The Multidimensional Spectrum of Abstraction, Realism and Cultural Meaning in Serious Games

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ABSTRACT

This paper extends an established framework for analysing abstraction and realism in serious games by introducing a seventh dimension that accounts for how cultural meaning is constructed, represented and interpreted within game environments. While the existing model describes the pedagogical implications of fidelity across visuals, audio, mechanics and interface, rules, narrative and feedback, it provides limited guidance for understanding how domain-specific values, practices and material cultures are encoded into playable experiences. To address this gap, the proposed Domain Culture System draws on anthropological theory and intercultural game studies to articulate how cultural ideology, practice and material can be conveyed at varying levels of abstraction and realism. The resulting multidimensional spectrum provides designers and researchers with a structured way to examine how cultural logics shape player interpretation, engagement and learning, alongside other factors that influence the realism of serious games.

Keywords

serious games, abstraction and realism, culture, game design

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INTRODUCTION

Serious games are increasingly recognised as complex cultural artefacts which do more than convey information or rehearse procedures; they create spaces where players navigate meaning, identity and affect through structured play (Sandovar 2016). Existing work (Risley et al. 2025a) on the spectrum between abstraction and realism provides a multidimensional framework to map the design choices shaping how players engage with learning tasks, interpret representational cues and transfer knowledge beyond the game environment. Yet while prior research established the pedagogical implications of realism-based design decisions across visual style, audio style, mechanics and interface, rule systems, narrative and feedback, less attention has been given to how culture interacts with and reshapes this spectrum. This paper extends an earlier iteration of the framework by introducing culture as a seventh design dimension, referred to as the Domain Culture System, to examine how games reflect, mediate or transform cultural logics across different levels of abstraction and realism.

Building on Shliakhovchuk and García's (2020) findings that serious games tend to produce intended intercultural learning outcomes and support players' cultural knowledge acquisition, this dimension is introduced to capture how games communicate meaning, value and disvalues and norms of the relevant culture. Culture has been demonstrated as shaping how individuals perceive authority, relationships, time, risk and emotion (Hofstede 2011) and is therefore likely to influence both how designers construct game worlds and how players interpret them. When cultural cues appear in either highly abstract or highly realistic forms, they frame player expectations, invite particular interpretive strategies and influence how enjoyable, challenging or alienating the learning experience may feel. Understanding this dynamic becomes especially significant for serious games, which often aim to familiarise players with professional, organisational or social domains that carry their own internal value systems.

The role of culture in serious game design extends beyond representation alone. Serious games communicate assumptions about how people behave, what actions are valued and which forms of knowledge or authority are treated as legitimate within a given domain (Meershoek et al. 2014). Designers make situated choices, whether intentionally or unintentionally, about which cultural practices to highlight, simplify or faithfully model, with such choices shaping how players interpret situations, evaluate actions and understand the game world. Cultural meaning therefore contributes to whether a game feels coherent, believable or authentic, even when other dimensions remain abstracted. Such decisions are particularly important in serious games for learning, where players may be introduced to unfamiliar professional, organisational or social systems. Representations of hierarchy, collaboration, conflict or responsibility can differ substantially across cultural contexts and influence how gameplay is interpreted. A game may appear procedurally realistic while still feeling culturally implausible if its underlying social logic conflicts with players' expectations or lived experience.

The scope of this work is confined to serious games for learning, although examples from simulations, gamified systems and commercial entertainment games are drawn upon where relevant. The central research question guiding this work is:

How does culture function as a dimension of abstraction and realism in serious games?

By integrating cultural considerations into the framework, this paper aims to offer designers, researchers and educators a more holistic tool for analysing or developing serious games. This expanded perspective highlights how pleasure, identity and cultural position shape game experiences and how designers can intentionally leverage these dynamics to enhance both engagement and learning.

RELATED WORK

Understanding how abstraction and realism operate in serious games is central to explaining how players learn within structured fictional environments. This is because design decisions about fidelity can influence not only what is represented but how players interpret situations, navigate uncertainty and construct meaning through play (Risley et al. 2025a). These decisions shape cognitive processing and emotional engagement, affecting the conditions under which learning can transfer beyond the game context. In this sense abstraction and realism function as pedagogical mechanisms that structure the player experience, rather than as stylistic categories alone.

Serious games rarely adopt a uniform level of fidelity; abstraction and realism instead appear unevenly across design dimensions such as visuals, audio, narrative, mechanics and rule systems (Risley et al. 2025a). Adams (2014) emphasises that all games simplify reality, even those which present themselves as highly realistic. Realism is therefore a series of selective representational choices rather than a matter of increasing detail. Fernández-Vara (2011) further argues that players experience a game as realistic when its rules, story logic and system behaviours work together in a consistent way. A coherent world therefore feels more believable than one which includes detailed features but lacks internal consistency.

