Playing to Learn: Designing Diegetic Onboarding for Creative Software

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Creativity Support Tools (CSTs) often offer rich yet complex features, making onboarding overwhelming for novice learners. While prior research has explored interactive tutorials to ease the learning curve, less work has examined gameful approaches such as diegetic tutorials to support early engagement. To address this gap, we examine the use of diegetic onboarding, using a novel multimodal game-based prototype for Unreal Engine as our case study. Our prototype uses Unreal Engine to apply diegetic onboarding, introducing key software features such as manipulating visuals and sound, and navigating interactions. A mixed-methods preliminary evaluation evaluated the system by gathering feedback from seven experts, including three professional game developers and four educators, to collect useful insights on the onboarding experience 'by proxy' to assess the tools' readiness for use with novice learners. Our findings suggest that diegetic onboarding can provide a more immersive and engaging entry point for learning, while illustrating key design tensions around clarity, pacing, and the transfer of knowledge from play to tool use. From these preliminary insights, we suggest design implications combining both usability and instructional design strategies for developing more approachable and inclusive creative software onboarding experiences.

Creativity Support Tools, Software onboarding, Learning, Play, User experience, Game engines

1. INTRODUCTION

Creativity Support Tools (CSTs) (i.e., interactive systems designed to support the generation, exploration, and externalization of creative ideas such as Adobe Photoshop and Unreal Engine) largely focus on features and affordances that enable rapid iteration and documentation during creative practice (Resnick et al. 2005; Shneiderman 2007, 2008). However, this emphasis on expert use can create challenges for novices, who must learn the tool while simultaneously engaging in creative tasks under substantial cognitive demand (Davis et al. 2013). Although onboarding is critical in addressing this tension, it remains underexamined in CSTs. Many systems, such as Unreal Engine, rely on external documentation, UI overlays, and video tutorials (Epic Games 2025a; Unity 2025). While effective for communicating procedural steps, these resources are often detached from the context of use, potentially hindering conceptual understanding and long-term skill retention (Cao and Liu 2022; White 2014; Carroll 1990).

Diegetic and situated approaches are promising alternative to the more procedural onboarding methods described above (White 2014; Cao and Liu 2022; Kuhne 2024). Diegetic onboarding embeds instructional content within the interactive environment, while situated learning emphasizes knowledge construction through context-dependent interaction. However, these approaches remain underexplored in complex CSTs (Cao and Liu 2022). This gap has prompted calls for more experiential

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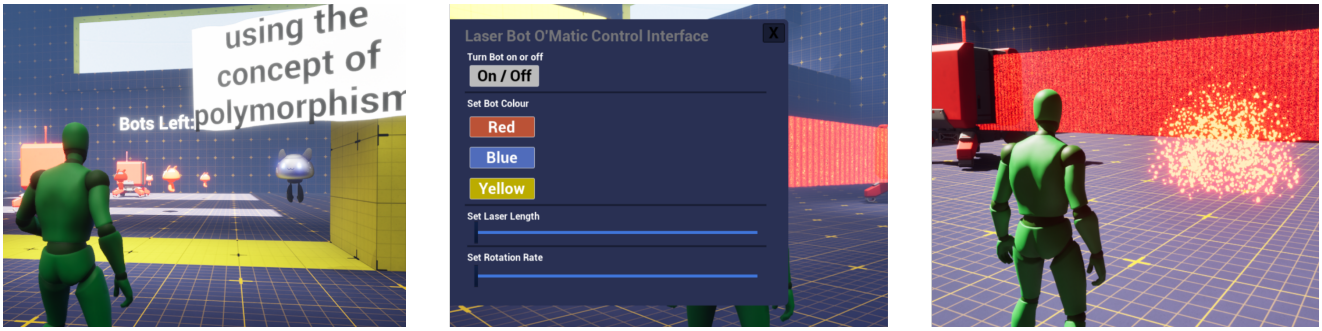

Figure 1: *Diegetic onboarding prototype in Unreal Engine. Left: tutorial space introducing object-oriented design concepts. Center: interactive control panel for manipulating bot behavior. Right: immediate environmental feedback following user input.*

forms of onboarding, where learning emerges through interaction rather than external instruction (Brown et al. 1989; Fagerholt and Lorentzon 2009; Kuhne 2024). To examine the use of diegetic onboarding in CST interaction, we take Unreal Engine (UE) as our case study. As a professional game engine with subsystems for rendering, physics, animation, and scripting, UE presents a dense interface that can overwhelm novices. Effective use requires accurate mental models to anticipate system behaviour and recover from errors (Norman 2016). Without these, users may struggle with cause-and-effect relationships, leading to frustration and inefficiency (Nielsen Norman Group 2024). Diegetic tutorials offer a potential response by embedding guidance directly within the environment, supporting situated interaction (Fagerholt and Lorentzon 2009; White 2014).

