

A Design and Development of Serious Game for Raising Awareness About Human Trafficking

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Abstract: This project presents a design and development of a serious game, which aims to raise awareness about human trafficking. Traditional educational methods often fail to translate passive knowledge into an understanding of the victim's vulnerability. To address this gap, the game is designed based on three educational and psychological frameworks: situated cognition, experiential learning, and empathy-driven design. The paper explores how these frameworks guide the game's tone, mechanics, and difficulty to create stealth mechanics (i.e., restricting combat options and emphasising evasion). Consequently, players navigate a non-violent environment to experience the vulnerability and loss of control inherent in trafficking scenarios. We argue that stealth mechanics as interaction agency can serve as a potent pedagogical tool for embodying a victim's perspective, transforming passive awareness of social crises into an internalised understanding.

Keywords: Serious game, Human trafficking, Game AI, Stealth mechanics

1. Introduction

1.1 Background

Serious games (SG) aren't just for fun, and they represent a fundamental shift in the purpose of games (Michael & Chen, 2005). The experiences of SGs are used to educate, build skills, and influence behaviours (Boyle et al, 2016; Wattanasoontorn et al., 2013). In particular, the term "serious" is highlighted to refer to intent, not format (Michael & Chen, 2005). Developers borrow compelling mechanics such as thinking role-playing games' (RPG) character progression, strategic resource management, or simulation realism to achieve specific learning outcomes (Boyle et al., 2016; Gee, 2003). This flexibility has driven the adoption of SGs across diverse domains, including science education, military training, healthcare and social activities (Calderon & Ruiz, 2015; Sawyer & Smith, 2008). The SGs can create immersive experiences, which is a key advantage to be used for engaging players with complex real-world problems. These games show how interactive media can serve as potent tools for social change (Schrier, 2021).

1.2 Motivation

Video games are increasingly prevalent globally, yet cultural attitudes toward them remain complex, particularly in regions like China. This perspective has led to strict regulations in order to avoid youth becoming addicted to computer games (Yang et al, 2023). In comparison, these concerns obscure the potential of games for positive social impact. This study addresses that issue by confronting a reality: the human trafficking of women and children in China (Citaristi, 2022).

Our goal is to improve public understanding of this problem. A stealth structure is utilised to convey the sense of panic and helplessness that victims face. In this setup, the player takes on the role of the victim rather than playing the hero. The gameplay mechanics restrict combat options and emphasise evasion and concealment, which mirror the oppressive dynamics of trafficking (Schrier, 2021; Isbister, 2016). This approach cultivates empathy and teaches players through an experience that is both immersive and emotional (Belman & Flanagan, 2010).

1.3 Contributions

This paper details the design and technical implementation of a serious game built in the Unity Engine (Gregory, 2018). Our key contributions are as follows:

A framework is introduced that blends "horror" elements to sustain narrative tension without overshadowing the core educational information. This method demonstrates a strategy for translating sensitive social topics into engaging gameplay (Pinchbeck, 2009).

A hybrid artificial intelligence (AI) system is combined with Behaviour Trees and State Machines. This architecture is implemented to create responsive and dynamic enemy behaviours (guards) that are central to the game's stealth mechanics (Rabin, 2013).

The development of specific graphical and interactive systems is utilised to enhance players' sense of immersion. Technical implementations include 3D object outlining (Akenine-Möller et al., 2018), an avatar system (Unity Technologies, n.d.), and inverse kinematics (IK) (Aristidou & Lasenby, 2011).

1.4 Theoretical Framework

This serious game is designed based on three educational and psychological theories: situated cognition, experiential learning, and empathy-driven design. These theories collectively explain how the integration of stealth mechanics can effectively translate the passive knowledge of human trafficking into an internalised understanding of the victims' difficulty.