This layered construction means that a game may for instance employ stylised visuals while simulating highly realistic procedures or use realistic soundscapes while abstracting interaction patterns to reduce cognitive load (Sweller 1988). Distinguishing between objective and subjective fidelity (Ye et al. 2020) shows that believability is shaped less by accuracy within individual dimensions and more by how players experience the combined effect of the game's visual, mechanical, narrative and systemic elements as coherent and authentic. Taxonomies such as those proposed by Rogers et al. (2022) further highlight the complexity of fidelity decisions, breaking realism into several components that operate differently across visuals, mechanics, sound, narrative and system logic. Although their granularity may challenge practical application, the underlying premise reinforces the value of structured frameworks that help designers consider how multiple dimensions contribute to the player's experience of coherence and authenticity.

Learners have long been understood to interpret these design choices through their own cognitive and experiential constraints. Of particular relevance is Cognitive Load Theory (Sweller 1988), which highlights the risks of unnecessary complexity, particularly when visual or procedural realism introduces extraneous detail not central to the learning objective. Ravyse et al. (2017) similarly observe that high fidelity

environments can obscure conceptual relationships, whereas abstraction can instead sharpen focus by stripping away less necessary surface features. Importantly, decisions about fidelity are also recognised as potential influencers of how learning transfers beyond the game environment. Realistic scenarios can anchor interpretation in familiar contexts and support near transfer where learners are expected to reproduce specific behaviours in recognisable settings (Kolb 1984). In contrast, abstraction can isolate or highlight specific underlying structures and principles, which is advantageous when the goal is far transfer or conceptual flexibility (Perkins and Salomon 1992). Narrative abstraction may also lower emotional or cognitive barriers to complex or sensitive material by reducing contextual load (Naul and Liu 2020). These dynamics appear across multiple applied domains; in leadership learning for instance realistic decision structures can enhance perceived relevance for experienced learners, while more abstract representations may support conceptual exploration for more novice learners (Risley and Buzady 2022).

Motivation and emotional engagement also appear to be influenced by how realism and abstraction are balanced across design dimensions. Intrinsic motivation is shaped by feelings of mastery, autonomy and enjoyment (Ryan and Deci 2020) and depends in part on players feeling capable within the system, which fidelity decisions can influence by making actions, feedback and system responses easier to interpret. More abstract environments however can lessen cognitive friction and encourage motivation through imaginative engagement, particularly for younger learners or those unfamiliar with the domain. Furthermore, stylisation may also contribute to a sense of psychological safety (Edmondson and Lei 2014) by reducing the perceived proximity or emotional weight of complex scenarios. It may also help sustain Flow by avoiding representational detail that disrupts the balance between challenge and skill (Csikszentmihalyi 1990).

In other contexts the motivational value of realism becomes more prominent, such as where seriousness, accountability or professional identity are central to the learning task - credible scenarios and consequences can reinforce the perceived gravity and relevance of decisions. Juul's (2005) notion of games as "half-real" captures this dynamic, illustrating how games routinely combine abstracted structures with selectively realistic elements to balance safety, engagement and perceived seriousness while still supporting reflection.

Design decisions are also shaped by practical, ethical and socio-cultural considerations that extend beyond questions of cognitive load or representational detail. Developing high-fidelity simulations typically demands specialist expertise, access to accurate data and significant development time, which often makes abstraction a more feasible and pedagogically efficient choice (Adams 2014; Petridis et al. 2012). However, fidelity is not only a practical concern in that representing real-world identities, events or sensitive topics with high realism can introduce ethical risks, particularly when cultural assumptions or stereotypes are inadvertently reproduced (Kalantar Hormozi 2025a). This reflects a broader challenge in serious games research, as games are increasingly recognised as culturally situated artefacts that shape how meaning is communicated, interpreted and negotiated (McGonigal 2011; Frasca 2003). Abstraction can mitigate some of these risks by creating emotional distance or allowing designers to avoid reproducing culturally specific surface features while still supporting critical reflection. However, although abstraction can mitigate some of these risks, it does not make a game culturally neutral. Empirical studies of collaborative worldbuilding in civic simulations and table-top role playing game (TTRPG) environments show that players

actively construct and negotiate shared meaning systems that frame how situations are interpreted and decisions are made (Gomer et al. 2025; Risley et al. 2025b). These findings suggest that fidelity decisions inevitably express aspects of a domain's underlying logic, values and practices, whether represented literally or metaphorically.

