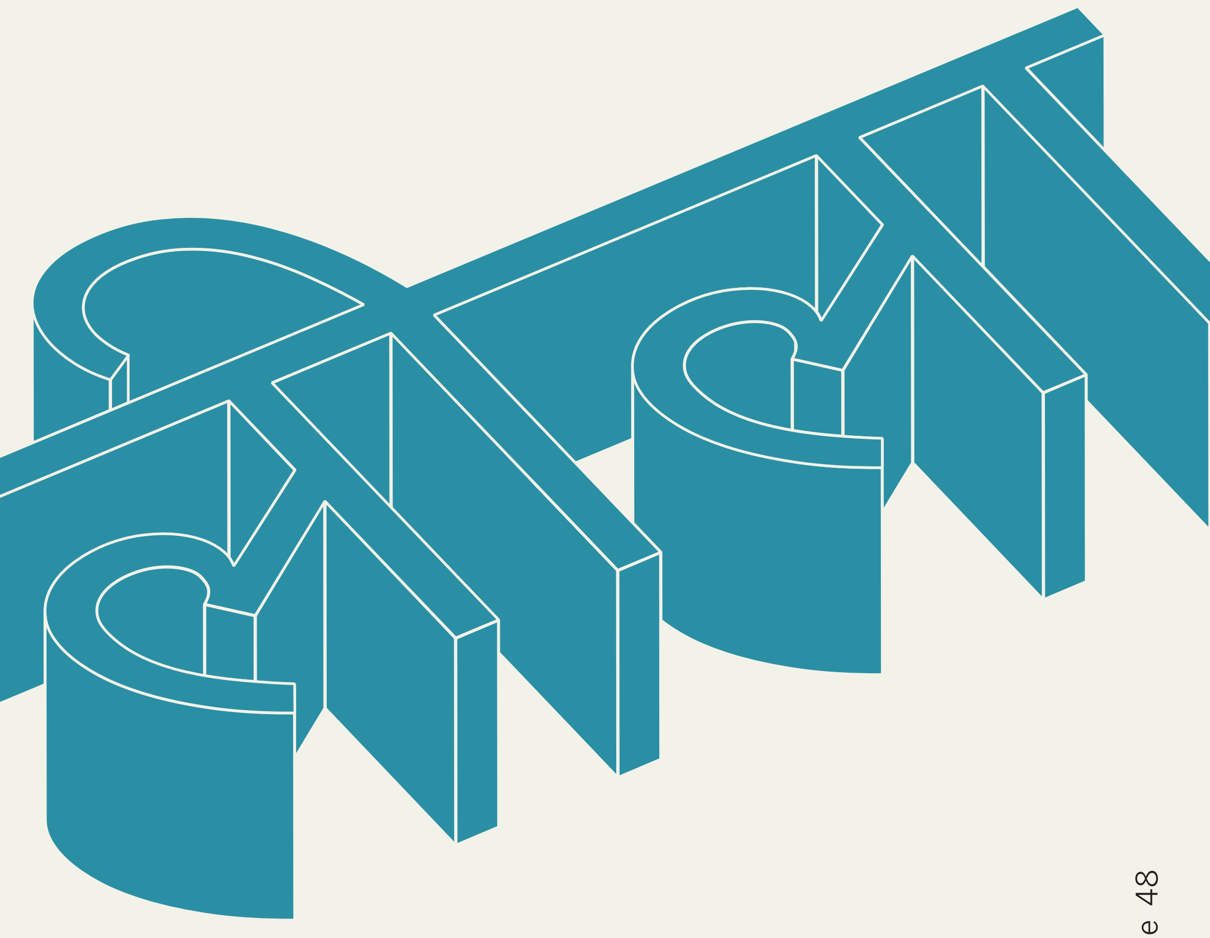
Gaming and Learning: Play, Game and Knowledge

Andrea Pontiggia
with a contribution by Tiziano Vescovi



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Abstract

This book explores game-based simulations as tools for learning, exploration, and innovation in economic and managerial contexts. It places particular emphasis on exploratory learning, distinguishing it from purely repetitive training: while repetition supports skill consolidation, exploration helps learners navigate uncertainty, confront unexpected outcomes, and develop adaptive mental models. By combining formal rules with meaningful freedom of action, simulations create environments where learning emerges through interaction, feedback, and experimentation. Integrating economics, management, game studies, and learning theory, the book offers an accessible conceptual and practical framework for readers, researchers, educators, and practitioners. No specific technical, managerial, or economic expertise is required of readers, except curiosity, interest, and a lightness of spirit.

