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Gamified Augmented Reality Application for Teaching and Learning Dadaism and Surrealism in Diploma-Level Design Education: A Preliminary Design and Formative Review

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Abstract

Although augmented reality (AR) and gamification approaches have demonstrated educational potential in cultural heritage and field-based teaching and learning environments, they remain underexplored in formal classroom-based art history teaching. This study employed design-based research as its overall methodology to design a preliminary gamified AR application (APP), ArtVenture, and to conduct a formative review of it. The APP was designed to transform abstract historical content, namely Dadaism and Surrealism, into immersive and interactive learning experiences within a digital gallery environment. Specifically, the study explains how the APP was designed using principles informed by Cognitive Load Theory (CLT), Gamified Learning Theory (GLT), and Self-Determination Theory (SDT). The paper systematically details the thematic environment, technical workflow, historical content, gamification mechanics, and matching game of the APP. Following a structured video demonstration of the APP, formative feedback was collected from 11 diploma-level design students recruited through convenience sampling. Participants' feedback indicated perceived visual appeal, apparent interface clarity, and anticipated engagement with the thematic gallery environments. However, the initial outcomes also identified the need for improvements to the visuals, audio, and instructional scaffolding. Future research should further refine the APP, and larger-scale

implementation and effectiveness studies with more diverse student populations should be conducted to assess its effects on motivation, engagement, knowledge retention, and learning outcomes in art and design history education.

Keywords Augmented reality; Gamification; Art and design history; Design-based research; Quality education

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Introduction

Art and design history is an essential area of academic learning that provides the historical, cultural, and theoretical foundation necessary for design students. As part of the mandatory Body of Knowledge (BoK) specified by the Malaysian Qualifications Agency (2021), it is taught in design-related programmes across higher education institutions (HEIs) in Malaysia. The study of art history fosters critical thinking, visual literacy, and cultural awareness, which are core skills for developing culturally aware and innovative design solutions. The subject not only offers insight into design as a cultural practice but also enables students to interpret visual information and make evidence-based, critical design decisions (Briggs & DeLosa, 2023).

However, the importance of art and design history in design education has long been debated, as there has been a tendency to prioritise practical and technical skills over historical knowledge (Rowe, 2025). Several scholars believe that this imbalance is also apparent in Malaysia. According to Wong et al. (2020, 2021), design curricula in Malaysia, especially in graphic design, often focus on software skills, human-centred design, and data visualisation, while less attention is given to the historical and cultural foundations of design. Although a deep knowledge of design history is said to build student confidence and strengthen students' ability to justify design decisions (Hein & van Dooren, 2020), conventional lecture-based pedagogy, supported mainly by static images and text-based reading, does not always align with the expectations of contemporary design students (Özgüleş et al., 2021). Augmented reality (AR) was selected for this study because of its potential to situate digital content within the existing classroom while maintaining students' connection with the physical environment (Cuendet et al., 2013). Unlike virtual reality (VR), which fully replaces the learner's surroundings, AR supplements the physical classroom and offers spatial interaction beyond conventional slides or desktop-based presentations. This paper therefore presents the preliminary design and formative review of a gamified augmented reality application (AR APP), ArtVenture, for teaching and learning art and design movements, specifically Dadaism and Surrealism, within a classroom-based setting.

Background of the Study

As Tagie et al. (2022) observed, attracting and sustaining students' motivation and interest in learning art and design history has become increasingly difficult as technology rapidly evolves and reshapes learning behaviours, particularly in the post-pandemic educational landscape. Today's students, raised in an environment saturated with digital technology and media (Tagie et al., 2022), may enter the classroom with markedly different expectations. They may expect not only immediate feedback but also interactive experiences and visually rich content in the instructional process. This may indicate that some contemporary students are less responsive to traditional lecture-based instruction, a trend that raises questions about the effectiveness and adequacy of traditional pedagogical methods.

Cognitive load can be considered one of the key problems in the traditional teaching of art and design history. Students are often required to understand and remember complex visual, spatial, temporal, and contextual relationships that are inherently three-dimensional, using static two-dimensional media in the classroom. This cognitive activity may overload students' working memory (Sweller, 1988; Paas et al., 2003). Consequently, many students may experience difficulty establishing meaningful connections with the material and may struggle to learn, recall, and apply what they have learned. Moreover, art and design history requires more than the memorisation or understanding of facts; effective learning depends on students' ability to internalise stylistic developments and critically debate major movements that are often cross-cultural in nature. There is therefore a need for effective support tools that promote meaningful learning experiences, minimise unnecessary cognitive load, and sustain students' interest and motivation in the subject. Alternative pedagogical approaches should also be explored to overcome the motivational and cognitive challenges in teaching and learning art and design history.

The widespread use of mobile technology provides new opportunities for teaching and learning at various levels, and a range of tools can work together with mobile technology to enhance the effectiveness of teaching and learning. Among these tools, AR is a promising one because it allows students to interact with digital information embedded within physical environments (Parsazadeh & Cheng, 2025). AR creates hybrid learning environments by combining physical and digital content (Choudhary, 2023). It can be used to project digital content onto a real-world context, providing learning experiences that are not possible in traditional classrooms, such as simulations, virtual recreations of objects, and virtual visits to important locations (Koumpouros, 2024). Logayah et al. (2025) reported promising results for AR-supported historical thinking in lower-secondary social studies, while Jesionkowska et al. (2020) described AR-supported active and hands-on learning in STEAM education. More broadly, Koumpouros (2024) found that AR has been used across both formal and informal educational settings to support simulation, visualisation, and contextual learning activities.

Gamification is another strategy that has often been used in education to increase students' motivation and active participation (Ivarson et al., 2024). In this study, gamification refers to the integration of game elements into learning activities, whereas the matching activity constitutes a game-based learning task. In the context of gamified project-based learning, Huang et al. (2022) reported generally positive findings for learning experiences, interest, subject knowledge, and learning outcomes, while also calling for broader and more systematic evaluation. Khaldi et al. (2023) noted that the effectiveness of gamification depends on the learning context and the combination of game elements, while Putz et al. (2020) reported positive effects on knowledge retention in gamified workshops. Najjar and Salhab (2022) argued that gamification positively influences motivation through elements such as competition, challenge, and socialisation. Similarly, a review by Zainuddin et al.

(2020) indicated that gamification generally has positive effects on motivation and engagement, although outcomes varied across implementations.

The potential of combining AR and gamification is particularly relevant to art and design history education. While gamification may address the motivational dimension of learning by encouraging challenge, feedback, and sustained participation, AR may support learning by providing immersive and contextualised experiences that make abstract historical content more accessible and cognitively manageable. Together, these technologies have the potential to create learning environments that support motivation, engagement, and understanding. Educational research highlights that interest supports attention and motivation and is important to academic success (Harackiewicz et al., 2016). Gamification applies this principle by organising learning activities around points, badges, stories, and challenges that can be designed to support competence and autonomy and, where cooperation and meaningful social interaction are incorporated, relatedness (Jiménez-Valverde et al., 2025). It may capture short-term attention (Tagie et al., 2022) and support learning and knowledge retention in some contexts (Triantafyllou et al., 2025). Souropetis and Kyza (2025) described how AR can complement these motivational effects by situating digital artefacts and stories within physical heritage contexts. Buchner et al. (2022) reported that well-designed AR may reduce some sources of cognitive load by integrating relevant visual information with the learning context, but that it may also become cognitively demanding, depending on its design and use.

Research that integrates AR with gamification in field-based education and cultural heritage contexts has produced promising but context-dependent evidence of enhanced motivation, engagement, and learning (Georgiou & Kyza, 2021; Souropetis & Kyza, 2025). However, many of these studies were carried out in outdoor or historical environments, and studies of the impact of specific game mechanisms on formal classroom-based learning appear to be limited. One exception is research on art and design appreciation, which provides an early classroom example of gamification (Tagie et al., 2022). The potential for further development of AR and gamification in higher education appears to be considerable (Ivarson et al., 2024), yet their specific application in the formal teaching and learning of art and design history remains limited.