These strands of research collectively show that fidelity decisions shape far more than surface representation. Abstraction and realism influence how players process information, how they transfer learning, how safe or serious an experience feels and how they interpret the coherence of the game world. They also interact with cultural and ethical considerations, as games inevitably embed implicit assumptions about how a domain works and how meaning is made within it. What remains insufficiently addressed in existing fidelity frameworks is how games convey these underlying logics, values and interpretive norms. Abstraction and realism shape how such meaning systems are perceived and engaged with, yet this dimension is rarely articulated. Recognising this gap provides the basis for treating cultural and domain meaning systems as a distinct design dimension. Addressing this gap requires expanding the framework to include a dimension that can describe how cultural meaning is communicated and adapted within a serious game.

The introduction of the Domain Culture System addresses an enduring limitation within existing abstraction–realism frameworks by providing a way to examine how cultural meaning is represented alongside other dimensions of fidelity. Earlier work has approached culture within the design of serious games differently. Meershoek et al. (2014), for example, focus on player game fit through the Culture Driven Game Design Method (CDGDM), which adapts serious games to cultural contexts of the players using Hofstede's (2011) dimensions. Their case studies show that a misalignment between the cultural assumptions embedded in the game and players' expectations of the culture can reduce motivation, produce resistance and impact learning outcomes. Their work highlights the importance of considering cultural contexts when designing serious games, but it does not address how the domain culture is expressed within the game itself and represented through levels of abstraction and realism. A broader perspective on cultural considerations and representation within games emerges from Shliakhovchuk and García's (2020) later systematic review of seventy-two studies on video games and intercultural outcomes. Their findings show that many games, including serious games, can function as intercultural learning environments when cultural meaning is intentionally embedded in the design with consideration. This embedding can have a positive effect on knowledge acquisition, attitudinal change, perception shifts and in some cases behavioural change. However, the review also shows that these outcomes depend on how cultural meaning is represented and interpreted within the gameplay, highlighting the importance of focusing on the "how" when it comes to representing culture across different levels of abstraction and realism. What remains under research is a structured method describing how cultural meaning of the domain is constructed within the game design, a gap that the domain culture system, the seventh dimension, can directly address.

The importance of cultural meaning systems in serious games is further supported by broader research on culture and cognition. Gutchess and Rajaram (2023) argue that culture shapes not only accumulated knowledge and patterns of thought, but also preferences for interpreting and processing information. Although their work is not focused specifically on serious games, it has clear relevance for understanding how

players interpret meaning, realism and emotional resonance within game environments. Players inevitably approach serious games through their own cultural experiences and interpretive frameworks. The purpose of the Domain Culture System is therefore not to provide a universal solution for adapting games to every cultural context, but to clarify how the domain cultural meaning is communicated and represented on different levels of abstract and realism. This shift creates an environment for learning to happen across diverse audiences and allows players from different cultural backgrounds to interpret and respond to the game's underlying value systems from their own social and cultural positions. This approach is reinforced by intersectional research, which shows that cultural identity, positionality and lived experience mediate what feels authentic, alienating, or engaging in media environments (Ruberg and Shaw 2017). This school of thought acknowledges both the lived identities of players and the value systems of the domain. Players make sense of, relate to, or push back against the value systems embedded in the domain being communicated in serious games. Shliakhovchuk and García (2020) similarly suggests that culturally grounded game environments can promote perspective-taking, identity reflection and empathy when players encounter unfamiliar value systems within structured play.

Although the cultural domain system is proposed here as a seventh dimension within the abstraction–realism framework, it differs from the other six dimensions of the framework in that culture does not appear as a single surface-level feature. Visual style, audio style, mechanics, interface, rule systems, narrative and feedback can be examined as relatively discrete design dimensions, whereas culture operates across and through them. The approach adopted here therefore draws on The CultureCraft Model (CCM) (Kalantar Hormozi 2025a), an emerging practice-based approach to cultural adaptation in video game design and production. Grounded in fieldwork, case study analysis and broader survey data, CCM has been developed through a series of workshops and conference presentations, including Culture as a System in Video Games between Representation and Transformation (Kalantar Hormozi 2025b). CCM adapts anthropological approaches to culture by breaking it down into interconnected elements of ideology, practice and material (Hasty et al. 2022) as a basis for making design choices in games with culturally grounded domains. Within this perspective, culture in games is treated as an interconnected system rather than a collection of isolated representational features, highlighting the risk of meaning becoming distorted when ideology, practice and material are separated or fragmented. Although CCM has primarily focused on entertainment games, the underlying approach has clear relevance for serious games, where the communication of domain meaning and the avoidance of distortion are closely tied to learning objectives.