This paper presents a proof-of-concept (PoC) prototype for diegetic onboarding in UE. We evaluate the PoC through a mixed-methods expert review. We chose to conduct an expert review to gather feedback 'by proxy' (Ford and Nash 2020) the PoC's readiness for later use in novice learning settings; without preliminary evaluation, the PoC could disrupt learning or demotivate novice users. From this preliminary evaluation, we identify design opportunities for embedding situated instruction in complex CSTs and outline implications for future onboarding design.

2. BACKGROUND

Creativity Support Tool research has long focused on enabling exploration, iteration, and the externalization of ideas through interactive systems (Shneiderman 2007, 2008). In practice, many CSTs prioritize expert use, emphasizing expressive power and rapid production over ease of entry. This creates a challenge for novices, who must learn the tool while engaging in creative work (Davis et al. 2013; Resnick et al. 2005). In professional tools such as Unreal Engine, this challenge is especially acute during onboarding, which typically relies on documentation, video tutorials, and overlay-based guidance (Unity 2025; White 2014). These forms of instruction are separated from action, requiring users to translate abstract information into practice (Carroll 1990), increasing cognitive load and hindering the formation of coherent mental models (Norman 2013; Sweller 2011; Green and Petre 1996). Learning theories help explain this limitation. Situated cognition and experiential learning (Kolb 2014) both emphasize that understanding develops through action in context, suggesting that onboarding decoupled from use is misaligned with how knowledge develops. While HCI research has explored these ideas through interactive tutorials, their application in complex creative software remains limited.

Game design research has more directly explored this alignment between instruction and interaction (White 2014; Benvenuti et al. 2023). Diegetic approaches embed guidance within the environment rather than presenting it as a separate instructional layer (Fagerholt and Lorentzon 2009), collapsing the distance between learning and doing that characterizes externalized onboarding. Empirical work supports this direction: in-world guidance has been shown to promote engagement and comprehension by enabling learning through interaction and feedback rather than explicit instruction (Cao and Liu 2022; Khazanehdarloo and Mohamed 2023; Kuhne 2024). However, this body of work has developed almost exclusively within entertainment contexts, where experiences are bounded, authored, and designed primarily to sustain player engagement. CSTs further pose a fundamentally different challenge: users must develop not only procedural fluency but transferable conceptual understanding of system behavior that generalizes across tasks and projects. For tools such as UE, effective use depends on accurate mental models of how objects, properties, and subsystems interact—an understanding that entertainment-oriented diegetic design has not been required to support.

Diegetic onboarding hence represents a promising but untested direction for creative software: embedding guidance within a complex 3D environment may support mental model formation through contextualized interaction, yet may equally introduce extraneous cognitive demands for novices already navigating an unfamiliar system (Sweller 2011). Prior work establishes the potential of situated, diegetic instruction for supporting engagement and learning, but leaves open whether and under what design conditions it can effectively scaffold conceptual understanding in creativity support contexts.

3. ARTIFACT DEVELOPMENT

3.1. Design Considerations and Goals

We developed a PoC onboarding game in UE (Epic Games 2025b) that introduced foundational object-oriented design (OOD) concepts which novice users typically learn when starting to use game engines through diegetic instructional elements (see Figure 2). Our design was informed by the Cognitive Theory of Creativity Support Tools (Davis et al. 2013), which distinguishes between a user's conceptual knowledge of a creative domain and their knowledge of how to execute that idea within a given tool. Davis et al. (2013) argue that novices often possess the former but lack the latter, and support tools should therefore minimize the technical burden of operating the tool itself, allowing novices to begin exploring a domain immediately rather than first having to master its mechanics. This distinction maps directly onto our onboarding context: our users may understand what an object, class, or method conceptually represents while having no experience translating that understanding into action within UE's interface. Accordingly, our design sought to maintain a low threshold for entry while preserving opportunities for playful engagement and interactive learning, operationalized through three design goals:

1. Lower the perceptual and cognitive barrier to entry for creative software.
2. Enable rapid recognition and interpretation of interactive elements.
3. Support immediate engagement without reliance on external instruction.