Brown, Collins, and Duguid (1989) presented situated cognition, which discussed that knowledge is linked to the context and activity in which it is developed. In the context of real society, it is difficult to achieve an understanding of the horror of human trafficking through reading or lectures alone. The player is placed within a simulated environment where they must navigate the physical and psychological constraints of a trafficking scenario. Hence, this game world facilitates situated learning. The "stealth" mechanic provides a gameplay choice and a cognitive scaffold that forces the player to adopt the perspective of the oppressed, wherein the environment itself becomes a teacher of the restrictive dynamics of trafficking (Lave & Wenger, 1991).

Kolb's (1984) cycle of experiential learning occurs through the transformation of experience (Kolb, 1984). The gameplay loop creates an experience in which the tension of hiding from guards produces emotional arousal and stress. This is followed by reflective observation, where players must analyse patrol patterns and consequences (Gao et al, 2024). In the end, active experimentation and conceptualisation occur as players adjust their strategies to evade capture. This cycle allows players to experience the consequences of visibility and vulnerability in a safe environment, leading to deeper retention of the educational message about the risks victims face.

The core mechanic is informed by empathy-driven design. Belman and Flanagan (2010) suggest that games possess a capacity to foster empathy through "procedural rhetoric", which is the practice of using game processes to persuade. This game empowers players to feel the powerlessness of the victim. The restriction of combat options and the emphasis on evasion over aggression serve to strip the player of the traditional "hero power" often found in video games (Isbister, 2016). This deliberate design choice induces a sense of vulnerability, which is essential for breaking down psychological barriers and cultivating genuine concern for the victims of human trafficking (Batson, 2011).

2. Related Work

2.1 Evolution of Game AI

The development of AI in video games has evolved significantly (Gao, 2024). Early examples (e.g., Yannakakis and Togelius, 2018) indicate that complexity is not always a prerequisite for engaging gameplay. For example, classic titles 'Pac-Man' illustrated that compelling game AI does not necessarily require advanced technology. Rather, a well-designed combination of simple behaviours can create dynamic and interesting challenges for the player (DeNero & Klein, 2010). Historically, state-based AI has been the mainstream approach for game development (Millington, 2019). While reliable, Finite State Machines face limitations when dealing with complex tasks, as the 'state explosion' makes the coding and testing load unmanageable (Millington, 2019). Consequently, the industry is increasingly integrating machine learning and reinforcement learning to handle dynamic environments (Yannakakis & Togelius, 2018). Recent breakthroughs in generative agents suggest that future game AI will be capable of exhibiting highly personalized believable personalities (Park et al., 2023; Gao, 2024). However, state-based designs remain the industry baseline for standard scenarios where data-heavy training is unnecessary (Russell & Norvig, 2021).

2.2 The Immersive Technology

The development of SGs relies on game engines (Laamarti et al, 2014), including Unity and Unreal engines. Among these, Unity is favoured for SGs due to its comprehensive pipeline and efficient asset management (Laamarti et al, 2014). Limited resources are used to create a high level of immersion to support skill training or behavioural change, which is a challenge for the development of SGs (Adams, 2014). Developers need to control specific engine tools to bridge this gap (Gregory, 2018). For instance, Unity's Avatar system allows for the reuse of 3D animations across different character models, reducing production costs (Unity Technologies, n.d.). Furthermore, achieving immersion requires both visual fidelity and technical optimisation in lighting and shadow

effects (Akenine-Möller et al, 2018). Lightmapping and the use of particle systems for environmental effects are essential for simulating a realistic atmosphere without sacrificing performance (Akenine-Möller et al., 2018).

3. Game Design

3.1 Aims and Objectives

The aim of this project is to shift the player's understanding of human trafficking from abstract statistics to an emotional, experience-based reality. To achieve this primary aim, the game design focuses on three specific objectives: First, a dark atmosphere is created to prompt an emotional response. Second, grounded in situated cognition, the game implements stealth mechanics (where progress depends on remaining entirely unseen through hiding and evasion). Third, the game models the dynamics of surveillance and control defining these crimes. Players are required to observe the map to survive.

3.2 Game Description

The narrative premise and the environmental setting (see Figure 1) were present in order to understand the context for the mechanics.