Furthermore, the literature suggests that the effectiveness of gamification is influenced by context, design quality, and learner characteristics, which means that the careful design of gamified learning environments is crucial. Several studies (e.g., Li et al., 2023; Smirani & Yamani, 2024) have reported generally positive relationships between gamification, motivation, engagement, and learning outcomes. However, while Xi and Hamari (2019) found associations between game mechanics such as points, badges, and leaderboards (PBL) and the satisfaction of basic psychological needs, Deci et al. (2001) found that expected tangible rewards can undermine intrinsic motivation, which raises concerns

about reward-based mechanics of this kind. Further research is therefore required to investigate the motivational effects of gamification and its integration with emerging technologies such as AR across different educational contexts. This is particularly relevant to the present study because many Malaysian design students are geographically and financially constrained from visiting historical sites and engaging directly with art and design heritage. They often learn art and design history primarily through textbooks, images, and classroom lectures, which may limit their capability to connect historical knowledge effectively with contemporary creative practice. In this context, AR offers the potential to simulate access to historical artefacts and environments, while gamification may enhance students' motivation and sustained engagement. Therefore, this study aims to present the preliminary design, development, and formative review of a gamified AR APP for teaching and learning art and design history.

Theoretical Foundation of the Study

Cognitive Load Theory

Cognitive Load Theory (CLT) was proposed by Sweller (1988). It provides a theoretical explanation of how instructional design influences learning by considering the limitations of human working memory. The theory suggests that learning becomes more effective when instructional materials manage intrinsic complexity and reduce unnecessary cognitive demands, allowing learners to devote their available mental resources to learning. According to CLT, working memory has a limited capacity to process new information, while long-term memory serves as the repository for knowledge and skills acquired through learning (Sweller et al., 2019).

CLT has traditionally categorised cognitive load into three types: intrinsic load, extraneous load, and germane load. Intrinsic load refers to the inherent complexity of the learning content itself. Extraneous load is generated by the manner in which information is presented and may unnecessarily burden learners when instructional materials are poorly designed. In the current understanding of CLT, however, only intrinsic and extraneous load are treated as basic categories, and germane cognitive resources refer to the working-memory resources devoted to learning-relevant processing rather than to a separate source of cognitive load (Sweller et al., 2019). Effective instructional design therefore aims to manage intrinsic load, reduce unnecessary extraneous load, and support learning-relevant cognitive processing.

Gamified Learning Theory

Gamified Learning Theory (GLT) was proposed by Landers (2014) to explain systematically the effects of gamification on learning processes. GLT emphasises that the effects of game elements on learning outcomes are indirect rather than direct. Within GLT, the interaction between game mechanics and

instructional materials is proposed to influence learners' behaviours and attitudes, which subsequently contribute to learning. The quality of instructional content (e.g., materials, activities, or tasks) remains the fundamental driver of learning, while game mechanics such as PBL are strategically integrated to stimulate learners, maintain their attention, and encourage deeper engagement with learning materials. According to Landers (2014), game elements may influence learners' behaviours and attitudes, which can mediate or moderate the relationship between instructional content and learning outcomes. In a mediating relationship, game mechanics influence learners' behaviours by encouraging them to spend more time on tasks or participate more actively, which subsequently improves learning outcomes. In a moderating relationship, game elements influence learners' attitudes, such as motivation and interest, thereby enhancing the relationship between instructional materials and learning outcomes. For example, a leaderboard may encourage students to invest more time in a task, whereas an engaging story or challenge system may increase interest in the content and support engagement with the instructional materials.

In other words, GLT explains that gamification does not replace instructional content; rather, it is intended to influence learning indirectly through learners' behaviours and attitudes (Landers, 2014). The effectiveness of gamified learning depends on the alignment of game elements with learning objectives and content, as well as their influence on desired learner behaviours and attitudes. This is especially relevant to the development of gamified AR APPs, as this learning theory provides a framework for understanding how game design features may influence learners' motivation, engagement, and learning outcomes in art and design history education.

Self-Determination Theory

Deci and Ryan's (1985) Self-Determination Theory (SDT) is a theory of human motivation that has been extensively used to explain and inform educational processes. SDT assumes that humans have an intrinsic motivation to develop, learn, and reach their potential, provided that their fundamental psychological needs are satisfied. Motivation is considered key in this process because it influences learners' actions, their persistence, and their meaningful engagement in learning situations.

SDT suggests that intrinsic motivation is based on three basic psychological needs, namely autonomy, competence, and relatedness (Deci & Ryan, 1985). Autonomy refers to the need to experience ownership of one's actions and choices. Students with a sense of autonomy feel that their behaviour is based on personal values, which increases their engagement and ownership in learning. Competence refers to the need to feel capable and effective in what one does. When students perceive that they have the skills needed to succeed, they tend to take on challenging tasks and develop a feeling of mastery. Relatedness refers to the need to feel connected to and cared for by others. Feeling part of

a group and having positive social interactions promote cooperative learning, understanding, and emotional commitment in the learning process.

Satisfaction of these needs increases the likelihood that learners will be intrinsically motivated, engaged, and persistent (Ryan & Deci, 2020). SDT has become a popular theory in studies of digital learning and gamification as a means of explaining how game features and technology can influence motivation and learning outcomes. Gupta and Goyal (2022) reported better learning outcomes for students who experienced game-based pedagogy and identified meaningfulness as important to engagement. Chiang (2025) proposed eighteen SDT-informed factors for designing online learning environments, with particular emphasis on autonomy.

Collectively, CLT, GLT, and SDT provide a complementary, theory-informed foundation for the design and development of the gamified AR APP, informing both the pedagogical and technical design decisions that underpin its development.

Methodology

In this study, a design-based research (DBR)-informed approach was used to design a preliminary gamified AR APP for teaching and learning art and design history and to conduct a formative review of it. DBR is a research approach that combines empirical educational research with the theoretical design of learning settings to understand how, when, and why design innovations operate in real educational practice (The Design-Based Research Collective, 2003). It is an iterative method for designing, implementing, evaluating, and refining educational technology in real-world contexts to generate both practical and theoretical knowledge (The Design-Based Research Collective, 2003). This study adapted the two-stage DBR framework proposed by Sayre (2023), as illustrated in **Figure 1**, to achieve its overall purpose.

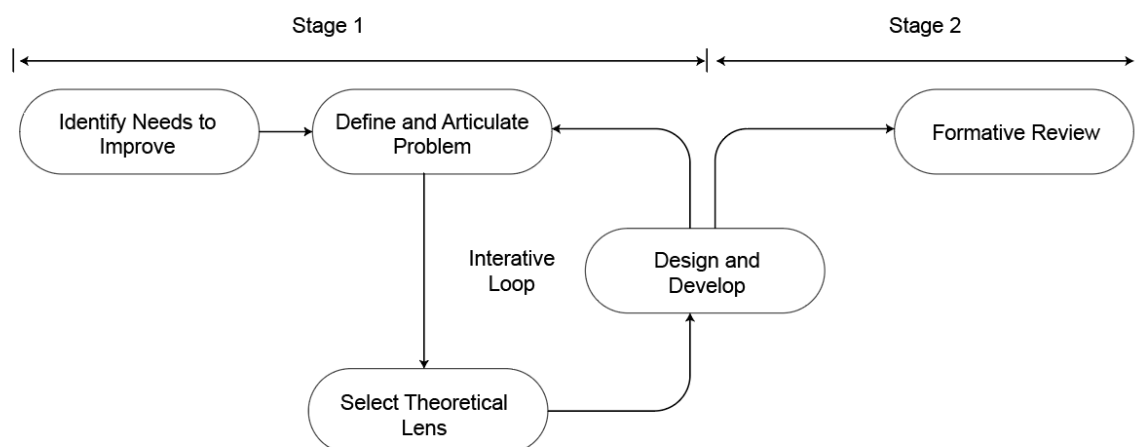


Figure 1. Research Design of the Study. Source: Adapted from Sayre (2023)

As shown in Figure 1, the first stage of the study focuses on designing the project by articulating the design problem, refining it through relevant theories, and constructing an initial design solution. The first step in this stage is to communicate the design problem precisely, including what the problem is, why it is a problem, and what a possible solution might look like.