To meet these goals, we prioritized clarity and consistency across the interface, adopting a simplified mock-prototype aesthetic with clean forms, limited visual noise, and consistent iconography. Drawing on Norman's concept of visceral design (Norman 2013), we used a cohesive visual language such as high-contrast colors and stylized robotic characters to shape positive first impressions, reduce ambiguity in identifying diegetic elements, and make the environment feel approachable to first-time users. Abstract OOD concepts were presented through recognizable and manipulable visual forms, scaffolding understanding through direct interaction rather than formal instruction (see Figure 1).

3.2. Design Details

Drawing on Norman's mental model framework (Norman 2003), the prototype was also structured around iterative cycles of action and feedback, allowing participants to manipulate in-world systems, observe outcomes, and internalize conceptual relationships through direct interaction rather than abstract instruction. Our approach thus aligns with situated cognition (Brown et al. 1989; Davis et al. 2013), in which knowledge is constructed through playful interactions.

The environment was organized into three sequential sections, each scaffolding understanding through progressively open-ended play. The PoC incorporated six diegetic onboarding elements across these sections: three NPCs delivering in-world instructional text, three interactive interfaces for modifying environmental properties, and one environmental cue using spatial positioning and visual contrast to direct attention. The first section served as an orientation phase (Figure 2). A non-playable character (NPC) introduced the learning context and objective, specifically, the concept of polymorphism before directing the user toward the next task (see Figure 2). The NPC functioned as an instructional anchor, embedding guidance within the game world rather than delivering it through external documentation. The second section shifted from guided orientation to active experimentation. Users interacted with a "laser bot", with environmental design guiding behavior through implicit constraints: a visible barrier signaled the need for interaction before progression was possible. Upon engaging the bot, users accessed a graphical interface to modify system properties. This interface mirrored familiar game UI conventions, reducing cognitive load and enabling users to engage with polymorphism by manipulating properties such as color, laser length, and rotation speed rather than through abstract code-level understanding. Changes produced immediate, real-time environmental responses, establishing clear cause-and-effect relationships that supported mental model formation through direct feedback. The third section built on this foundation by introducing goal-oriented tasks. Following Schell's concept of the system as "toy" (Schell 2010), the environment encouraged open-ended experimentation while incorporating structured objectives such as configuring laser bots to destroy targets. The experience combined intrinsic

feedback (visual changes, system responses) with minimal extrinsic cues (NPC prompts, completion signals), maintaining engagement without reliance on text-based instruction. Progression was lightly constrained throughout: early interactions scaffolded later tasks through repeated interaction patterns of increasing complexity, with each section requiring engagement while preserving space for exploratory behavior.

4. FORMATIVE STUDY WITH GAME EXPERTS

4.1. Participants & Data Collection

We conducted a preliminary expert review (Korhonen et al. 2009; Vermeeren et al. 2010) with seven participants to examine the perceived suitability of the prototype for supporting novice users' formation and refinement of mental models during onboarding. Following the 'by proxy' approach described by Ford and Nash (2020) the study was intended as a formative evaluation of the design prior to direct evaluation with novice users. We decided to initially conduct an expert review as we wanted to identify preliminary feedback on our prototype quickly to ensure the tool's readiness for use in novice learning settings; research activity with an untested tool could disrupt, or even demotivate, novice learners if deployed prematurely. This method thus allows us to understand educators' perspectives in designing suitable digital game experiences to enhance learners' experiences.

Through social media, we recruited three game industry professionals and four game design and development educators, all experienced in training novices to use Unreal Engine (see Table B). Each participant received a link to the hosted PoC, which they explored independently. Although the session was estimated at 20 minutes, no time limit was imposed, allowing participants to engage at their own pace.

