhance the relevance and applicability of AR in education.

6 Conclusion: the potential of immersive technologies for longevity coaching and education

We prototyped three guided longevity coaching services using different immersive technologies—projection, tablet, and wearable augmented reality (AR)—each combined with 12 tangible artifacts—Longevity Planning Blocks (LPBs). Our findings indicate these are possible approaches to create engaging educational experiences. Though projection and wearable AR require specialized and expensive equipment, tablet AR is relatively accessible, and could make for promising opportunities in designing future longevity coaching experiences. Additionally, the knowledge, personal capabilities, and social skills of longevity coaches has the potential to change the way clients perceive financial and longevity planning advising. For example, financial advising services could transform from transactional goal-oriented tasks, such as design for retirement, to conversational experience-driven journeys, such as design for longevity.

We concluded that one affordance of projection and wearable AR is that it can provide privacy and autonomy for participants, which creates an intimate personal space, especially benefiting self-reflection, decision-making, and then discussing sensitive and complicated longevity coaching and financial planning topics and enhancing the service centered around tangible artifacts. Wearable AR could contain untapped business potential to deliver enjoyable and immersive longevity coaching services and experiences. Across all three groups, we observed participants naturally holding and playing with the LPBs while talking and sharing their ideas. The value of tangibility, serious play, significantly shown in the experiment through percipients behaviors. Whether with or without using immersive technologies, the LPBs can effectively help participants express abstract longevity planning needs and financial concepts during the discussion, confirming past conclusions that provocative objects may enable and evocate personal reflections and conversation.

This paper enhances our preliminary understanding of Design for Longevity (D4L) by exploring it through immersive technologies and service design. D4L expands traditional retirement planning to consider themes—such as family, mobility, and community—to help longevity planning recipients comprehensively prepare for their futures (Lee, Coughlin, Balmuth, Lee, Cerino, Yang, et al., 2023; Lee, 2023b). Future research could explore immersive technologies and media in different social contexts, cultural backgrounds, power dynamics, demographics, ethics, and other societal structures. For example, how might we use these technologies to develop meaningful, respectful, and insightful longevity coaching services elderly individuals?

The implications of this study for design education lie in the need to critically reassess the interrelationship between subject matter (e.g., sensitive topics), media (e.g., immersive technologies), and environment (e.g., experimental or instructional settings). When addressing complex and vulnerable subjects such as longevity planning, designers, researchers, and educators can thoughtfully consider how these elements interact to support meaningful engagement and effective learning outcomes.

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