FRAMEWORK OVERVIEW: DESIGN DIMENSIONS OF ABSTRACTION AND REALISM

Drawing on interdisciplinary sources from game studies, educational psychology and serious game design, a framework emerges composed of the following elements:

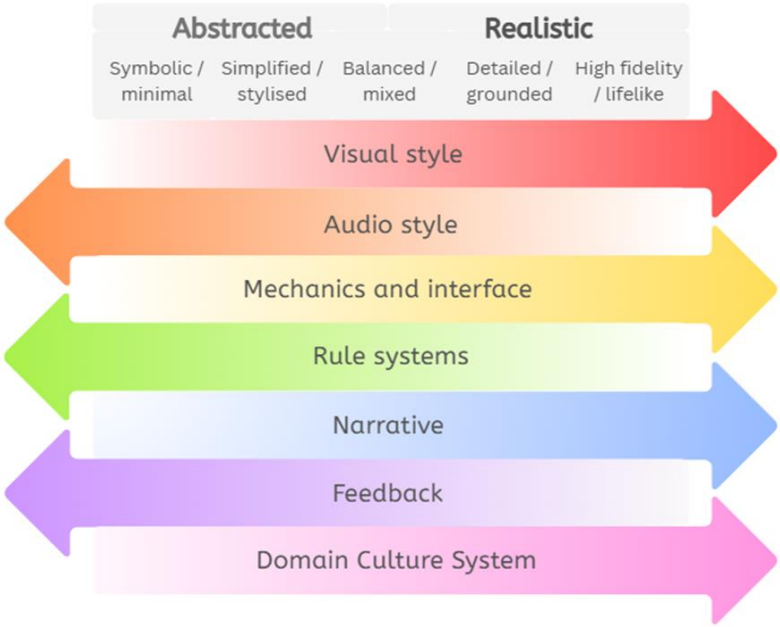

Figure 1: Design Dimensions of Abstraction and Realism

1.1 Visual Style

Visual style is one of the most immediate ways in which abstraction and realism manifest in serious games. At the realistic end of the spectrum, visual design may emphasise photorealistic textures, anatomically accurate models and dynamic lighting to approximate real-world environments. Such approaches are common in simulation-based training tools, including medical procedure trainers and flight simulators, where visual fidelity can assist with domain recognition and context sensitive learning (Chalmers and Debattista 2009). At the abstract end designers may use simple geometric forms, colour-coded interfaces or schematic layouts to focus learning on core information. For instance, many language-learning games for children adopt cartoon-style avatars and simplified spatial structures to reduce visual complexity and make key interactions easier to interpret (Bai et al. 2023; Xu et al. 2024). Abstraction in these cases supports minimised cognitive effort, particularly for novice users or when the learning goal concerns conceptual rather than spatial or procedural knowledge. Between these poles sits stylised realism, where visual detail is selectively emphasised or minimised to focus attention on instructional priorities, which can help reduce extraneous cognitive load while preserving a sense of immersion (Ravyse et al. 2017).

1.2 Audio Style

Audio style has been found to contribute to immersion and instructional effectiveness by providing spatial, emotional and procedural cues which shape how players interpret the game world. At the realistic end of the spectrum, sound design may incorporate ambient environmental noise, adaptive audio or professional voice acting calibrated to approximate real-life acoustics and enhance situational awareness (Vontzalidis et al. 2024). This is particularly important in domains such as emergency response or clinical simulation, where auditory information forms a core part of task performance (Du et al. 2025; IEEE 2025). High-fidelity audio can also support affective learning and well-integrated soundscapes have been shown to enhance emotional plausibility,

contributing to learner engagement and memory consolidation (Ravyse et al. 2017). Consistency between auditory and visual design then further reinforces the coherence of the simulated environment and strengthens the learner's sense of presence (Marucci 2021).

Abstraction in audio may involve simplified cues such as chimes, buzzers or synthesised tones, or stylised music and effects designed to match symbolic or metaphorical game worlds. When aligned with visual style and feedback systems these forms can communicate meaning efficiently while maintaining narrative engagement. Even so, abstract audio must remain internally consistent to avoid cognitive dissonance or misinterpretation (Bai et al. 2023). For instance, fantasy based learning games may employ non-representational soundscapes that lack real world fidelity yet remain perceptually coherent within the game's logic. The appropriate level of audio realism therefore depends on the game's purpose and target audience: realistic sounds may enhance credibility and cue recognition in professional or context-specific training, whereas stylised or abstract audio may better support clarity and focus in conceptual or exploratory environments.