Following playtesting, participants completed an online survey. Prior to the experiment, we obtained ethics approval for PGT coursework from Falmouth University. The survey comprised two sections. The first was a modified 7-point User Experience Questionnaire (UEQ) (Laugwitz et al. 2008), measuring attractiveness, ease of use, efficiency, stimulation, and novelty. Dependability items were excluded, as the single-session, short design did not support a meaningful evaluation of reliability or consistency. Including these measures risked invalid responses due to limited interaction time. As the full UEQ item set was not used, benchmark comparisons were omitted, consistent with formative evaluation practices using modified instruments (Laugwitz et al. 2008; Schrepp et al. 2017). The second survey section included eight open-ended questions on participant experience, clarity, and suggested improvements. Given the small sample size and exploratory nature of this evaluation, the analysis was primarily qualitative and formative (Rode et al. 2024). Quantitative UEQ responses are reported descriptively to characterize broad usability patterns, while qualitative responses were analyzed using affinity mapping (Lucero 2015) to highlight game experts' insights into our diegetic onboarding design. We discuss key findings in the following section.

4.2. Preliminary Results and Discussion

The UEQ scores suggest that educators experienced the prototype as novel, understandable, and engaging, while also revealing tensions around efficiency and visual coherence. The three highest-rated dimensions align with the prototype's core design intent. Novelty received the strongest rating (M = 4.80, SD = 0.50), with low variance; this suggests broad agreement that the diegetic approach of our PoC was different to more familiar methods of CST onboarding. Perspicuity was also rated highly (M = 4.70, SD = 0.98), suggesting that participants were generally able to infer instructional intent and proceed without external support in our PoC; this corroborates situated learning accounts where understanding emerges through contextual interaction rather than explicit instruction (Brown et al. 1989; Kolb 2014), however, the wide variance suggests this might depend on external factors. Stimulation scored similarly (M = 4.60, SD = 0.84), aligning with prior work suggesting that diegetic cues sustain intrinsic motivation and engagement (Fagerholt and Lorentzon 2009; Norman 2003).

The two lower-rated dimensions illustrate a design tension in the use of embedded instruction in our gaming prototype. Efficiency (M = 4.20, SD = 1.47) showed the greatest variance of any UEQ dimension, suggesting that, while environmental embedding might have supported immersion, it also introduced ambiguity around task boundaries and progression. We observed this occurred especially when cues were insufficiently explicit. Attractiveness received the lowest overall rating (M = 3.90, SD = 1.21). In diegetic onboarding, we suggest that aesthetic quality is not merely a matter of appeal but of instructional coherence: when guidance is embedded in the environment, visual polish directly shapes how reliably users interpret that environment as a learnable system. This aligns with research on the aesthetic-usability effect, which suggests that perceived visual quality influences users' tolerance for interactional friction (Tractinsky et al. 2000).

Qualitative findings further help to corroborate the UEQ findings above. Four themes were identified from affinity mapping (Lucero 2015). Firstly, Difficulty noticing and sustaining attention on instructional cues, secondly Uncertainty around navigation, progression and task completion, thirdly Difficulty interpreting abstract concepts during early tasks, and fourthly Frustration caused by disproportionate consequences for minor mistakes.

Due to the scope, we report here our highlights. First, participants reported difficulty noticing or sustaining attention on floating NPC dialogue; some missed early instructions after falling behind the guiding character. We suggest this illustrates a tension in diegetic design between maintaining environmental coherence and ensuring users' attention. Perhaps, critical guidance could require more complementary support – such as spatial audio, persistent markers, or hybrid diegetic/non-diegetic cues – to ensure key information is not lost to environmental noise (Fagerholt and Lorentzon 2009). Second, participants expressed uncertainty about where to go and whether tasks had been completed, particularly at the beginning of the experience. The relationship among action, progress, and completion was not always sufficiently legible in our PoC, suggesting that diegetic onboarding may still require explicit mechanisms to communicate progress and task closure, even when instruction is embedded in the environment. Third, early tasks were described as abstract and difficult to interpret, suggesting that diegetic cues may be more effective for reinforcing an emerging mental model than for introducing unfamiliar concepts at the outset. We suggest that this illustrates the value of a scaffolding structure, where early interactions provide stronger guidance before progressively shifting interpretive responsibility to the environment. Finally, participants found disproportionate consequences for minor mistakes to be frustrating. Small errors could trigger full resets, redirecting attention from exploration to error recovery. Because high-cost failure increases extraneous cognitive load (Sweller 2011), this dynamic is misaligned with the exploratory learning conditions that diegetic onboarding seeks to support. More forgiving recovery paths may be essential for sustaining experimentation during early learning.