To identify the challenges and requirements associated with teaching art and design history, preliminary consultations were conducted with two lecturers from the Faculty of Arts & Design of a private higher education institution in Malaysia. Both lecturers had more than eight years of experience teaching art and design history and related design subjects at undergraduate level. The consultations were conducted individually through online semi-structured interviews, each lasting approximately 30 minutes. The interviews explored current teaching practices, the challenges encountered in delivering art and design history content, the lecturers' perceptions of students' learning difficulties, engagement, and motivation, and potential opportunities for integrating emerging educational technologies such as AR and gamification into classroom instruction. The lecturers were also invited to suggest suitable content, learning activities, and design considerations for the proposed APP. The key findings from the preliminary lecturer consultations are summarised in Table 1.

Table 1: Key Findings from preliminary lecturer consultation

Issue	Key Concerns	Suggestions for Design
Student Engagement	Students perceive art and design history as theoretical and less engaging than studio-based subjects	Introduce interactive and exploratory learning experiences
Visualisation of Historical Content	Students struggle to imagine historical contexts and artistic movements, for example Dadaism and Surrealism	Use AR-based 3D visualisations and immersive environments
Retention of Historical Knowledge	Students tend to memorise facts without deeper understanding	Incorporate quizzes, matching activities, and knowledge reinforcement mechanisms
Motivation	Difficulty sustaining attention during lecture-based delivery	Integrate gamification elements such as points, badges, and challenges

The concerns and formative inputs from the lecturers were subsequently considered in the design process of the gamified AR APP.

In addition, three theoretical perspectives, namely CLT, SDT, and GLT, were used to shape both the understanding of the problem and the outline of a feasible solution. Based on the consultations with the lecturers, the design also took into account the scope of the content and the expected interaction time to ensure that it was feasible within the study time frame.

In the second stage, formative feedback was collected after the preliminary design was produced. A formative pilot review with a small sample of diploma-level design students was conducted to identify possible issues and gather initial feedback on the preliminary APP design.

Preliminary Design and Development

Within the initial DBR design stage, the development of the APP comprised three sub-stages: pre-design, design, and technical development.

Stage 1: Pre-design Process

As mentioned, CLT, SDT, and GLT were intentionally used to inform the design of the preliminary gamified AR APP. Table 2 shows how the key concepts of these theories were applied in the design process.

Table 2: Integration of theories in designing the gamified AR APP

Theory	Core Concepts	Design Feature in Gamified AR APP
SDT by Deci & Ryan (1985)	Autonomy	Students freely select learning paths, explore galleries at their own pace, and choose which artefacts to investigate.
	Competence	Immediate feedback, achievement badges, points, and progressively challenging activities were intended to communicate progress and provide competence-relevant feedback.
	Relatedness	Relatedness was not directly incorporated into the current preliminary prototype. The shared leaderboard serves only as a social-comparison feature, allowing learners to view their peers' progress.
CLT by Sweller (1988)	Reduce Extraneous Cognitive Load	Historical information is presented through concise information cards, contextualised 3D objects, and simplified visual layouts rather than lengthy text descriptions.
	Contextualised Learning	Dadaism and Surrealism content is embedded within immersive AR environments that visually represent the characteristics of each movement.
	Progressive Information Processing	Layered information structure enables students to discover content step by step by interacting with AR artefacts.
	Germane Cognitive Processing	Matching-game activities ask students to match artworks, concepts, and historical descriptions.
GLT by Landers (2014)	Gamification elements: Points, Badges, Leaderboards (PBL)	Students receive points and badges for learning activities. Leaderboards display achievements.
	Game-based learning activity: Matching Game	Matching game challenges in which students are expected to apply learned knowledge.
	Narrative & Storytelling	The design offers thematic narratives in connection to Dadaism and Surrealism.

Furthermore, the pre-design phase focused on conceptual exploration, thematic alignment, and the emotional and aesthetic framing of the APP. This preliminary phase was intended to provide continuity and coherence between the historical content and the design strategies for user motivation and engagement. The main design challenge was to portray the worlds of Dadaism and Surrealism, both of which challenge rationalism, embrace absurdity, and focus on the subconscious (Meggs & Purvis, 2016). The pre-design process began with schematic floor plans, which were used to define the appropriate spatial layout and flow of content in the virtual galleries. This process supported the translation of theoretical requirements into practical spatial design considerations (Baloian et al., 2021; Kristianto et al., 2021).

Dadaism Schematic (The Circular Archive) and Environment (The Anti-Logic Archive)

In the initial conceptual floor plan (Figure 2), the Dadaism environment is designed in a circular form organised around concentric rings. This framework establishes a purposeful, chronological learning journey through clearly defined display sections arranged around a central axis. The spatial arrangement is particularly important when presenting the highly fragmented and anarchic nature of Dadaist works, as it enables students to engage with the content systematically through themes such as historical origins, key artists, and defining characteristics, in alignment with the course learning outcomes and lesson objectives, while managing visual complexity (Skulmowski & Xu, 2022). This organisation can be regarded as a form of sequential instructional scaffolding intended to support students' understanding of complex historical content.

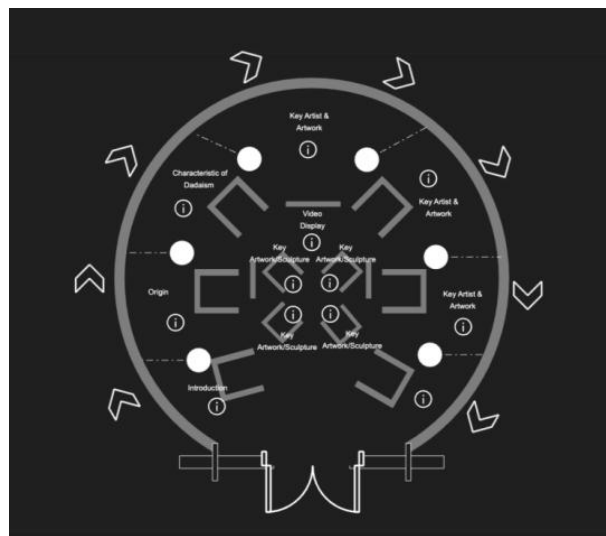


Figure 2. Dadaism Floor Plan (The Circular Archive)

The ‘Anti-Logic Archive’ is the Dadaist AR environment, designed with an industrial and deconstructed aesthetic that embodies the anti-rational philosophy of the Dada movement. It is characterised by high-contrast black-and-white imagery, framing devices, distorted typography, and collage-inspired structures, all of which pay homage to the inherent anti-aestheticism and anti-rationalism of Dada. These visual elements were intentionally derived from key Dadaist principles that emerged during the early twentieth century, including anti-aestheticism, collage-based artistic practices, anti-bourgeois criticism, and the rejection of conventional artistic norms (Meggs & Purvis, 2016). The combination of structural segmentation and prominent information panels creates a structured learning pathway within a visually complex environment. This spatial organisation was intended to facilitate navigation and manage visual complexity by organising fragmented content into smaller units of information, which is consistent with the general design principles of CLT (Skulmowski & Xu, 2022). Figure 3 depicts the wireframe, solid-view, and material-preview representations of the Dadaism gallery.

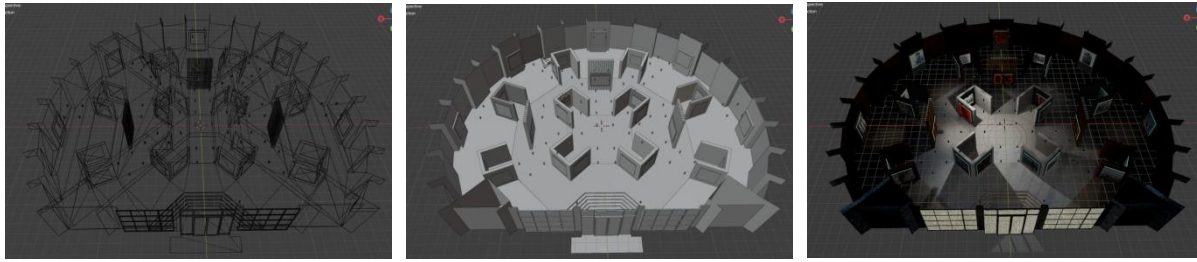


Figure 3. Wireframe, Solid View and Material Preview

Surrealism Schematic (The Multi-Zone Space) and Environment (The Dream Logic Gallery)

The initial floor plan for Surrealism was a simple rectangular, multi-zone space divided into distinct functional areas. Each section of this plan is dedicated to a specific theme, such as the Surrealist manifesto, artistic practices, and the influence of key theorists. This simple arrangement provided the experiential structure for the transition to the final, complex, multi-level dream architecture, in which all key content checkpoints are woven into the 3D environment (Souropetsis & Kyza, 2025). The Surrealism floor plan is shown in Figure 4.