1.3 Mechanics and Interface

Game mechanics and interface design determine how learners act within and interpret the game world. At the realistic end of the spectrum, mechanics often replicate real-world tasks or procedures, such as operating the physical controls of a forklift, following the steps of a surgical intervention or navigating decision-making processes in a corporate setting. These approaches task learners to interact with systems that mirror the sequencing and complexity of professional practice and high interaction fidelity, where user inputs closely correspond to real-world actions, can support skill transfer in procedural domains (Ye et al. 2020). More abstract mechanics simplify these interactions by reducing complex processes to symbolic or streamlined actions. For instance, a detailed surgical procedure may be represented through drag and-drop interactions or structured multiple-choice reasoning rather than through precise manipulation of instruments. Interfaces in abstracted games similarly rely on symbolic icons, menu-based navigation or colour-coded feedback, which can enhance usability and reduce cognitive demand (Ravyse et al. 2017). Achieving an appropriate level of abstraction or realism is therefore an important design consideration. Realistic mechanics can strengthen experiential learning, particularly for advanced learners or high-stakes environments where contextual accuracy matters (Chalmers and Debattista 2009). However, overly complex interactions may hinder accessibility and immersion, especially for novices. Conversely, abstract mechanics can reduce friction, maintain focus on conceptual understanding and support wider engagement, particularly when the learning objective concerns principles rather than procedural fidelity (Bai et al. 2023).

1.4 Rule Systems and Simulation Fidelity

Rule systems establish the underlying logic of a game by determining how player actions generate outcomes, how resources and time progress and how the environment responds. At the realistic end of the spectrum, rule systems reproduce domain-specific logic with high fidelity. A medical simulation for example may follow established clinical pathways, including time-dependent patient deterioration, while flight simulators routinely model aerodynamics, engine behaviour and procedural checklists to support transfer to real-world performance (Ye et al. 2020). These

systems typically prioritise procedural and functional fidelity, reinforcing cause-effect relationships that essentially mirror the phenomena they aim to simulate. More abstract rule systems reduce complexity to foreground concepts or streamline play. For example, a time-intensive process may be represented as a turn-based sequence or condensed into a single decision point, or sustainability games may model resource management through simplified algorithms or metaphorical tokens rather than detailed environmental systems. Such abstractions have been found to be particularly effective when the learning goal concerns conceptual understanding or values exploration rather than procedural accuracy (Ravyse et al. 2017). Ultimately the credibility of a rule system depends on internal consistency and alignment with learner expectations and instructional goals. Arbitrary or inconsistent rules can undermine immersion and learning - a challenge which is particularly evident in the behaviour of non-player characters (NPCs). Furthermore, a rule system's credibility often hinges on behavioural fidelity as well as procedural accuracy, since players expect non-player characters to respond in ways that are socially plausible even when the underlying mechanics are simplified (Ravyse et al. 2017).

1.5 Narrative Structure

Narrative has long been considered a central mechanism for anchoring meaning in serious games and whether expressed through linear stories or branching dialogue, provides emotional context, guides decision-making and shapes how learners interpret events. At the realistic end of the spectrum, narratives typically draw directly on real-world settings and professional dilemmas, such as resolving workplace conflict, managing patient care or navigating ethical business decisions. Embedding challenges in plausible social and institutional contexts can enhance the relevance of educational content and support the transfer of behaviours and attitudes into real world practice (Xenos and Velli 2020). When characters, settings and interactions reflect learners' lived or aspirational experiences, narrative can become a powerful vehicle for situated learning (Lave and Wenger 1991). More abstract or metaphorical narratives instead typically involve symbolic representation as opposed to strict realism. These may take the form of allegorical journeys, stylised quests or metaphors for internal processes, such as representing an illness as a monster to be overcome for instance. Such framing can be highly effective in games aimed at conceptual understanding or personal development, as metaphor can enhance emotional engagement and make complex or intangible ideas more approachable (Naul and Liu 2020; Xu et al. 2024). Abstraction can also encourage psychological safety through emotional distance (Edmondson and Lei 2014), which may be valuable when exploring sensitive or ethically charged topics.