Keywords Game-based learning. Simulation-based learning. Exploratory learning. Game design and assessment. AI-enhanced learning environments.

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Preface

"A Perfect Day" by Lou Reed

Game-based simulations are increasingly recognised as powerful tools for learning, decision-making, and innovation in economic and managerial contexts. This book explores the theoretical foundations, design principles, and practical applications of simulation games as artificial environments that reproduce essential features of real-world systems, enabling users to learn through repetition, experimentation, and most importantly exploration. At the core of this work lies a conception of learning not merely as the accumulation of knowledge or skills, but as a process of discovery. Game-based simulations provide structured yet open-ended contexts in which individuals and organisations can explore complex situations, test hypotheses, observe emergent behaviours, and uncover novel strategies without incurring the costs and risks associated with real-world experimentation. In this sense, simulations act as epistemic devices: they are not only instruments for training existing competencies, but also laboratories for generating new insights.

The publication places particular emphasis on exploratory learning, distinguishing it from purely exploitative or repetitive forms of training. While repetition supports skill consolidation and procedural fluency, exploration enables learners to navigate uncertainty, confront unexpected outcomes, and develop adaptive

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mental models. Game-based simulations are especially suited to this purpose because they combine formal rules with meaningful freedom of action, creating environments where learning emerges from interaction, feedback, and experimentation rather than prescription. From an economic and managerial perspective, simulation games offer a powerful approach to understanding and addressing complex adaptive systems such as markets, organisations, supply chains, and innovation ecosystems. By abstracting and formalising key variables while preserving dynamic interdependencies, simulations make it possible to analyse strategic behaviour, coordination problems, path dependency, and unintended consequences. Managers, policymakers, and students can experiment with alternative decisions, governance structures, and incentive mechanisms in a safe yet realistic setting. A distinctive feature of the book is its guidance-oriented approach. Readers are systematically led to understand the internal mechanisms through which games generate learning, including rules, feedback structures, incentives, and player agency. Building on this understanding, the book supports readers in the conception and design of their own simulation games and in the development of applications to concrete economic and managerial problems. Attention is devoted to problems that require the ability to connect concepts, notions, models, and frameworks both existing and novel across disciplinary boundaries and levels of analysis. Simulation games are presented as integrative tools that foster systems thinking and cognitive flexibility by making such connections explicit and operational. A central contribution of the book lies in the application of game design principles to the construction of effective learning simulations. Concepts such as meaningful choice, uncertainty, feedback loops, progressive challenge, and exploration spaces are discussed not as entertainment devices, but as cognitive and organisational design criteria. The book argues that the effectiveness of game-based learning depends less on technological sophistication and more on the coherence between learning objectives, conceptual models, and gaming structure. Finally, the work situates game-based simulations within a broader anthropological and philosophical perspective, drawing on the enduring notion of Homo Ludens. Far from being trivial or merely playful, gaming activity is presented as a serious and foundational mode of human sense-making. Simulation games, in this view, reactivate an ancient human capacity for learning through play, adapting it to the challenges of contemporary economic and managerial environments characterised by complexity, uncertainty, and continuous change. By integrating insights from economics, management science, game studies, and learning theory, this book provides both a conceptual framework and practical guidance for researchers, educators, and practitioners interested in leveraging game-based simulations as tools for learning, exploration, and innovation. No specific technical, managerial, or economic expertise is required of the reader to engage with the themes of this book, except for a dose of curiosity, interest, and a lightness of spirit.