The findings above illustrate the CST tension between accessibility and expressive power (Resnick et al. 2005; Shneiderman 2007) within diegetic onboarding methods. The high perspicuity and stimulation scores could suggest that participants begin forming mental models without extensive prior knowledge, aligning with Davis et al. (2013) argument that creativity support should facilitate understanding through action rather than abstraction. This is particularly poignant as our participants already had familiarity with Unreal, yet still needed to form a mental model of our prototype and its teaching concepts. However, variability in efficiency and the qualitative themes around signposting and ambiguity might indicate that diegetic embedding does not inherently resolve the clarity challenges it seeks to address per se, rather, it redistributes them. Instead of residing in interface conventions or technical terminology, we suggest that complexity shifts into the interpretation of environmental cues. This redistribution is consistent with distributed cognition perspectives (Norman 2013), but introduces perceptual demands distinct from those of traditional onboarding and requires deliberate design attention (Green and Petre 1996).

Further, the results illustrate the relevance of situated and experiential learning frameworks for creative software onboarding (Brown et al. 1989; Kolb 2014), while simultaneously exposing their limits, within the context of our prototype. Participants engaged productively with tasks that reinforced emerging understanding but struggled with early interactions in which foundational concepts had not yet been established. This suggests that experiential approaches could be more effective for consolidating mental models than for initiating them. Effective diegetic systems may therefore require a structure where early interactions provide explicit scaffolding before progressively shifting interpretive responsibility (Carroll 1990) to the environment, consistent with CST principles of progressive disclosure (Davis et al. 2013).

Together our research suggests that diegetic onboarding is best understood as part of a hybrid strategy rather than a replacement for traditional instruction. The observed issues with missed cues and unclear task boundaries illustrate that, within our case study context, fully diegetic systems could benefit from further scaffolding. For example, spatial audio, persistent markers, or selective non-diegetic overlays could further support attention and comprehension when used alongside diegetic onboarding. In this sense, the design challenge is not whether to combine diegetic and non-diegetic elements, but how to calibrate their relationship so that critical content remains perceptible while preserving the situated qualities that make diegetic onboarding distinctive. The prototype's toy-like framing encouraged experimentation and reduced perceived barriers, supporting Deterding (2015)'s argument that gameful mechanics are most effective when intrinsically meaningful. However, this study suggests that playful interaction must be carefully structured to support, rather than obscure, learning

objectives. Future work should investigate through longitudinal studies with novice users.

5. DESIGN IMPLICATIONS

The positive scores across perspicuity, stimulation, and novelty suggest that embedding instructional cues within an interactive environment resonates with users' expectations of active, contextual, exploratory learning (Brown et al. 1989; Kolb 2014). However, recurring themes of missed cues, signposting failures, and conceptual confusion point to a core tension: as spatial freedom and environmental immersion increase, the capacity to direct user attention to specific instructional content decreases. Cognitive load theory (Sweller 2011) predicts that distributing information across 3D space increases navigational effort, competing with conceptual learning. Diegetic onboarding can be understood as a form of embodied, situated creativity support that seeks to make the act of learning continuous with the act of creating. If successful, this could reduce attentional overhead during skill acquisition and allow users to direct creative energy toward expressive work earlier. The present results suggest this aspiration is achievable but requires more precise attention to perceptual salience, cognitive pacing, and conceptual scaffolding than the current PoC achieved. Future iterations should consider adaptive signposting such as proximity triggers, audio cues, and contextual prompts to ensure instructional content is reliably perceived without disrupting interactive immersion.

5.1. Limitations and Future Work

Several limitations should be considered. First, the small sample of expert participants limits the generalizability of the findings to novice users, who are the intended audience for onboarding systems. As experts bring prior domain knowledge, they may interpret diegetic cues more easily and experience less cognitive difficulty than beginners. There is a clear need for future work that examines diegetic onboarding for novice Unreal Engine users. Second, the asynchronous study design prevented direct observation of participants' in-session behavior. As a result, the study offers limited insight into how participants navigated the prototype and responded to onboarding cues in real time. Future research could address this through think-aloud protocols or screen-recording methods. Finally, given the study's exploratory scope, design variables such as level layout, lighting, color, and visual hierarchy were not systematically controlled. These factors may have influenced attention and comprehension independently of the diegetic elements under investigation. More controlled comparative studies are therefore needed to isolate the effects of diegetic onboarding on learning outcomes.