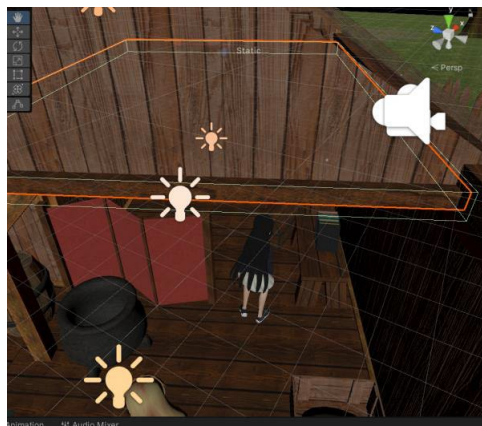


Figure 1: Screenshot of dark environment

The game places the player in the role of a victim abducted and confined within a desolate, claustrophobic building. Weapons or combat mechanics are not provided to players, who must navigate through guarded corridors, hiding in shadows and behind obstacles to avoid detection. See Figure 2. This is the gameplay of stealth mechanics.

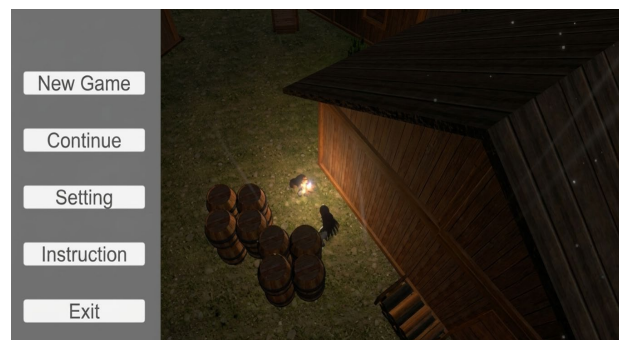


Figure 2: The player hides in shadows

The primary systemic threat stems from the 'Guards,' who represent the traffickers. These entities patrol fixed paths inside the structure using a localised Field of View (FoV) mechanism. Because the player/character is denied offensive capabilities, detection leads to immediate capture and a subsequent reset of the simulation, reinforcing the structural power imbalance victims experience.



Figure 3: A localised Field of View (FoV) mechanism

3.3 Game Design Framework

Three core frameworks of the game design (Tone, mechanics, and difficulty) are listed to provide a structured overview of the research direction (Table 1). This form outlines the alignment between specific implementation strategies and the educational objectives derived from the three theoretical frameworks.

Table 1: Game design framework

Component	Core concept	Implementation strategy	Educational/Empathetic goal
Tone of game world	Dark	Use of claustrophobic environments, dim lighting, and isolation soundscapes.	To highlight the loss of control and make the victim's vulnerability clear, aiming to create a deeper emotional connection and understanding from the audience (Bogost, 2010).
Gameplay Mechanics	Narrative-based Stealth	The player assumes the role of a victim with no means to fight back or defend themselves, as the gameplay centres entirely on hiding, staying unseen, and watching from the shadows.	This design mirrors the power imbalance of trafficking, which forces the player to navigate through situations defined by helplessness and fear rather than power or control (Bogost, 2010).
Difficulty Curve	Progressive Tension	The game begins with a relaxed pace to familiarise the player with the mechanics, then gradually adds layers in intricate surroundings and more alert enemies to prevent jumps in challenge.	This progression is designed to keep the player in a state of "flow" (Csikszentmihalyi, 1990), which builds the sense of tension of the story smoothly without ever breaking the emotional bond the player has with the game.

4. Game Implementation

4.1 System Architecture

The technical foundation of the game was established using the Unity Engine. See Figure 4. The underlying system was built using independent modules that keep the game's rules distinct from its graphics. With these functions separated, it became simpler to maintain and improve the game, and developers could tweak specific gameplay parts without risking the stability of the central engine.