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1 Foundations of Play and Learning

Summary 1.1 Play and the Time of Learning. – 1.2 Play and Games: Definitions, Tensions, and Endurance in Human Experience. – 1.3 Entertainment, Pastime, and the Paradox of Gratuitous Action. – 1.4 The Learning Consequences of Play as a Designed Artifact. – 1.5 The Power of Design and the Artificial in Play Experiences. – 1.6 Transferability and Reproducibility: Conditions and Limits of Gaming Experience. – 1.7 Expected Outcomes: Not Identical Results But Different Types of Learning.

1.1 Play and the Time of Learning

This chapter establishes the conceptual ground of the ebook by clarifying why play matters for learning, how games organise experience, and why designed ludic environments can support meaningful knowledge acquisition.

Why do we speak about play? Because play profoundly affects learning and the ways in which knowledge is acquired. It strengthens motivation and stimulates the desire to apply what has been learned, especially when the learning experience is embedded in a real or simulated context. People struggle to understand why they should learn something whose usefulness or beauty they cannot perceive. What is not perceived as useful, engaging, or meaningful and is learned with difficulty risks remaining unapplied or having only a

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very limited impact. The question, then, becomes how to increase the perceived usefulness, enjoyment, and appeal of learning. From this perspective, play should not be understood as a break from cognitive work, but as a structured form of experience capable of making visible the meaning of what is learned. As John Dewey observed, learning becomes meaningful when it is rooted in action and experience: play, precisely because it is goal-oriented and governed by constraints, constructs a context in which knowledge can be used, not merely remembered.

Usefulness emerges when knowledge is tested in situations that simulate its real use. An economic role-playing game, for example, in which students must manage limited resources and make collective decisions, makes abstract concepts such as opportunity cost or risk immediately understandable. In this protected space, error is not punished but analysed: a dynamic that recalls Dewey's "learning by doing" and situated learning practices.

Enjoyment does not coincide with superficiality, but with deep engagement. Mihály Csíkszentmihályi (1990) described this condition as flow: a state in which challenge is proportionate to skill, attention is total, and feedback is immediate. This is what happens, for example, in a well-designed mathematical game, where each solution opens onto a slightly more complex new problem. Pleasure arises from perceived progress, not from simplifying the task.

Beauty, or fascination, concerns instead the form of the experience. Johan Huizinga, in *Homo Ludens*, emphasises how play creates a "magic circle", a separate space in which actions acquire symbolic value. An educational game that is carefully designed in its narrative, its rules, and its visual artifacts whether a historical simulation or a digital environment does not merely transmit content, but offers an experience endowed with meaning. It is in this formal coherence that learning becomes memorable. In this intertwining of usefulness, enjoyment, and beauty, play does not eliminate complexity, but makes it inhabitable. The developmental literature underscores the depth of this relationship: Chu and Schulz (2020), in a comprehensive review, demonstrate that play and curiosity are bidirectionally linked cognitive processes, each amplifying the other and together constituting a primary engine of knowledge construction across the lifespan. As Lev Vygotsky suggests, it is precisely in the mediating space between what one knows how to do and what one can learn that education finds its strength. Play, if well designed, occupies exactly this space: it does not simplify knowledge, but renders it desirable, practicable, and meaningful.

1.2 Play and Games: Definitions, Tensions, and Endurance in Human Experience

Defining play is a less simple operation than it may appear. Not because definitions are lacking, but because play seems to evade every attempt at a single, univocal reduction. It is an activity that crosses eras, cultures, and contexts, assuming different and sometimes contradictory forms, while maintaining a constant presence in human experience. Every definition of play, rather than closing its meaning, illuminates one of its tensions: between freedom and rule, gratuity and purpose, pleasure and discipline, escape and learning.

One of the most famous definitions is that proposed by Johan Huizinga, who in *Homo Ludens* describes play as a free, voluntary activity, separate from ordinary life, regulated by its own norms, and capable of creating a temporary order. For Huizinga, play is not a simple pastime, but a primary form of cultural production: law, war, art, and ritual all carry with them an original gaming structure. From this perspective, play precedes culture and constitutes one of the conditions of its possibility. It is serious without being 'useful' in any immediate sense, and it is precisely this apparent uselessness that makes it significant.