1.6 Feedback Systems

Feedback is central to shaping learner behaviour in serious games by supporting reflection, guiding performance and sustaining engagement while helping players evaluate the effects of their actions. The degree of realism within feedback mechanisms can also influence how learning is interpreted and internalised (Mozdzer 2021). Realistic feedback is typically embedded diegetically within the game world as a direct and contextually meaningful response. In medical simulations such as Body Interact (Take The Wind 2025) for example, failing to administer treatment may cause a virtual patient's condition to deteriorate, mirroring real-world cause-effect patterns and reinforcing understanding through experiential learning mechanisms (Marshall and Honey 2023). When aligned with authentic scenarios, such feedback can support situated cognition by helping learners understand not only what went wrong, but also

why. In contrast, abstract feedback systems typically use external or symbolic cues such as points, stars, badges or progress bars to signal performance. These systems can enhance transparency and support motivation by making goals and achievements explicit, particularly in fast-paced or conceptual learning environments. These symbolic forms may reduce immersion, but their clarity and ease of implementation can make them highly effective, particularly when they highlight core behaviours or scaffold understanding in ways that preserve the underlying learning logic (Ravyse et al. 2017). In practice many effective serious games adopt a hybrid approach: diegetic in-game consequences provide immediate experiential feedback, while post-level summaries or visual dashboards support reflection and debrief. Ultimately the appropriate level of feedback realism should be calibrated to the learning context: intrinsic feedback may be essential for procedural or behavioural training, whereas symbolic cues may be more suitable for conceptual development or formative exploration.

1.7 Domain Culture System

Defining the Domain Culture System first requires clarification of culture itself. Gutchess and Rajaram (2023, 915) broadly define culture as "a group of people with shared experiences or perspectives." This definition emphasises shared meaning and collective understanding, suggesting that culture emerges through common values, practices and forms of belonging. Within this framing, culture may emerge within any collective, including professions, organisations, classrooms or disciplines. Anthropological research further clarifies what is shared within these collectives as culture. Hasty, Lewis and Snipes (2022) break down culture into three cultural elements: cultural ideology, cultural practice and cultural material. Cultural ideology refers to "what is thought" within a collective, including shared values, disvalues and norms. Cultural practice refers to "what is done", encompassing repeated actions, rituals and behaviours through which shared meaning is expressed. Cultural material refers to "what is used", including the tools, technologies, spaces and artefacts associated with that culture. These three elements do not stand alone and are interconnected in a hierarchical way. Practice follows ideology and materials follow practice, making cultural ideology a foundational component within the wider cultural system (Hasty et al. 2022). In other words, surface features such as objects (cultural material), or actions (cultural practice) cannot be fully understood when detached from the meanings and values that produced them (cultural ideology). The relationship between ideology, practice and material also appears within the CultureCraft Model (CCM), which was synthesised through analysis of case studies showing that cultural meaning is miscommunicated or appropriated when the ideology is separated from the practice and the material (Kalantar Hormozi 2025b).

The consequences of this fragmentation are documented in several serious game contexts. For instance, Meershoek et al. (2014) report two cases in which players' shared cultural norms directly overrode game design intent. In one, a supply chain multiplayer game played by German players ended within five minutes when a senior player ordered all other players to report their information directly to him, collapsing the intended core mechanic of distributed information sharing before meaningful learning could occur. This reflected a misalignment between the game's intended structure and participants' expectations surrounding hierarchy and authority. In another example, an American-designed trading game played by students from Taiwan continued for hours without any bankruptcies because collectivist norms encouraged cooperation rather than competition. In both cases, the formal rules of

the game remained unchanged, but players' cultural assumptions reshaped how those systems functioned in practice. These examples demonstrate that cultural norms cannot be treated as passive background context within serious games, as they directly influence interpretation, behaviour and learning outcomes.
To summarise the addition of the Domain Culture System within the abstraction–realism framework, three core principles are proposed.

1.Cultural ideology should remain coherent throughout representation. In *Body Interact* (Take The Wind, 2025), the clinical ideology of cause-and-effect patient care remains constant, whether feedback is realistic or abstracted.

2.Cultural practice and cultural material may be abstracted or represented realistically depending on the purpose of the game, while maintaining a clear relationship to the underlying ideology. In *FLIGBY* (Risley and Buzady 2022), the cultural ideology of flow-based leadership is maintained, while its material setting is simplified to a winery environment and its practices are abstracted into decision-point mechanics.

3. Cultural practice and material may be represented across different levels, ranging from accurate representations grounded closely in factual detail, to authentic representations that recreate emotional resonance or lived experience, to inspired representations that remain connected to the underlying ideology while using alternative forms. *Discovery Tour: Ancient Egypt* (Ubisoft. 2018) exemplifies an accurate representation of practice and material by recreating factual historical details; *Body Interact* (Take The Wind, 2025) is an example of an authentic representation of material and practice, faithful to the emotional experience of clinical responsibility and decision-making but represented in a simplified practice and material in the game; and *FLIGBY* (Risley and Buzady 2022) is an example of an inspired orientation grounded in leadership ideology but represented through a fictional winery setting.
These three orientations towards cultural adaptation, accurate, authentic and inspired, are derived from the CultureCraft Model (CCM) (Kalantar Hormozi 2025a).