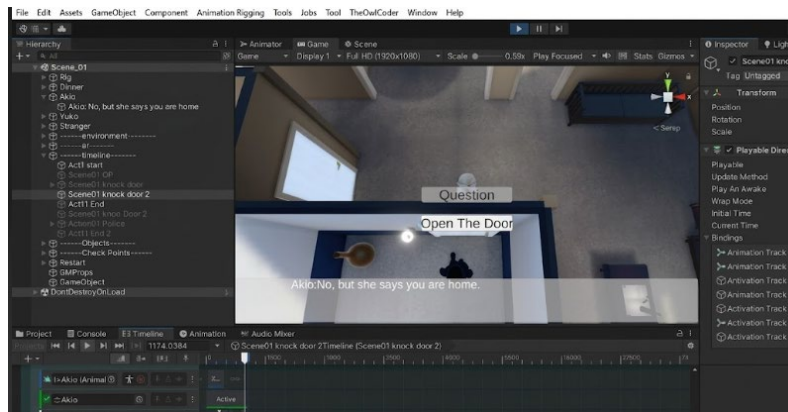


Figure 4: Unity editor Interface

A centralised game manager was employed by the architecture to handle global game states, ensuring that systems such as level loading, score tracking, and the narrative controller were operated in synchronisation. Additionally, Unity’s prefabs and asset bundles were utilised by the system to manage 3D assets, which ensured run-time memory usage was reduced. This framework was designed to ensure that the game was kept performant even when complex environments were being rendered or multiple active AI agents were being handled simultaneously.

4.2 AI System Design

The Artificial Intelligence system served as a core technical contribution of this project, designed to create dynamic and unpredictable antagonist behaviours. To achieve a balance between high-level strategic decision-making and efficient state management, a hybrid AI architecture (AI agents) was implemented. See Figure 5.

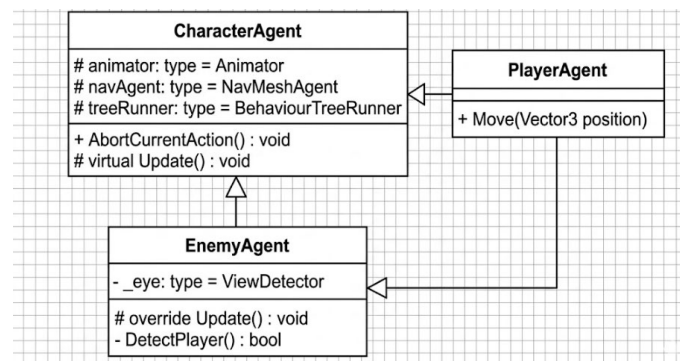


Figure 5: Class diagram of different agents in the game

The system combined the hierarchical flexibility of Behaviour Trees with the precise control of Finite State Machines (FSM). This approach allowed for complex, layered logic to be visualized and adjusted easily by designers (Rabin, 2009).

Behaviour Trees were utilized for macro-level tasks, such as generating the implementation of guard search and patrol logic. The patrol system utilised Unity’s Navigation Mesh to guide agents along predefined paths, simulating a standard security routine. The search logic introduced dynamic behaviour. When the player generated a stimulus such as visual detection or auditory noise, the Behaviour Tree triggered a switch from “Patrol” to “Search” mode. In “Search” mode, the AI navigated to the last known position of the stimulus and executed a randomised search pattern within a specific radius. The system mathematically simulated uncertainty, meaning the AI might not find the player immediately, creating tension and allowing for stealth tactics. This functionality created a responsive gameplay loop rather than a simple script.