6. CONCLUSION

We explored diegetic onboarding as an alternative approach for introducing novice users to creativity support tools. Through a proof-of-concept prototype developed in Unreal Engine and evaluated via a mixed-methods expert review, we found that embedding instructional content within an interactive 3D environment was perceived as novel, understandable, and engaging. At the same time, the evaluation surfaced recurring challenges around the visibility of instructional cues, the legibility of task progression, and the scaffolding of unfamiliar concepts—challenges that are not incidental to the approach but inherent to the design space it occupies. Based on these findings, we contribute three design implications for diegetic onboarding in creativity support tools: ensuring perceptual salience through adaptive and multimodal mechanisms, graduating scaffolding from guided interaction to environmental interpretation, and designing for low-cost failure to sustain exploratory engagement. These implications extend the CST literature by articulating specific conditions under which situated, embedded instruction can function effectively in professional creative software - a context where such approaches remain largely untested. Our results further suggest that diegetic onboarding is best understood not as a replacement for conventional instruction but as a complementary strategy that makes the boundary between learning and creating more permeable. Realizing this potential will require moving beyond the proof-of-concept stage to longitudinal evaluations with novice users, controlled comparisons between diegetic and non-diegetic approaches, and systematic exploration of hybrid instructional strategies across creative tools.

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AI Use Declaration. We used Claude (Anthropic) for proofreading (e.g., grammar, spelling, readability check) for content produced by the authors. We have reviewed all suggested changes and are fully responsible for the final manuscript.

REFERENCES

Benvenuti, D., L. S. Ferro, A. Marrella, and T. Catarci (2023). An approach to assess the impact of tutorials in video games. In *Informatics*, Volume 10, pp. 6. MDPI.

Brown, J. S., A. Collins, and P. Duguid (1989). Situated cognition and the culture of learning. *Educational researcher 18*(1), 32–42.

Cao, S. and F. Liu (2022). Learning to play: understanding in-game tutorials with a pilot study on implicit tutorials. *Heliyon 8*(11).

Carroll, J. M. (1990, 1). *The Nurnberg Funnel*. The MIT Press.

Davis, N., H. Winnemöller, M. Dontcheva, and E. Y.-L. Do (2013). Toward a cognitive theory of creativity support. In *Proceedings of the 9th ACM Conference on Creativity & Cognition*, pp. 13–22.

Deterding, S. (2015). The lens of intrinsic skill atoms: A method for gameful design. *Human–Computer Interaction 30*(3-4), 294–335.

Epic Games (2025a). Content Examples Sample Project for Unreal Engine | Unreal Engine 5.7 Documentation | Epic Developer Community.

Epic Games (2025b). The Unreal Engine.

Fagerholt, E. and M. Lorentzon (2009). *Beyond the HUD User Interfaces for Increased Player Immersion in FPS Games*. Masters Of Science, Chalmers University of Technology., Sweden.

Ford, C. J. and C. Nash (2020). An iterative design 'by proxy' method for developing educational music interfaces. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, pp. 279–284.

Green, T. and M. Petre (1996). Usability analysis of visual programming environments: A 'cognitive dimensions' framework. *Journal of Visual Languages & Computing 7*(2), 131–174.

Khazanehdarloo, A. and K. Mohamed (2023). *The Impact of Diegetic and Non-diegetic User Interfaces on the Player Experience in FPS Games*. Bachelor thesis, Södertörn University, Sweden.

Kolb, D. A. (2014). *Experiential learning: Experience as the source of learning and development*. FT Press.

Korhonen, H., J. Paavilainen, and H. Saarenpää (2009). Expert review method in game evaluations: comparison of two playability heuristic sets. In *Proceedings of the 13th international MindTrek conference: Everyday life in the ubiquitous era*, pp. 74–81.

Kuhne, K. (2024). *Designing for immersion: The influence of diegetic player guidance on the gaming experience*. Ph. D. thesis, Dresden University of Technology.

Laugwitz, B., T. Held, and M. Schrepp (2008). Construction and evaluation of a user experience questionnaire. In *Symposium of the Austrian HCI and usability engineering group*, pp. 63–76. Springer.

Lucero, A. (2015). Using affinity diagrams to evaluate interactive prototypes. In *IFIP conference on human-computer interaction*, pp. 231–248. Springer.