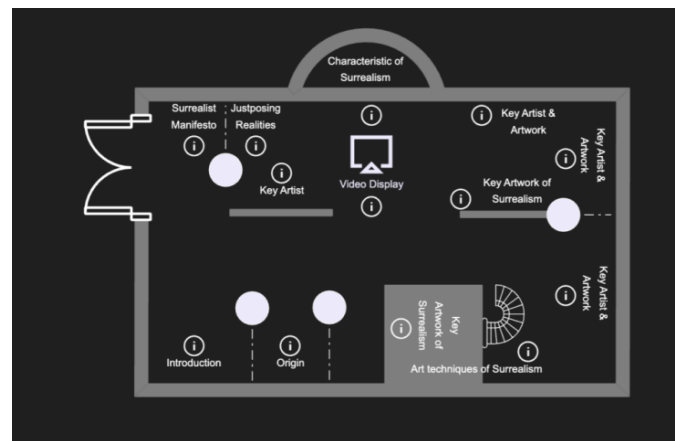


Figure 4. Surrealism Floor Plan (The Multi-Zone Space)

The ‘Dream Logic Gallery’ is the Surrealist AR environment, created by transforming Surrealist artistic principles into an interactive space. The design draws on central Surrealist concepts, such as dream imagery, Freudian psychoanalysis, automatism, irrational association, and the subconscious mind, which were key elements of the movement (Tang & Misri, 2025). The flooring of the environment functions as both a metaphorical and a spatial narrative element. It begins with a structured checkered pattern near the entrance, symbolising rationality and order, and gradually transitions into more abstract and fragmented forms as users move deeper into the gallery, representing the realm of the subconscious.

The Surrealist environment was designed as a spatial interpretation of dream logic, translating abstract psychological ideas into a navigable digital experience. This transformation of conceptual ideas into embodied navigation was intended to enhance aesthetic immersion and support engagement. Through this contextualised learning approach, the design may support deeper conceptual understanding and emotional resonance, consistent with previous studies (e.g., Souropetsis & Kyza, 2025). Figure 5 depicts the wireframe and solid-view representations of the Surrealism gallery.

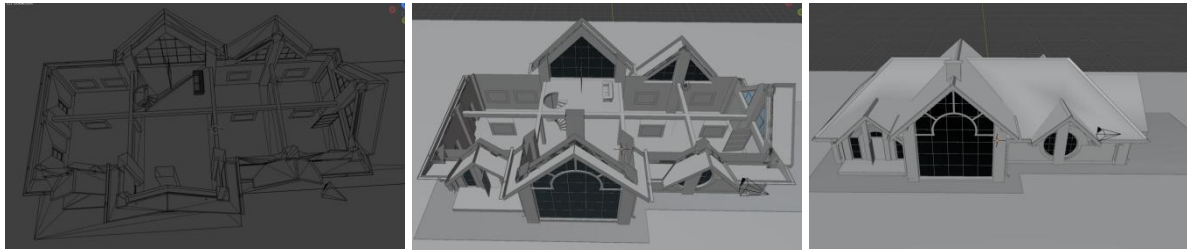


Figure 5. Wireframe, Solid View Without Roof and Solid View with Roof

Structure of the Gamified AR APP

The APP flowchart is depicted in Figure 6. The linear, branching structure was designed to provide a clear navigation path and to document the two prototype versions for future comparative evaluation (Argueta-Muñoz et al., 2023). The flow begins with the APP initiation and the Mode Selection Screen. Users entering the gamified version provide a pseudonymous Student ID, which enables points, badges, and leaderboard positions to be recorded across sessions without displaying their actual names. Users entering the non-gamified version proceed without registration, and no PBL data are awarded, displayed, or recorded. Each version then directs users to its respective main menu, which offers two AR learning paths: the Dadaism AR Gallery and the Surrealism AR Gallery. These galleries contain the learning content common to both prototype versions. In the non-gamified version, students move within the AR space and access the same informational content in an exploratory manner, without PBL. The gamified AR APP, on the other hand, adds PBL elements and matching-game activities. These mechanisms were purposefully overlaid onto the AR experience as design features intended to support motivation and engagement. Previous research has reported context-dependent relationships between AR-integrated gamification and learning or motivation (Weng et al., 2024). In this study, when a student engages with informational materials in the galleries, the system awards points as a reinforcement strategy that helps to maintain attention and active engagement (Meng et al., 2024). Likewise, the matching games require learners to match artworks with relevant descriptions or artists, a recall-and-selection activity associated with the remembering level of learning (Wood & Drew, 2025).

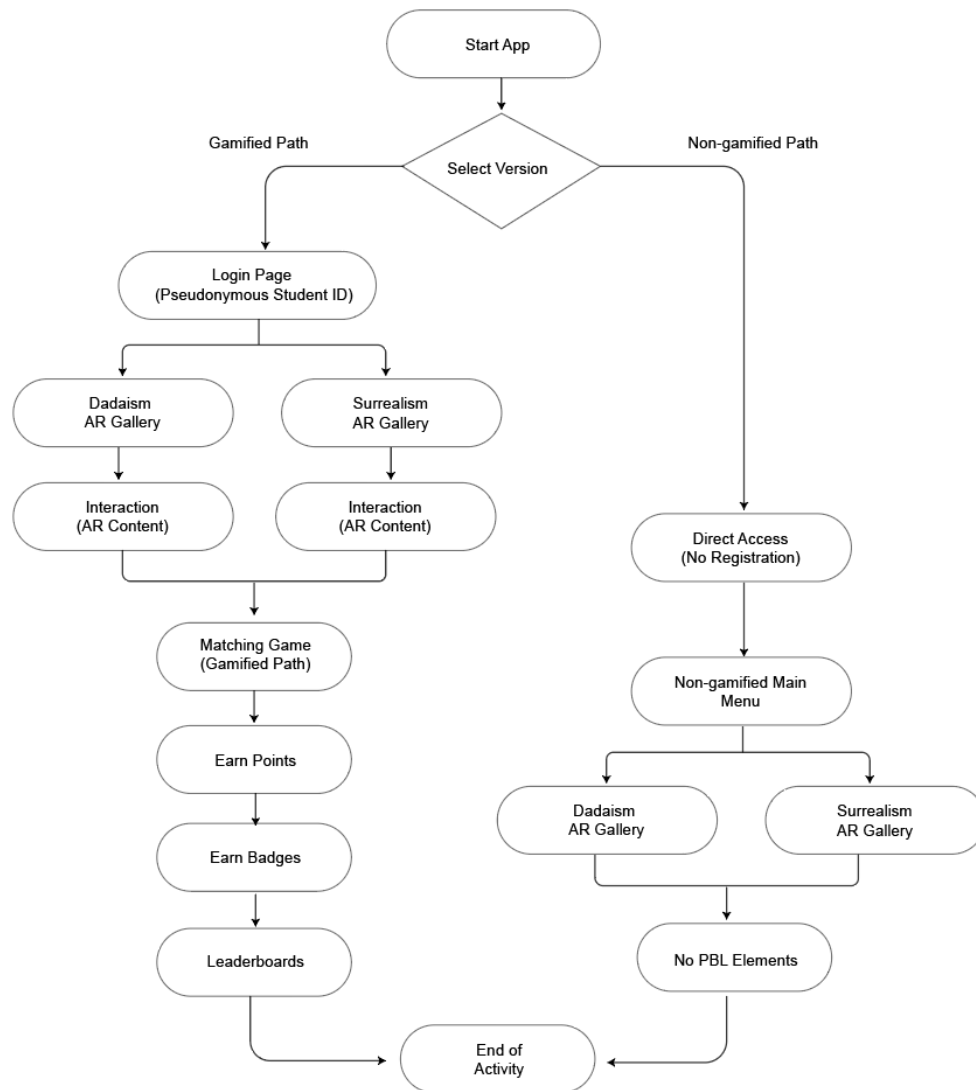


Figure 6. Structure of the AR APP

The final element of the gamified branch is the leaderboard, where cumulative points and badges are displayed using pseudonymous identifiers. The leaderboard introduces social-comparison feedback and may encourage some learners to monitor their progress relative to others (Landers, 2014). The non-gamified APP ends without these motivators and focuses on understanding the content rather than on performance-based feedback. Overall, the two paths (gamified AR and non-gamified AR) show the structural differentiation between the two versions of the APP. Although both provide the same content exposure, the gamified version contains an additional motivational layer that may influence learners' engagement, behaviour, and performance.