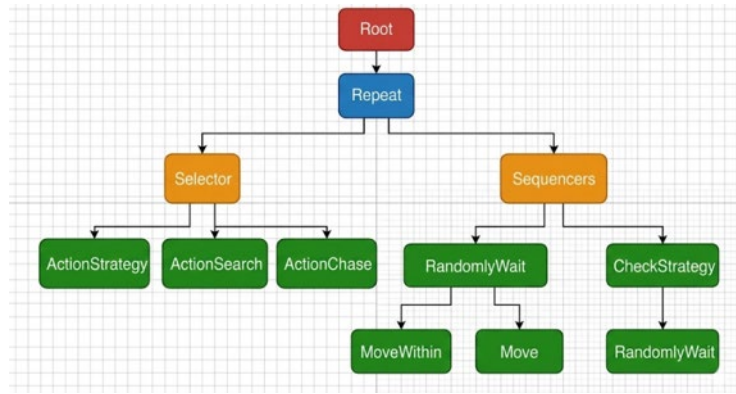


Figure 6: A Behaviour Tree controls the guards patrolling

FSM was employed for micro-level behaviours. Specific states such as “idle,” “walk,” “run,” and “attack” managed the granular details of the guard’s actions. This dual-layered approach optimised performance. The FSM handled rapid state updates for animation and physics, while the Behaviour Tree managed the more computationally expensive evaluation of environmental conditions.

4.3 Visual and Immersion

To achieve the atmospheric tone and immersive quality required for this serious stealth game, the development pipeline integrated several tailored graphical techniques: the Unity avatar system, particle systems, pre-baked lighting, and a custom outlining effect.

The Unity avatar system was utilised to ensure that animation data could be efficiently reused across different character models while maintaining consistent motion dynamics (Millington, 2019). This mathematical approach was paired with inverse kinematics (IK), which was utilised to align a character’s hands and feet with environmental geometry, preventing visual anomalies such as feet sliding across constraints (Aristidou & Lasenby, 2011). This ensures that structural interactions, such as traversing staircases or grasping doors, appear physically accurate.

Particle systems were deployed to simulate fuzzy visual phenomena, generating atmospheric fog and localised smoke that players can use to obscure enemy lines of sight and create strategic safe zones in gameplay (Feil & Scattergood, 2005). To ensure performance scalability, pre-baked lightmaps were used to compute complex light behaviours and shadow maps during development (Akenine-Möller et al., 2018). This rendering optimisation allows the game to maintain its dark, claustrophobic aesthetic on lower-end hardware without sacrificing the frame rates required for responsive stealth mechanics.

A custom outlining effect was engineered to facilitate intuitive gameplay interaction (Akenine-Möller et al., 2018). Environmental objects relevant to the player’s escape emit a soft, localised edge illumination when approached or viewed directly. This system provides immediate contextual feedback, guiding player choices and maintaining mechanical flow, because intrusive text prompts or floating user interface icons might disrupt narrative immersion (Schell, 2014).

5. Challenges and Discussion

5.1 Design Adaptations Within Project Constraints

During the development process, the team faced significant constraints regarding asset acquisition and technical feasibility. In order to solve the problem, the developers discussed how these constraints influenced the design decisions. A text-based approach was considered but rejected due to the requirement for immersion. Conversely, a stylised 3D aesthetic was feasible for a small-scale educational project because it allowed the game to maintain complete visual consistency through unified materials and optimised lighting maps across disparate assets. This ensures the game runs smoothly on low-end educational hardware and conveys the horror and seriousness of the narrative (Michael & Chen, 2005) without requiring photorealistic assets.

5.2 Theoretical Reflections

We reflect here on how the specific design choices embed the player in the context. For instance, the decision to strip the player of combat abilities forces them to “cognise” the environment not as a playground, but as a survival simulation. The visual cues (the dark corridors) and the auditory cues (footsteps of guards) represent

the “situated” information the player must process to succeed. This design reflects Bogost’s (2010) notion of procedural rhetoric, where the mechanics themselves argue for the difficulty of the victim’s situation, rather than text descriptions doing so.

Kolb’s (1984) learning cycle as a theoretical framework was engineered directly into the game’s level design, which ensures that the game mechanics of stealth enforce “reflective observation.” The gameplay requires the player to pause and critically observe the environment, such as identifying safe zones, shadow cover, and the timing of guard patrols, rather than action games that encourage rapid responses. When they finally commit to a route and move, they shift into active experimentation.