Nielsen Norman Group (2024). Mental Models and User Experience Design.

Norman, D. A. (2003). *Emotional design: why we love (or hate) everyday things* (Paperback edition ed.). New York, NY: Basic Books.

Norman, D. A. (2013). *The design of everyday things* (Rev. and expanded edition ed.). Cambridge (Mass.): MIT press.

Norman, D. A. (2016, February). *Living with Complexity*. Cambridge, MA, USA: MIT Press.

Resnick, M., B. Myers, K. Nakakoji, B. Shneiderman, R. Pausch, T. Selker, and M. Eisenberg (2005). Design principles for tools to support creative thinking.

Rode, J. A., Y. Feng, H. Zhang, R. Rosman, A. S. Bastaman, J. King, M. H. Samson, X. Dong, A. Walker, M. Horton, et al. (2024). Playful telepresence robots with school children. In *Proceedings of the 13th Nordic Conference on Human-Computer Interaction*, pp. 1–16.

Schell, J. (2010). *The art of game design: a book of lenses* (Reprinted ed.). Amsterdam Heidelberg: Elsevier.

Schrepp, M., A. Hinderks, and J. Thomaschewski (2017). Construction of a benchmark for the user experience questionnaire (ueq). *International Journal of Interactive Multimedia and Artificial Intelligence 4*(4), 40–44.

Shneiderman, B. (2007). Creativity support tools: accelerating discovery and innovation. *Communications of the ACM 50*(12), 20–32.

Shneiderman, B. (2008). Creativity support tools: A grand challenge for hci researchers. In *Engineering the user interface: From research to practice*, pp. 1–9. Springer.

Sweller, J. (2011). Cognitive load theory. In *Psychology of learning and motivation*, Volume 55, pp. 37–76. Elsevier.

Tractinsky, N., A. S. Katz, and D. Ikar (2000). What is beautiful is usable. *Interacting with computers 13*(2), 127–145.

Unity (2025). Unity Learn.

Vermeeren, A. P., E. L.-C. Law, V. Roto, M. Obrist, J. Hoonhout, and K. Väänänen-Vainio-Mattila (2010). User experience evaluation methods: current state and development needs. In *Proceedings of the 6th Nordic conference on human-computer interaction: Extending boundaries*, pp. 521–530.

White, M. M. (2014). *Learn to Play: Designing Tutorials for Video Games* (1 ed.). FL: CRC Press Taylor & Francis Group.

A. GAME DESIGN OVERVIEW

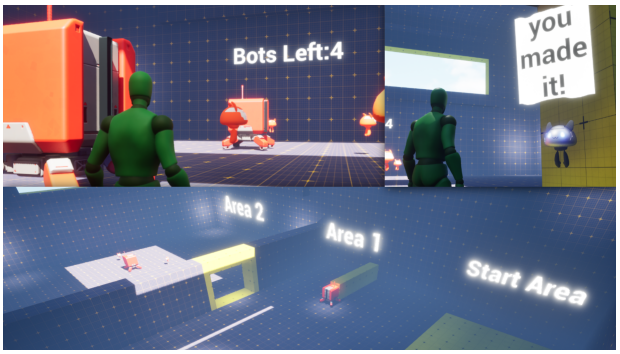

Figure 2: *Challenges to reinforce learning through a game-based task (upper left); space layout showing three areas for interactive learning and play (bottom); the Laser Bot control interface allows users to modify bot state, color, laser length, and rotation rate, illustrating how instructional interaction is embedded within the prototype environment (upper right).*

B. PARTICIPANT INFORMATION TABLE

ID	Gender	Experience Summarized
P1	Male	Senior University Lecturer with experience of teaching some Unreal Engine Software within their practice
P2	Female	University Lecturer with some Unreal Experience and experience with other creative software
P3	Male	Professional technical designer working within the games industry with substantive experience using the Unreal engine as part of their daily work
P4	Male	Educator in further education with experience teaching the Unreal Engine to further education learners
P5	Female	Lecturer who specializes in asset production for video games, some experience within Unreal, but substantive experience with other creative tools such as Blender and Zbrush
P6	Male	Game designer working professionally within the games industry, experienced with Unreal and other creative software
P7	Male	Quality assurance tester working in the games industry, has some experience with Unreal, and other creative software such as Unity