Stage 2: Design Process

This stage describes how the plans and concepts outlined above were translated into a visible APP.

Visual Identity System (Aesthetic Integration)

The ArtVenture visual identity system was developed as a coherent aesthetic environment intended to support thematic immersion alongside gamified feedback. Rather than serving as mere decoration, the aesthetic specification was treated as an integral part of the gamified AR APP design.



Figure 7. The ArtVenture Logo

Branding and logo construction (see Figure 7) provided visual differentiation between the prototype versions without breaking the unity of the theme. The ArtVenture logo, developed through sketching and refinement, combines a geometric six-pointed star, signifying structural precision and AR technology, with a stylised ‘V’ signifying venture and directional focus. Significantly, colour treatment was the only visual cue distinguishing the two conditions: the gamified version used an amber accent to signify reward and progression, whereas the non-gamified version used a single colour to avoid activating reward-based schemas. This visual variation allows the two conditions to be clearly separated without changing the narrative or content structure.

Dadaism and Surrealism (Thematic Development)

The exterior of the Dadaism gallery (Figure 8), known as the Anti-Logic Archive, transforms the gallery into an industrial, dystopian landscape. The environment incorporates rusted metal panels, fragmented typography, graffiti-inspired visuals, warning signs, and anti-art symbols that reflect Dadaism’s rejection of traditional artistic conventions and rational thinking. The fortress-like structure creates a sense of disruption and disorder, visually communicating the movement’s spirit of rebellion, social criticism, and aesthetic defiance. These thematic features continue into the interior environment, where they organise the presentation of the learning content. The Dadaism interior preserves the industrial and fragmented style, using high-contrast, segmented displays that present the learner with chaos in a graded and ordered way.

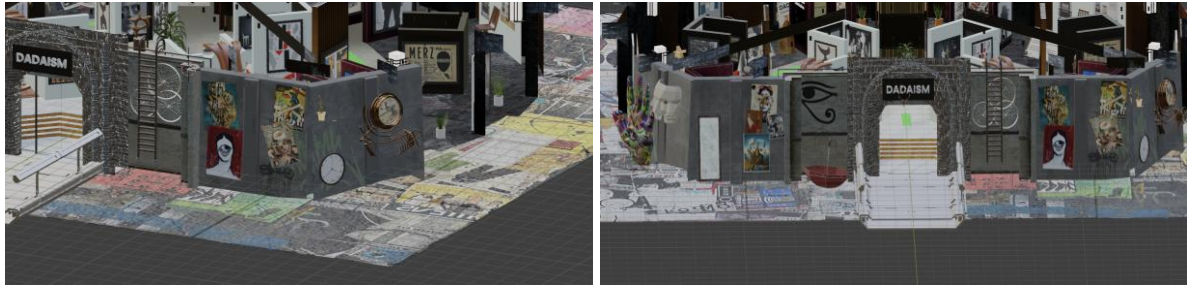


Figure 8. Dadaism Gallery (Exterior Look)

Meanwhile, the exterior of the Surrealism gallery (Figure 9) features a shifting floor pattern that transforms from a checkerboard into swirling shapes. It also contains seemingly impossible architectural features, which give the abstract idea of the subconscious a physical manifestation in space. These exterior features were designed to represent the complex artistic concepts of Surrealism spatially, through navigation within the digital environment.

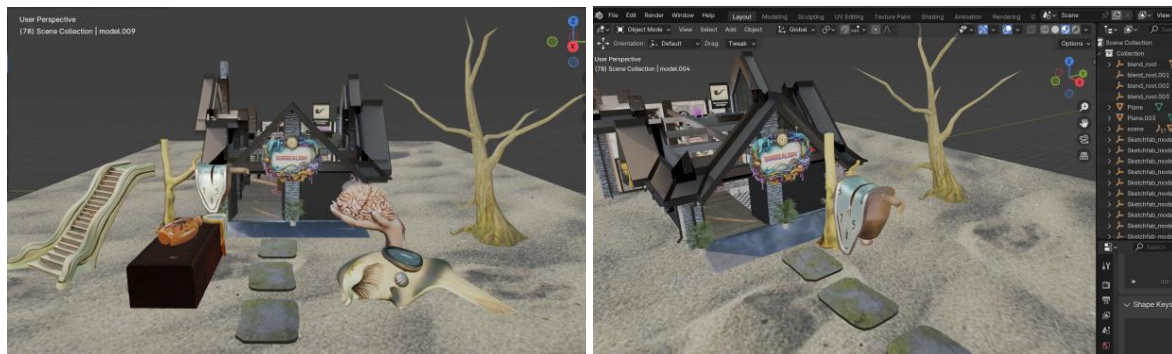


Figure 9. Surrealism Gallery (Exterior Look)

Stage 3: Development Process

The development phase involved a planned, multidisciplinary technical process that combined specialised asset production (3D modelling and texturing) with mobile application development in Unity to generate the preliminary APP.

Stages of Prototyping User Interface (UI)

The UI prototyping followed an iterative process, beginning with low-fidelity wireframes that captured both screen layouts and key user flows before progressing to higher-fidelity designs. The main goal of these wireframes was to capture the functional logic while avoiding the expense of detailed styling. This black-and-white phase enabled the team to establish the visual hierarchy and spatial organisation without considering colour or branding (Figure 10). The mock-ups played a key part in determining the relative sizes of the primary navigation tabs (such as Dashboard, Choices, and Profile) and of key gamification elements (such as the XP score and badge progress indicator). The design was then

progressively refined to improve fidelity, replacing placeholders with visual elements such as rounded buttons for better touch-target usability, card frames to group related content visually, and descriptive text fields to reduce cognitive load during navigation. A heuristic evaluation was then undertaken to confirm that the overall layout and spacing were appropriate. The evaluation identified several minor changes to the buttons, which were implemented before the visual styling and production coding were completed.



Figure 10. Wireframe of the APP

AR and UI Merging

The APP framework was developed in Unity, a modern development environment, to bring the different parts of the system together as a unified user experience. First, 3D models created in and exported from Blender were integrated into an ARCore-based markerless plane-detection system designed for Android platforms. Instead of relying on physical image targets, this system requires a well-lit physical space in which to scan and detect flat surfaces (indicated by yellow plane visuals). Once a suitable surface has been detected, the AR viewport is triggered and registers the 3D Dadaism or Surrealism gallery environment directly onto the physical classroom floor. These spatial elements were then combined with 2D screen overlays to form the interface. The authentication and navigation flow were coded in line with the operationalised flowchart. The Mode Selection Screen (gamified or non-gamified) is an obligatory entry point prior to the main menu. Only users entering the gamified version provide a pseudonymous Student ID, whereas users entering the non-gamified version proceed directly to the main menu without registration.

Game Mechanics Implementation

In the gamified version, points were awarded for eligible interactions and correct responses, badge thresholds were checked, and the performance data were recorded against the user's pseudonymous

Student ID in Firestore. A ‘Dual Mode Logic’ was added to regulate the operation and display of reward-based elements: in the non-gamified version, points, badges, and leaderboard positions are neither calculated nor displayed, whereas in the gamified version, points and badges are recorded under the pseudonymous Student ID and displayed on the shared leaderboard. This feature was implemented to enable future comparative studies of the gamified and non-gamified learning environments. Lastly, Social Metric Logging was implemented using a function that updates the shared pseudonymous Firestore leaderboard, recalculates player rankings, and refreshes the display in real time.

Quality Assurance for Initial Testing

This stage was intended to ensure the stability and reliability of the APP. An exploratory internal quality-assurance trial was conducted to identify technical issues associated with surface detection, environmental lighting, device compatibility, and object drift. The final step of the development process was to compile, package, and deploy the preliminary ArtVenture build to a mobile platform for the formative review and for use as the core intervention in subsequent formal studies.