Partly opposed to this view is a tradition that has regarded play with suspicion. Plato, while recognising its educational value in the early years of life, tends to relegate it to a preliminary phase, destined to be surpassed by the rational and disciplined exercise of thought. In this perspective, play is tolerated insofar as it prepares for something more serious but loses legitimacy when it seeks to substitute itself for commitment and responsibility. Play thus becomes the opposite of work, duty, and production: a pause, an interruption, sometimes even a distraction.

This ambivalence runs through the whole history of the West. On the one hand, play is celebrated as a space of freedom; on the other, it is controlled, regulated, often marginalised. Aristotle considers it necessary as a form of rest, but subordinate to active and contemplative life. Play serves to restore energy, not to construct the meaning of existence. Here play is not foundational, but functional: a means of returning to work, not an experience endowed with intrinsic value.

A nearly opposite definition to Huizinga's emerges in the modern age, when play becomes progressively associated with childhood and with social irrelevance. In productivist thought, play is what does not produce economic value, what does not contribute directly to growth or efficiency. It is 'wasted' time, unproductive time. This idea, deeply rooted in industrial modernity, long shaped the educational perception of play, relegating it to a secondary or decorative tool. And yet, already in the twentieth century, this view was radically challenged. Jean Piaget interpreted play as a fundamental mode of knowledge construction: through symbolic play and rule-based play, the child assimilates the world and reorganises cognitive structures. Here play does not escape, but authentic cognitive work, even if not immediately directed toward an external result.

Lev Vygotsky pushes this intuition even further, arguing that in play the child acts 'above' their usual level of competence. In pretend play, for example, the child follows rules that are not imposed from outside but internalised as part of the meaning of the activity. Play thus becomes a space of mediation between desire and norm, between freedom and discipline: a place where one learns to want what the rules make possible.

Another definition, only apparently distant, is that proposed by Roger Caillois, who distinguishes play according to fundamental axes: agon (competition), alea (chance), mimicry (simulation), and ilinx (vertigo). In this classification, play is not a single category, but a set of forms that respond to different needs and drives. Some are structured and rule-governed, others chaotic and destabilising. Play may be order or disorder, control or loss of control. Again, every partial definition reveals a polarity rather than a definitive synthesis.

If we broaden our gaze beyond the Western tradition, play appears as a recurring anthropological trait. Archaeological traces of board games, dice, and ritual competitions appear in the oldest civilisations: from Egypt to Mesopotamia, from pre-imperial China to pre-Columbian cultures. Play accompanies the birth of cities, social hierarchies, and mythical narratives. It is not a luxury of advanced societies, but a sign of their symbolic organisation.

In many cultures, play is intertwined with the sacred: contests, masks, and ritual simulations serve to stage conflict, death, and rebirth. Play becomes a form of representation of the world, a way of confronting the uncertainty of existence through temporary and shared rules. In this sense, play does not deny the seriousness of life but makes it manageable. These definitions sometimes convergent, sometimes opposed show how play has been alternatively conceived as freedom and discipline, gratuity and function, escape and learning, pleasure and cultural construction. It is precisely this ambivalence that makes it such a resilient category over time. Play survives because it knows how to change form without losing its deep function: giving meaning to human action when meaning is not immediately given.

It is from this horizon that space opens to consider play as entertainment, a dimension often undervalued but central in human history. Entertainment is not merely distraction: it is one of the ways through which societies work through desires, motivations, and shared pleasures. Play, as entertainment, marks the passage from mere survival to civilisation; it indicates that a community has enough time, resources, and imagination to devote itself to what is not immediately necessary, but profoundly human.

From this perspective, play approaches the idea of motivation and desire: it does not compel, it invites; it does not impose, it attracts. It is a space in which action is sustained by the pleasure of acting, not by fear of sanction. And perhaps it is precisely in this capacity to bind pleasure, meaning, and participation that play continues, after millennia, to be one of the quietest yet most powerful engines of human development.