Dimension	Symbolic / minimal	Simplified / stylised	Balanced / mixed	Detailed / grounded	High fidelity / lifelike
Domain Culture System	Cultural ideology in alternative forms; practice and material represented symbolically, without real-world connection.	Cultural ideology maintained; practice and material inspired by real-world forms, adapted for player experience and accessibility.	Cultural ideology maintained; some practice and material authentically represented, others inspired.	Cultural ideology maintained; practice and material authentically represented, recognisable and emotionally resonant.	Cultural ideology, practice and material all accurately represented.

Table 1: Cultural domain system row in the Abstract and realism spectrum

DISCUSSION

Earlier iterations of the abstraction–realism framework (Risley et al. 2025a) have emphasised internal coherence across representational dimensions such as visuals, audio, mechanics, rules and narrative, but it did not articulate how cultural logics

themselves contribute to realism. The Domain Culture System extends this work by establishing cultural fidelity as a design dimension rather than a secondary layer. This reframing helps explain why serious games are sometimes experienced as unrealistic not because of graphical or mechanical abstraction, but because the behaviours, values or institutional logics they portray diverge from learners' lived experience of the domain.

Understanding culture as a spectrum of abstraction and realism provides a clearer vocabulary for analysing these effects. An abstract cultural dimension foregrounds ideology while using symbolic or stylised representations of practice and material. For example, a leadership learning game may use simplified rituals or archetypal characters to communicate power dynamics without replicating a real organisation. A realistic cultural dimension, by contrast, could draw on authentic practices, recognisable tools, emotionally plausible interactions and domain-specific materiality to convey not only what happens in a professional environment but why these actions matter. These choices shape cognitive interpretation, emotional investment and the transfer of learning: abstraction can support conceptual exploration and psychological safety, whereas realism can strengthen situated learning by anchoring gameplay in familiar cultural logics. Incorporating culture into the fidelity spectrum also clarifies the role of emotional resonance in serious games. Emotional resonance does not arise solely from narrative detail or visual quality; it emerges from how convincingly ideological values, social expectations and culturally grounded practices are represented. This aligns with emerging design research such as the CultureCraft Model, which emphasises cultural authenticity and resonance as core components of meaningfully constructed game experiences. Rather than adding a separate emotional dimension, emotional resonance is integrated into the cultural dimension, where it naturally belongs as part of the interpretive frameworks through which players make sense of learning environments.

The findings of this work indicate that cultural meaning systems operate as an interpretive anchor within the abstraction–realism spectrum. Even when other dimensions are highly stylised, convincingly portrayed cultural logic can render an experience coherent and believable. Conversely, high fidelity in visuals or mechanics cannot compensate for misaligned cultural assumptions. This demonstrates that realism in serious games is not only aesthetic or procedural but socio-cultural: it depends on whether the world operates according to recognisable values, norms and relationships. Strengthening the case for the cultural dimension is the fact that culture influences cognition, interpretation, decision-making and meaning-making - processes fundamental to how serious games achieve learning outcomes. Without a structured way to articulate how domain values and norms are represented, designers risk overlooking how learners will interpret or emotionally engage with the scenario being taught. The Domain Culture System therefore fills a substantial and previously unaddressed gap by providing a metric for cultural coherence with the same analytical rigour as other fidelity dimensions. Integrating intersectionality into this dimension further clarifies how players experience pleasure, discomfort or engagement when encountering domain cultures. Learners do not approach serious games neutrally: their identities, histories and lived experiences affect what feels authentic or alienating. Making culture explicit within the framework supports analysis of how serious games generate pleasurable recognition – as when a learner sees their professional or community norms represented - or productive tension that encourages reflection on unfamiliar or challenging value systems.

The detailed matrix in Appendix 1 operationalises the expanded framework by providing designers with a practical tool for assessing the cultural dimension alongside the six existing design elements. With five contextual points for each dimension, the matrix aims to support intentional and transparent decision-making about how abstraction and realism should be calibrated to communicate cultural meaning accurately and purposefully.

CONCLUSION AND FUTURE OUTLOOK

The expanded framework demonstrates that cultural meaning is inseparable from how realism and abstraction function in serious games. By formalising the Domain Culture System, this work positions culture as an important design consideration and offers a foundation for analysing, comparing and creating learning experiences that are coherent, inclusive and pedagogically purposeful. However, incorporating a cultural dimension introduces the need for systematic validation to ensure its relevance and reliability in practice. Future work will therefore focus on several complementary strands.