The game’s design practices empathy-driven design principles (Belman & Flanagan, 2010) by intentionally manipulating the player’s perception of power. The primary mechanism for achieving this is the strategic deprivation of the player’s combat capabilities. By denying the player the means to fight back, the mechanics strip away the traditional power fantasy and agency typical of digital media, inducing an acute state of vulnerability designed to bridge the psychological gap between the player and the actual victim (Isbister, 2016).

This dynamic shift in control creates an oppressive gameplay experience where “survival” completely replaces “dominance” as the primary objective. Forced to navigate systemic threats without defensive tools, players must inhabit the structural helplessness that defines the trafficking experience (Lankoski, 2011). Furthermore, these strict mechanical constraints are reinforced by heavy narrative elements. For instance, plotlines involving betrayal by trusted figures deliberately exacerbate the player’s sense of isolation and distress.

Through the helplessness of the gameplay mechanics combined with the emotional weight of the script, the design aims to move the audience beyond mere intellectual sympathy or passive concern (Batson, 2011). These interactive restrictions force players to confront the severe situational constraints of a victim, utilising the game’s structural systems to evoke a deeper embodied empathy (Bogost, 2010) for the realities of human trafficking.

5.3 Limitations and Future Studies

The integration of these theories with stealth mechanics’ impact remains mostly on the theoretical and technical framework design due to the tight development cycle. Future studies will transition to a empirical evaluation (both qualitative and quantitative) stage. Specifically, we plan to execute large-scale user testing to evaluate whether the interactive mechanics successfully fulfil the pedagogical goals established by our three theoretical frameworks, correlating in-game evasion failure rates with long-term safety awareness and knowledge retention metrics. Secondly, the situated experience is a simulation and may not fully reflect the long-term psychological trauma of victims. The studies should focus on correlating in-game failure rates with real-world knowledge retention to measure educational success in future.

All authors declare that we have no conflict of interest.

Ethical Declaration: The research does not involve human participants and/or animals, so the 1964 Helsinki Declaration and its later amendments or comparable ethical standards are not applicable to this paper.

Consent Declaration: All testers consent to the publication of the testing data.

AI Declaration: We confirm that no AI tools were used in the creation of this manuscript.

Reference

- Adams, E. (2014) *Fundamentals of game design*. 3rd edn. San Francisco: Pearson Education.
- Akenine-Möller, T., Haines, E., Hoffman, N., Pesce, A., Hillaire, S. and Iwanicki, M. (2018) *Real-time rendering*. 4th edn. Boca Raton: AK Peters/CRC Press.
- Aristidou, A. and Lasenby, J. (2011) ‘FABRIK: A fast, iterative solver for the Inverse Kinematics problem’, *Graphical Models*, 73(5), pp. 243–260. doi: 10.1016/j.gmod.2011.05.003.
- Batson, C.D. (2011) *Altruism in humans*. Oxford: Oxford University Press.
- Belman, J. and Flanagan, M. (2010) ‘Designing games to foster empathy’, *International Journal of Cognitive Technology*, 15(1), pp. 11–21.
- Bogost, I. (2010) *Persuasive games: The expressive power of videogames*. Cambridge, MA: MIT Press.
- Boyle, E.A., Hainey, T., Connolly, T.M., Gray, G., Earp, J., Ott, M., Pereira, J. et al. (2016) ‘An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games’, *Computers & Education*, 94, pp. 178–192. doi: 10.1016/j.compedu.2015.11.003.
- Brown, J.S., Collins, A. and Duguid, P. (1989) ‘Situated cognition and the culture of learning’, *Educational Researcher*, 18(1), pp. 32–42.