1.3 Entertainment, Pastime, and the Paradox of Gratuitous Action

If play accompanies the history of humanity as a sign of civilisation, entertainment represents one of its most evident and, at the same time, most ambiguous forms. In common language, to entertain means 'to pass the time': a pastime, indeed. An activity that suspends, at least temporarily, the pressure of everyday life, dominated by an implicit yet pervasive rule: that of efficiency and effectiveness. In modern daily life, action is legitimate only if it is purposeful, measurable, and oriented toward a result. What does not produce an immediate effect appears superfluous, if not outright suspicious. In this framework, pastime seems to occupy the margins of meaningful experience. It is what one does 'meanwhile', when work is suspended, when the goal is not urgent.

The time of play and entertainment thus appears as an empty, residual time, withdrawn from the logic of productivity. And yet, it is precisely this apparent gratuity that reveals its deepest value. Play, as pastime, challenges the idea that every action must be justified by an external utility. It shows that there are experiences that matter because of the way they are lived, not only because of what they produce. The paradox is evident: play is often perceived as inefficient, and yet it is extraordinarily effective at generating engagement, attention, and motivation. One immerses oneself in play not because one must, but because one wants to. Not for an external reward, but for the pleasure of the experience itself.

In this sense, play reveals a truth often repressed in adult life: that learning, growth, and even personal transformation can also and sometimes above all occur through activities that are not immediately instrumental. Research confirms this: a broad review of the psychological literature on video games shows that even entertainment-oriented play can foster learning, emotional development, and prosocial behaviour (Granic, Lobel, Engels 2014).

Play, in fact, is not a simple suspension of the rule, but its temporary rewriting. Within it, precise rules, clear goals, and shared constraints apply. What changes is not the presence of structure, but its meaning: action is not imposed from outside, but voluntarily accepted. It is in this free adherence that play becomes a powerful engine of motivation. The individual does not undergo the experience, but immerses themselves in it, recognising it as meaningful.

From this emerges another decisive element: play does not 'pass the time' neutrally. On the contrary, it occupies time in a dense, intentional, memorable way. It is an experience designed to leave something behind: a competence, a memory, an emotion, a new understanding of the world or of oneself. Even when it is not explicitly educational, play produces lasting effects. It is precisely this capacity to have an impact, despite its apparent gratuity, that makes it a crucial object of reflection.

At this point, the discourse on play inevitably encounters the theme of design. If play succeeds in generating pleasure, immersion, and motivation, it is not only because it 'happens', but because it is constructed according to a design. Rules, times, spaces, roles, feedback: nothing is accidental, especially in the more complex forms of play. Fun is not the opposite of structure; rather, it is its result. Hong et al. (2009) give this principle empirical grounding in an educational game context: their study of playfulness-based design found that games engineered to maximise perceived playfulness, through responsiveness, enjoyment, and a sense of control, produced significantly higher learning engagement and satisfaction than comparable games without these design properties, demonstrating that the playful texture of an experience is not decorative but constitutive. As Schell (2019) observes, the art of game design lies precisely in engineering the conditions from which pleasure emerges, treating structure not as a constraint on enjoyment but as its generative source.

A fundamental tension thus opens: is play an emergent and natural expression of human beings one need only think of the spontaneous play of children or of animals or is it an exercise in artificial design, the fruit of precise intentionality? The answer probably lies in the coexistence of both dimensions. Play arises as a natural impulse, but develops and is refined through design. It is precisely when the gaming instinct encounters conscious design that play becomes capable of sustaining complex, lasting, and transformative experiences.

In this sense, designing a game does not mean betraying its nature, but recognising its potential. It means creating the conditions so that pleasure is not ephemeral, so that pastime is not empty, so that entertainment becomes experience. It is in this passage from spontaneity to design that play prepares to become not only entertainment, but also a cultural, educational, and social tool.

1.4 The Learning Consequences of Play as a Designed Artifact

If we accept as valid the idea that play can be not only a spontaneous expression of human experience, but also an artificial artifact intentionally designed and oriented toward learning, then the educational implications are profound and not without ambiguity. Play ceases to be a simple motivational accessory and becomes a full-fledged pedagogical device, subject to choices, responsibilities, and evaluative criteria.