Social Reinforcement and Status

The social reinforcement mechanism within the APP centres on individual achievement and social comparison rather than collaboration. It is implemented as a competitive Points-Badges-Leaderboard (PBL) system (Souropetsis & Kyza, 2025). Points for correct actions give immediate, granular feedback that reinforces task-level performance. Badges, on the other hand, are self-referenced: they mark milestones of progress and mastery but do not affect the leaderboard score, which may make them attractive to learners who collect them for their own satisfaction. The leaderboard provides a social-comparison feature by displaying pseudonymous rankings based on the points accumulated by learners. Collaborative mechanics are outside the scope of this PBL implementation, which keeps the focus on individual progress and choices.

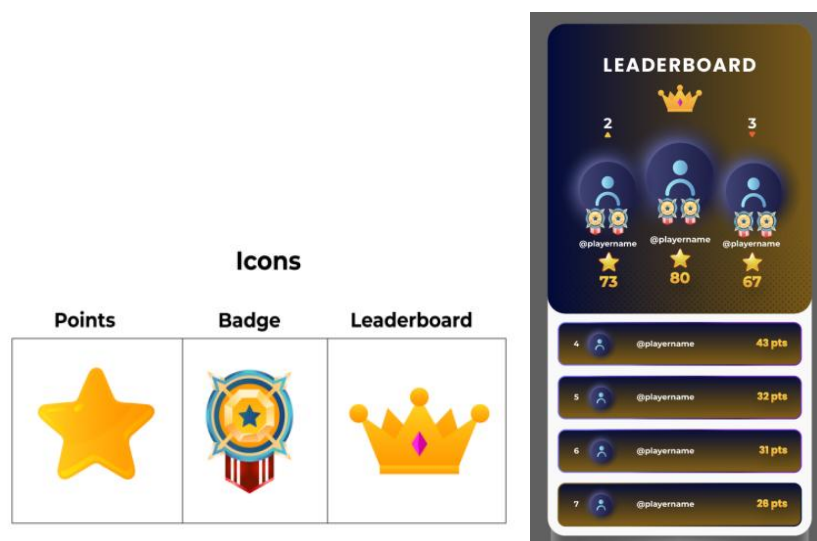


Figure 11. PBL Icons and Leaderboard

Preliminary Gamified AR APP Design

The development of ArtVenture resulted in a preliminary design system that translated the theory-informed design principles into a unified mobile application prepared for formative user testing (Figure 12). The preliminary APP screens demonstrate the integration of thematic aesthetics, typographic clarity, and the core functional logic established during prototyping.

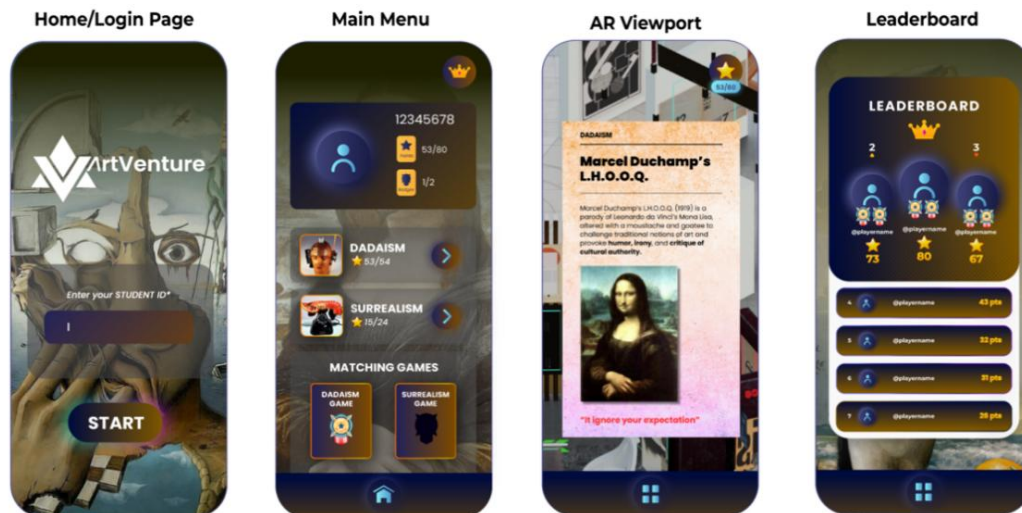
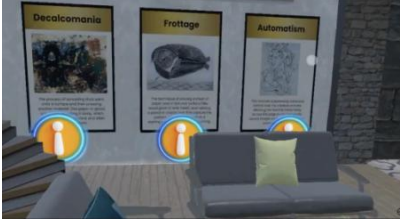
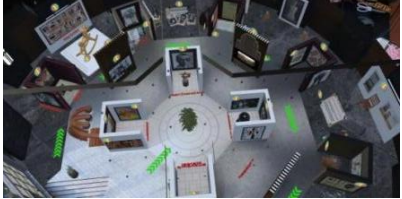


Figure 12. Preliminary UI Design of Gamified AR APP

Table 3 depicts the different angles and spaces of the Dadaism and Surrealism sections as they appear in the actual AR APP, featuring the exterior architecture and the interior gallery space.

Table 3. Interior and exterior angles/ sections

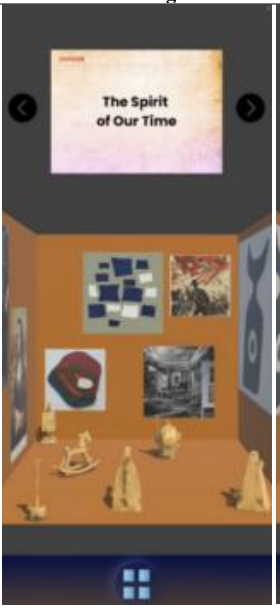
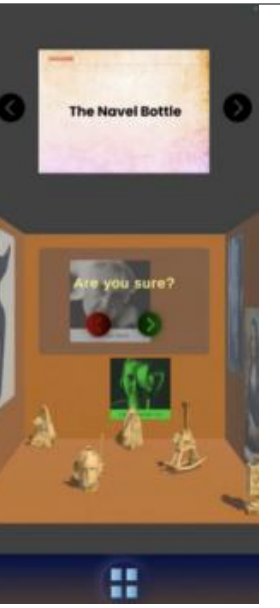
Section / Angle	Surrealism	Dadaism
Front View		
Video Display		
Sample Space View 1		

Sample Space View 2		
Sample Space View 3		
Top View		

Overview of the Matching Game Design

Table 4 shows the Dadaism and Surrealism matching-game activities, including the interactive elements and UI design of the matching-game interface implemented in the preliminary AR APP. A screen recording of the game flow is provided as supplementary material for a more detailed view.

Table 4. Sample Matching Game Design

Surrealism Matching Game View	Dadaism Matching Game View
	
	

Video-based Formative Review

Once the preliminary gamified AR APP had been developed, a formative pilot review was conducted with 11 diploma-level design students enrolled in the Diploma in Visual Communication programme at a private university in Malaysia. The participants were aged 18 to 19 years and were selected through convenience sampling. As the target users of the proposed APP, the participants had prior exposure to art and design history content and were considered suitable for providing preliminary feedback on the perceived design, usability, engagement potential, and educational relevance of the APP. Ethical approval was obtained from the institutional research committee (Reference No. RU-REC2025-014), and informed consent was obtained from all participants before data collection. In addition, the students were clearly informed that their participation in the pilot test would not affect their academic results.

The pilot test was conducted in two stages. First, participants were shown a demonstration video of the ArtVenture APP, including its AR environments, navigation structure, gamification features, and learning activities. It is important to note that the participants did not interact directly with the AR APP during this formative review; the findings therefore reflect their perceptions of the demonstrated prototype rather than experiences derived from hands-on use. Following the video presentation, participants were invited to discuss their perceptions of the APP in a semi-structured online interview. The interview protocol focused on students' perceptions of the APP's visual design, usability, engagement, learning experience, and suggestions for improvement. Each interview lasted approximately 15 to 20 minutes.