- Calderón, A. and Ruiz, M. (2015) 'A systematic literature review on serious games evaluation: An application to software project management', *Computers & Education*, 87, pp. 396–422. doi: 10.1016/j.compedu.2015.07.011.
- Citaristi, I. (2022) 'United Nations Office on Drugs and Crime—UNODC', in *The Europa Directory of International Organizations 2022*. Abingdon: Routledge, pp. 248–252.
- Csikszentmihalyi, M. (1990) *Flow: The psychology of optimal experience*. New York: Harper & Row.
- DeNero, J. and Klein, D. (2010) 'Teaching introductory artificial intelligence with Pac-Man', in *Proceedings of the AAAI Conference on Artificial Intelligence*, 24(3), pp. 1885–1889.
- Feil, J., & Scattergood, M. (2005). *Beginning Game Level Design*. Thomson Course Technology.
- Gao, L. (2024) 'A literature review: Which, how and what for the use of artificial intelligence in gamification', in *European Conference on Games Based Learning*, 18(1), pp. 218–224. Reading: Academic Conferences International Limited.
- Gao, L., Ward, R., Fabricatore, C., Ahmed, E. and Lopez, M.X. (2024) 'Exploring game features and reframing: The construction of a relationship model', *Simulation & Gaming*, 55(5), pp. 886–924. doi: 10.1177/10468781241267520.
- Gee, J.P. (2003) 'What video games have to teach us about learning and literacy', *Computers in Entertainment (CIE)*, 1(1), pp. 20–20.
- Gregory, J. (2018) *Game engine architecture*. 3rd edn. Boca Raton: AK Peters/CRC Press.
- Isbister, K. (2016) *How games move us: Emotion by design*. Cambridge, MA: MIT Press.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.
- Laamarti, F., Eid, M. and El Saddik, A. (2014) 'An overview of serious games', *International Journal of Computer Games Technology*, 2014, Article 358152. doi: 10.1155/2014/358152.
- Lankoski, P. (2011), 'Player character engagement in computer games', *Games and Culture*, 6(4), pp. 291–311.
- Lave, J. and Wenger, E. (1991) *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Michael, D.R. and Chen, S.L. (2005) *Serious games: Games that educate, train, and inform*. Boston: Muska & Lipman/Premier-Trade.
- Millington, I. (2019). *AI for Games* (3rd ed.). CRC Press.
- Park, J.S., O'Brien, J., Cai, C.J., Morris, M.R., Liang, P. and Bernstein, M.S. (2023) 'Generative agents: Interactive simulacra of human behavior', in *Proceedings of the 36th Annual ACM Symposium on User Interface Software and Technology*, pp. 1–22. doi: 10.1145/3586183.3606763.
- Pinchbeck, D. (2009) 'Shock, horror: First-person gaming, horror, and the art of ludic manipulation', in Perron, B. (ed.) *Horror Video Games: Essays on the Fusion of Fear and Play*. Jefferson: McFarland & Company, pp. 79–94.
- Rabin, S. (Ed.). (2009). *AI game programming wisdom 4*. Charles River Media.
- Rabin, S. (ed.) (2013) *Game AI pro: Collected wisdom of game AI professionals*. Boca Raton: CRC Press.
- Russell, S.J. and Norvig, P. (2021) *Artificial intelligence: A modern approach*. 4th edn. Hoboken: Pearson.
- Sawyer, B. and Smith, P. (2008) *Serious games taxonomy*. Washington, DC: Serious Games Initiative.
- Schell, J. (2014) *The art of game design: A book of lenses*. Boca Raton: CRC Press.
- Schrier, K. (2021) *We the gamers: How games teach ethics and civics*. Oxford: Oxford University Press.
- Unity Technologies (n.d.) *Unity manual: Avatar system and animation retargeting*. Available at: <https://docs.unity3d.com/Manual/AvatarCreationAndSetup.html> (Accessed: 10 March 2026).
- Wattanasoontorn, V., Boada, I., García, R. and Sbert, M. (2013) 'Serious games for health', *Entertainment Computing*, 4(4), pp. 231–247. doi: 10.1016/j.entcom.2013.09.002.
- Yang, Q., Wang, H., Wu, H., Li, W., Zhang, Y., Yao, Y. et al. (2023) 'Effect of online game policy on smartphone game play time, addiction, and emotion in rural adolescents of China', *BMC Psychiatry*, 23(1), p. 814. doi: 10.1186/s12888-023-05312-w.
- Yannakakis, G.N. and Togelius, J. (2018) *Artificial intelligence and games*. Berlin: Springer Nature.