The first consequence concerns the role of educational intentionality. A game designed for learning cannot be limited to being fun: it must incorporate cognitive objectives, competencies to be exercised, and forms of feedback that make progress visible. This implies a redefinition of educational work: the teacher or designer does not 'add' the game afterward, but constructs an environment in which learning is inscribed in the very structure of the experience. The risk, however, is evident: when intentionality becomes too explicit, the game loses its dimension of freedom and is perceived as disguised exercise. Dickey (2005) captures this tension in her analysis of engagement strategies in computer and video games: the most effective instructional designs are those that embed learning objectives within the game's intrinsic logic, rather than imposing them from outside.

From this follows a second, more subtle consequence: the transformation of the relation between pleasure and purpose. In spontaneous play, pleasure is an end in itself; in designed educational play, pleasure becomes a means. This shift is not neutral. If the participant perceives that enjoyment is instrumental, motivation risks becoming extrinsic. Paradoxically, play works only if it does not openly show that it wants to 'teach'. Design must therefore operate by subtraction, allowing learning to emerge from action more than to be declared.

A third consequence concerns the redefinition of error. In a game designed for learning, error is not a deviation to be corrected, but a necessary passage of the experience. This entails a deep cultural change: evaluating no longer means exclusively measuring the final result, but observing the process, the strategies adopted, and the capacity for adaptation. Play, in this sense, introduces a pedagogy of experimentation that often comes into tension with educational systems still strongly normative.

To assume play as an artifact also implies reflection on the responsibility of design. Every design choice, rules, levels of difficulty, reward systems, directs participants' behaviour and attention. Play is not neutral: it suggests what counts, what is rewarded, what can be ignored. To use play for learning therefore means assuming responsibility for shaping experiences that influence values, attitudes, and ways of thinking, not only disciplinary knowledge.

A further consequence concerns the time of learning. Play breaks the traditional linearity of the didactic path. It does not proceed through exposition and verification, but through exploration, attempts, and returns. This makes learning less predictable, but often deeper. It does, however, require educational contexts capable of tolerating uncertainty and of recognising different learning times as legitimate.

Finally, to consider play as an artificial product leads one to question the boundary between education and entertainment. If play becomes a systematic tool of learning, there is a risk either of trivialising it or, conversely, of colonising the educational experience with superficial gaming logics. The challenge is not to 'make everything a game', but to recognise when and how play can open spaces of meaning that other devices fail to generate.

Ultimately, to assume play as an artifact designed for learning does not mean domesticating it, but accepting its complexity. As Woolston (2021) observes in a synthesis of the developmental science on play, researchers continue to debate precisely what play is and how it works, but converge on one point: its educational and developmental power cannot be captured by any single mechanism, and any account that simplifies it loses what matters most. Play works educationally only when it preserves a share of gratuity, ambiguity, and freedom. It is in this zone of tension between design and openness, between purpose and pleasure, that play can become one of the most powerful and, at the same time, most delicate forms of educational experience.

1.5 The Power of Design and the Artificial in Play Experiences

The power of design and the artificial in the construction of play experiences lies in their capacity to transform a natural impulse into an intentional, repeatable, and meaningful experience. If spontaneous play arises from the immediate need to explore, imitate, or experiment, designed play introduces a structure that directs that impulse without necessarily suffocating it. It is in this mediation between nature and artifice that play acquires depth and duration.

Design first of all makes possible the construction of contexts. Every play experience takes place within a bounded space physical, symbolic, or digital in which rules different from those of everyday life apply. This space is not given: it is designed. Through rules, goals, roles, and constraints, design creates a 'possible world' that invites action and makes experience inhabitable. The artificial, in this sense, is not falsification, but a condition of access to meaning.