Interview data were de-identified, and access was restricted to the researchers. As the participants viewed a demonstration of the APP and did not register as users, no participant account or PBL data were collected during this formative review. Interview data were transcribed and analysed thematically following Braun and Clarke's (2006) method. The analysis comprised familiarisation with the data, initial coding, pattern recognition, theme development, refinement, and finalisation. Thematic analysis was chosen because it allowed the researchers to identify systematically the students' perceptions of the strengths, limitations, and opportunities for improvement of the preliminary ArtVenture prototype. Seven themes were identified through this process: perceived visual engagement potential, perceived usability, anticipated motivation and interest, perceived learning experience, visual design improvement priorities, technical improvement requests, and pedagogical support requests. Overall, participants perceived the demonstrated prototype as potentially engaging, interactive, and visually appealing (Table 5).

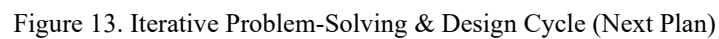
Table 5. Key Findings from the formative review of the demonstrated prototype

No.	Theme	Key Findings	Sample Quotes
1.	Perceived Visual Engagement Potential	Students perceived the AR environments as immersive, visually attractive, and different	“When I first saw it, it looked quite different from what we normally use in class. It caught my attention straight away.” (Student 1)

		from traditional classroom learning.	• “It seems like I am walking around inside a gallery instead of just looking at slides on PowerPoint.” (Student 4) • “The 3D environment makes the whole topic feel more interesting and easier to explore.” (Student 8)
2.	Perceived Usability	Students perceived the demonstrated navigation structure and interface controls as potentially easy to understand.	• “I don’t think it is difficult to use. It looks easy to understand.” (Student 2) • “It seems the navigation is quite straightforward. I could figure out where to go without much explanation from the video shown.” (Student 6)
3.	Anticipated Motivation and Interest	Gamified features were perceived as having the potential to increase interest and encourage exploration of historical content.	• “I normally would not be so interested in history topics, but this interests me in learning more about Dadaism and Surrealism.” (Student 3) • “It’s more fun than to listen to a regular class lecture as a whole class, I think.” (Student 5) • “It makes me want to keep investigating and discover what else is going to happen.” (Student 10)
4.	Perceived Learning Experience	Students anticipated that self-paced exploration and integrated presentation of artworks and information could support their learning experience.	• “I think it’s easier to remember the information when I can interact with it instead of just reading.” (Student 1) • “Seeing the artworks and information together helped me understand how the concepts are connected.” (Student 11)
5.	Visual Design Improvement Priorities	Some students felt that parts of the environments appeared dark, crowded, or visually monotonous.	• “Some parts of the environment feel a bit dark. Maybe it could be brighter.” (Student 4) • “There are quite a lot of objects in some areas, so it feels a bit crowded.” (Student 8) • “Maybe adding a bit more colour could make the gallery look more attractive.” (Student 10)
6.	Technical Improvement Requests	Students suggested improvements to audio quality and raised concerns about performance stability during actual use.	• “The audio from the video is okay, but I think it could be clearer.” (Student 2) • “If the performance was stable in actual interaction, I think the overall experience would be better.” (Student 9)
7.	Pedagogical Support Requests	Students requested more guidance, explanations, storytelling elements, animations, and quizzes.	• “I think having more explanations would help me understand the content better.” (Student 3) • “Maybe there could be more guidance while exploring the gallery.” (Student 7) • “From the video shown, the learning would be made more interesting by small games throughout the tour.” (Student 11)

Overall, the formative review provided preliminary indications that students perceived the proposed gamified AR design as a potentially suitable educational approach for teaching and learning art and design history. In general, students were positive about the demonstrated immersive gallery environment, the self-paced exploration, and the interactive learning activities. This suggests that the initial design may have addressed several of the issues identified in the preliminary lecturer consultations. The formative feedback also revealed areas for improvement, particularly concerning pedagogical scaffolding, anticipated surface-detection stability, audio quality, and visual quality. These findings will inform the refinement of the prototype and guide future iterations of ArtVenture before larger-scale implementation and evaluation.

The results of the formative review suggest that ArtVenture, as an educational technology, has the potential to support the teaching and learning of art and design history through a theory-informed gamified AR design in the classroom context. The APP is designed to provide students with opportunities for self-directed exploration while incorporating design features informed particularly by the needs for autonomy and competence. Relatedness was not directly incorporated into the current preliminary prototype, and the shared leaderboard serves primarily as a social-comparison feature. Methodologically, this study documents a preliminary framework for the design and development of gamified AR APPs in art and design history education. Pedagogically, it offers a preliminary prototype and practical reference for educators seeking to modernise the design curriculum through immersive and interactive learning experiences.



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References

- [1] Argueta-Muñoz, F. D., Olvera-Cortés, H. E., Durán-Cárdenas, C., Hernández-Gutiérrez, L., & Gutierrez-Barreto, S. E. (2023). Instructional design and its usability for branching model as an educational strategy. *Cureus*, 15(5), e39182. <https://doi.org/10.7759/cureus.39182>
- [2] Baloian, N., Biella, D., Luther, W., Pino, J., & Sacher, D. (2021). Designing, realizing, running, and evaluating virtual museum: A survey on innovative concepts and technologies. *JUCS - Journal of Universal Computer Science*, 27(12), 1275–1299. <https://doi.org/10.3897/jucs.77153>
- [3] Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- [4] Briggs, J. A., & DeLosa, N. (2023). Art education and visual literacy: Putting theory into practice. *Journal for Learning through the Arts*, 19(1). <https://doi.org/10.21977/D919154522>
- [5] Buchner, J., Buntins, K., & Kerres, M. (2022). The impact of augmented reality on cognitive load and performance: A systematic review. *Journal of Computer Assisted Learning*, 38(1), 285–303. <https://doi.org/10.1111/jcal.12617>
- [6] Chiang, J. (2025). A conceptual eighteen crucial factors development of self-determination theory in practice of online learning environment. *Education and Information Technologies*, 30(8), 10023–10038. <https://doi.org/10.1007/s10639-024-13227-4>
- [7] Choudhary, Y. (2023). Augmented reality in education. *International Journal for Research in Applied Science and Engineering Technology*, 11(11), 1830–1836. <https://doi.org/10.22214/ijraset.2023.56965>
- [8] Cuendet, S., Bonnard, Q., Do-Lenh, S., & Dillenbourg, P. (2013). Designing augmented reality for the classroom. *Computers & Education*, 68, 557–569. <https://doi.org/10.1016/j.compedu.2013.02.015>
- [9] Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Plenum Press. <https://doi.org/10.1007/978-1-4899-2271-7>
- [10] Deci, E. L., Koestner, R., & Ryan, R. M. (2001). Extrinsic rewards and intrinsic motivation in education: Reconsidered once again. *Review of Educational Research*, 71(1), 1–27. <https://doi.org/10.3102/00346543071001001>
- [11] Georgiou, Y., & Kyza, E. A. (2021). Bridging narrative and locality in mobile-based augmented reality educational activities: Effects of semantic coupling on students' immersion and learning gains. *International Journal of Human-Computer Studies*, 145, 102546. <https://doi.org/10.1016/j.ijhcs.2020.102546>
- [12] Gupta, P., & Goyal, P. (2022). Is game-based pedagogy just a fad? A self-determination theory approach to gamification in higher education. *International Journal of Educational Management*, 36(3), 341–356. <https://doi.org/10.1108/IJEM-04-2021-0126>