First, participatory validation with game designers will be central. Workshops will be organised where designers, developers and researchers can apply the framework to their serious games. Participants will be asked to evaluate their projects across all seven dimensions, including the newly introduced cultural category, to assess the clarity, usefulness and interpretive consistency of the descriptors. This process will not only test the framework's applicability but also reveal how designers intuitively prioritise or negotiate realism and abstraction during early-stage conceptualisation versus late-stage refinement.

Second, comparative rating studies will be conducted to evaluate how consistently multiple designers or analysts classify the same game. This will support refinement of descriptors, identification of ambiguous points on the spectrum and assessment of inter-rater reliability. These studies will also allow us to explore whether particular design dimensions exert disproportionate influence over perceptions of realism. For instance, in some contexts narrative fidelity may overshadow visual detail, while in others mechanical authenticity may dominate player interpretation. Understanding these relative weightings will help us develop more precise design recommendations and guide practitioners in balancing fidelity according to pedagogical intent.

Third, future research will examine interactions across dimensions. The seven components of the framework - visual style, audio style, mechanics and interface, rule systems, narrative structure, feedback systems and culture - are unlikely to operate independently. Instead, preliminary observations suggest that certain combinations of abstraction and realism may amplify or dampen each other. For example, abstracted visuals paired with culturally specific narratives may create a different learning effect than realistic visuals paired with symbolic cultural cues. Mapping these interactions will offer deeper insight into how coherence, dissonance or synergistic design choices shape learning outcomes.

Finally, the cultural dimension itself warrants further expansion. Initial conceptualisation positions culture as a meaning system that expresses values, practices and interpretive norms. Future studies could investigate how cultural fidelity operates at different levels such as individual, organisational, societal and domain specific and how games negotiate cross-cultural tensions.

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Appendix - Matrix of Design Dimensions in Abstraction and Realism

Abstract <----------> Realistic					
Dimension	**Symbolic / minimal**	**Simplified / stylised**	**Balanced / mixed**	**Detailed / grounded**	**High fidelity / lifelike**
Visual style	Icons / symbols / flat shapes with minimal detail / text only	2D or cartoon style, blurry / simplified anatomy or environment	Recognisable forms with selective realism in environments, characters etc	3D environments with natural scale and features, with selective stylisation	Photorealistic textures or environmental detail, anatomical accuracy
Audio style	No sound or basic tones (e.g. beeps, chimes), unrelated to game context	Stylised effects, limited audio cues, repetitive loops	Mix of sound effects and selective speech or ambient cues	Layered soundscapes with ambient details, some voice acting	Rich, dynamic spatial audio, nuanced effects, full voice acting
Mechanics and interface	Simple and not directly representational (e.g. click through menus / choices)	Basic controls (e.g. taps / clicks), functionally suggestive, low procedural detail	Reflective of real-world workflows, largely reduced complexity	Actions and interfaces mimic real world procedures, tools or workflows	Realistic two way input methods, precisely emulated actions / controls
Rule systems	Arbitrary rules, simplified logic (e.g. collecting coins), unrelated cause-effect	Simplified systems with basic logic & cause-effect, metaphors progress	Logic partly reflects real world cause effect, without full complexity	Cause-effect reflects domain relevant logic, modelled on real trade-offs	Closely models real-world dynamics, complex / linked outcomes
Narrative	Minimal context, no cohesive storyline (e.g. play framed by instructions only)	Simplified or fantastical story elements (e.g. fantasy quests / vague missions)	Loosely mirrors real-world themes, with metaphorical or fictional narrative	Authentic domain relevant scenarios, plausible choices / characters	Facts, dialogue, choices based on real events / dilemmas, authentic roles
Feedback	No in-game responses or minimal cues (e.g. score totalled at end)	Simple points or icons (e.g. stars, badges, timers) indicate success without context	Blended feedback combining scores with contextual reactions / system prompts	Gameplay consequences / system outcomes reflect player actions	Specific, real time feedback, fully embedded in gameplay / scenario itself
Domain Culture System	Cultural ideology in alternative forms; practice and material represented symbolically, without real-world connection.	Cultural ideology maintained; practice and material inspired by real-world forms, adapted for player experience and accessibility.	Cultural ideology maintained; some practice and material authentically represented, others inspired.	Cultural ideology maintained; practice and material authentically represented, recognisable and emotionally resonant.	Cultural ideology, practice and material all accurately represented.