- [13] Harackiewicz, J. M., Smith, J. L., & Priniski, S. J. (2016). Interest matters: The importance of promoting interest in education. *Policy Insights from the Behavioral and Brain Sciences*, 3(2), 220–227. <https://doi.org/10.1177/2372732216655542>
- [14] Hein, C., & van Dooren, E. (2020). Teaching history for design at TU Delft: Exploring types of student learning and perceived relevance of history for the architecture profession. *International Journal of Technology and Design Education*, 30, 849–865. <https://doi.org/10.1007/s10798-019-09533-5>
- [15] Huang, W., Li, X., & Shang, J. (2022). Gamified project-based learning: A systematic review. *Lecture Notes in Computer Science*, 313–324. https://doi.org/10.1007/978-3-031-08939-8_27
- [16] Ivarson, E., Erlandsson, V., Faraon, M., & Khatib, S. (2024). Augmented reality and gamification in higher education: Designing mobile interaction to enhance students' motivation and learning. *E-Learning and Digital Media*, 22(6), 571–590. <https://doi.org/10.1177/20427530241239981>
- [17] Jesionkowska, J., Wild, F., & Deval, Y. (2020). Active learning augmented reality for STEAM education: A case study. *Education Sciences*, 10(8), 198. <https://doi.org/10.3390/educsci10080198>
- [18] Jiménez-Valverde, G., Fabre-Mitjans, N., Heras-Paniagua, C., & Guimerà-Ballesta, G. (2025). Tailoring gamification in a science course to enhance intrinsic motivation in preservice primary teachers. *Education Sciences*, 15(3), 300. <https://doi.org/10.3390/educsci15030300>
- [19] Khaldi, A., Bouzidi, R., & Nader, F. (2023). Gamification of e-learning in higher education: a systematic literature review. *Smart Learning Environments*, 10(1). <https://doi.org/10.1186/s40561-023-00227-z>
- [20] Koumpouros, Y. (2024). Revealing the true potential and prospects of augmented reality in education. *Smart Learning Environments*, 11(1). <https://doi.org/10.1186/s40561-023-00288-0>
- [21] Kristianto, T. A., Ekasiwi, S. N. N., Arifianto, D., Ardianto, O. P. S., & Budianto, C. A. (2021). Digital geometry for virtual museum based on field studies. *IOP Conference Series Earth and Environmental Science*, 738(1), 012026. <https://doi.org/10.1088/1755-1315/738/1/012026>
- [22] Landers, R. N. (2014). Developing a theory of gamified learning. *Simulation & Gaming*, 45(6), 752–768. <https://doi.org/10.1177/1046878114563660>
- [23] Li, M., Ma, S., & Shi, Y. (2023). Examining the effectiveness of gamification as a tool promoting teaching and learning in educational settings: a meta-analysis. *Frontiers in Psychology*, 14, 1253549. <https://doi.org/10.3389/fpsyg.2023.1253549>
- [24] Logayah, D. S., Salira, A. B., Rakhman, M. A., Darmawan, R. A., & Heryanto, F. N. (2025). Enhancing students historical thinking based on augmented reality (AR) media in social studies. *International Journal of Social Learning (IJSL)*, 5(2), 442–459. <https://doi.org/10.47134/ijsl.v5i2.402>
- [25] Malaysian Qualifications Agency. (2021). *Programme standards: Art and design* (2nd ed.). Malaysian Qualifications Agency.

- [26] Meggs, P. B., & Purvis, A. W. (2016). *Meggs' history of graphic design*. John Wiley & Sons.
- [27] Meng, C., Zhao, M., Pan, Z., Pan, Q., & Bonk, C. J. (2024). Investigating the impact of gamification components on online learners' engagement. *Smart Learning Environments*, 11(1). <https://doi.org/10.1186/s40561-024-00336-3>
- [28] Najjar, E. A., & Salhab, R. A. (2022). Position paper: Gamification in the learning process. *International Journal of Online and Biomedical Engineering (iJOE)*, 18(01), 148–153. <https://doi.org/10.3991/ijoe.v18i01.26609>
- [29] Özgüleş, M., Kalman, M., Özyurt, M., & Şahin, S. (2021). Exploring student perceptions and experiences of different teaching and learning approaches in architectural history education: A comparative case study. *Learning Environments Research*, 24, 269–297. <https://doi.org/10.1007/s10984-020-09328-9>
- [30] Paas, F., Renkl, A., & Sweller, J. (2003). Cognitive load theory and instructional design: Recent developments. *Educational Psychologist*, 38(1), 1–4. https://doi.org/10.1207/s15326985ep3801_1
- [31] Parsazadeh, N., & Cheng, P. (2025). Meaningful mobile learning framework to improve learning performance of natural science students. *Journal of Educational Technology Systems*, 54(2), 452–476. <https://doi.org/10.1177/00472395251363636>
- [32] Putz, L., Hofbauer, F., & Treiblmaier, H. (2020). Can gamification help to improve education? Findings from a longitudinal study. *Computers in Human Behavior*, 110, 106392. <https://doi.org/10.1016/j.chb.2020.106392>
- [33] Rowe, A. (2025). A necessary shift in design education: from outputs to outcomes. *International Journal of Art & Design Education*, 44(1), 4–17. <https://doi.org/10.1111/jade.12521>
- [34] Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, 61, 101860. <https://doi.org/10.1016/j.cedpsych.2020.101860>
- [35] Sayre, E. C. (2023). Design-based research. In *Research: A Practical Handbook*. <https://handbook.zaposa.com/articles/design-based-research/>
- [36] Skulmowski, A., & Xu, K. M. (2022). Understanding cognitive load in digital and online learning: A new perspective on extraneous cognitive load. *Educational Psychology Review*, 34(1), 171–196. <https://doi.org/10.1007/s10648-021-09624-7>
- [37] Smirani, L., & Yamani, H. (2024). Analysing the impact of gamification techniques on enhancing learner engagement, motivation, and knowledge retention: A structural equation modelling approach. *The Electronic Journal of e-Learning*, 22(9), 111–124. <https://doi.org/10.34190/ejel.22.9.3563>
- [38] Souropetsis, M., & Kyza, E. A. (2025). COMPARE: Design and development of a gamified augmented reality learning environment for cultural heritage sites. *Journal on Computing and Cultural Heritage*, 18(1), Article 6, 1–16. <https://doi.org/10.1145/3703917>

- [39] Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, 12(2), 257–285. [https://doi.org/10.1016/0364-0213\(88\)90023-7](https://doi.org/10.1016/0364-0213(88)90023-7)
- [40] Sweller, J., Van Merriënboer, J. J. G., & Paas, F. (2019). Cognitive architecture and instructional design: 20 years later. *Educational Psychology Review*, 31(2), 261–292. <https://doi.org/10.1007/s10648-019-09465-5>
- [41] Tagie, G., Merman, H., Taharuddin, N. S., & Ibrahim, N. A. (2022). Gamification in art and design appreciation. *Kupas Seni*, 10, 93–103. <https://doi.org/10.37134/kupasseni.vol10.sp.2.9.2022>
- [42] Tang, Y., & Misri, I. B. (2025). Exploring surrealist approaches in digital media art for enhancing graphic and visual communication design. *Journal of Humanities, Music and Dance*, 5(1), 1–14. <https://doi.org/10.55529/jhmd.51.1.14>
- [43] The Design-Based Research Collective. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher*, 32(1), 5–8. <https://doi.org/10.3102/0013189x032001005>
- [44] Triantafyllou, S. A., Georgiadis, C., & Sapounidis, T. (2025). Gamification in education and training: A literature review. *International Review of Education*, 71(3), 483–517. <https://doi.org/10.1007/s11159-024-10111-8>
- [45] Weng, C., Tran, K. N. P., Yang, C., Huang, H., & Chen, H. (2024). Can an augmented reality-integrated gamification approach enhance vocational high school students' learning outcomes and motivation in an electronics course? *Education and Information Technologies*, 29(4), 4025–4053. <https://doi.org/10.1007/s10639-023-11966-4>
- [46] Wong, S., Idris, M. Z., & Tan, W. (2020). The perceived level of importance of competency constructs for future graphic design graduates in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, 10(11). <https://doi.org/10.6007/ijarbss/v10-i11/7952>
- [47] Wong, S., Idris, M. Z., & Tan, W. (2021). Identifying competencies for future graphic design graduates in Malaysia: A Delphi study. *Journal of Graphic Engineering and Design*, 12(3), 13–23. <https://doi.org/10.24867/jged-2021-3-013>
- [48] Wood, K., & Drew, S. (2025). Aligning gamified learning experiences to learning outcomes. *International Journal of Changes in Education*, 2(3), 181–190. <https://doi.org/10.47852/bonviewijce52023413>
- [49] Xi, N., & Hamari, J. (2019). Does gamification satisfy needs? A study on the relationship between gamification features and intrinsic need satisfaction. *International Journal of Information Management*, 46, 210–221. <https://doi.org/10.1016/j.ijinfomgt.2018.12.002>
- [50] Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *Educational Research Review*, 30, 100326. <https://doi.org/10.1016/j.edurev.2020.100326>

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