A second element of strength concerns the control of complexity. Reality is often too opaque or too chaotic to be immediately understood. Designed play selects, simplifies, and renders visible the relationships among the variables at play. It does not eliminate complexity, but makes it explorable. In a well-designed game, the consequences of actions are perceptible, causal links emerge, and feedback guides learning. The artificial thus makes it possible to construct experiences that would be impossible, or too risky, in real life.

Design also intervenes in the time of experience. Artificial play can accelerate, slow down, or repeat situations, offering the player the possibility of retracing their steps, experimenting with alternatives, and learning through iteration. This manipulation of time is not an escape from reality, but a form of reflection embedded in action. Play thus becomes a training ground of experience, where time is shaped to favour understanding and mastery.

The time of learning, when mediated by play, withdraws from the linearity and rigid pacing typical of traditional educational models. It does not proceed through the progressive accumulation of content, nor through the orderly succession of objectives to be reached within fixed times, but through immersion, return, deviation, and meaningful repetition. Play introduces a qualitative rather than a quantitative time: a lived time, in which duration is determined by the intensity of the experience and not by its placement in a calendar. In this time, error does not interrupt the path, but prolongs and enriches it; repetition is not redundancy, but exploration of new possibilities. The player can slow down, accelerate, stop, begin again, following a rhythm that responds to their cognitive and emotional needs. This type of temporality favours deep learning because it allows one to inhabit problems, to remain within uncertainty, and to build understandings that mature gradually. Play, in this sense, does not eliminate the effort of learning, but redistributes it over time, making it sustainable and meaningful. The artificial design of the play experience makes possible this manipulation of time, creating spaces in which learning is bound not to the urgency of the result, but to the quality of attention and commitment.

A further point of strength concerns motivation. Designed play constructs conditions in which the desire to act arises from within the experience itself. Clear goals, progressive challenges, and systems of symbolic or narrative reward sustain commitment without recourse to external obligations. Here the artificial shows its paradoxical power: creating rules in order to generate freedom, imposing constraints in order to make pleasure possible. Design does not produce motivation, but makes it sustainable over time.

Design also makes it possible to integrate different dimensions of human experience: cognitive, emotional, social, and aesthetic. A game is not only a problem to be solved, but an experience to be lived. Through careful attention to form narrative, aesthetics, rhythm, interaction design constructs a unity of meaning that favours immersion. The artificial, far from being cold or mechanical, becomes the place where experience is rendered coherent and memorable.

Finally, the power of the artificial lies in its transferability. A designed experience can be shared, adapted, and replicated in different contexts. This makes play a powerful tool not only for entertainment, but for education, training, and research. Design makes it possible to abstract from singular experience in order to build devices that speak to many, without losing the ability to engage the individual.

The transferability of the learning experience, made possible by designed play, poses a delicate challenge: how to build shareable experiences without homogenising, without rendering uniform what is by nature personal and situated. The strength of play lies precisely in its ability to offer a common structure rules, goals, and constraints within which each participant constructs a singular path.

The experience is the same only in appearance: in reality, each player traverses it with different competencies, motivations, strategies, and sensibilities. Design must not erase this difference but sustain it. A good game does not prescribe a single solution but opens a field of possibilities; it does not impose meaning, but renders it negotiable. In this way, the experience can be transferred reintroduced in different contexts, adapted to different publics without losing its capacity to generate personal meaning. The artificial, here, does not standardise, but makes possible the encounter between a stable structure and a multiplicity of interpretations.

It is in this tension between repeatability and uniqueness that play shows one of its deepest educational potentials: offering designed experiences that do not produce identical learnings, but comparable learnings, each rooted in the history and lived experience of the player.

One may conclude that design and the artificial are not the opposite of gaming spontaneity, but its cultural extension. Where natural play ignites desire, designed play constructs its path. It is in this fragile but fertile alliance that play becomes an intentional experience, capable of generating pleasure, meaning, and lasting learning.

1.6 Transferability and Reproducibility: Conditions and Limits of Gaming Experience

To affirm that a gaming learning experience is transferable means recognising that it can be reintroduced in different contexts without losing its educational function. However, when transferability is translated into reproducibility, a fundamental tension emerges: what is reproducible risks becoming standardised, whereas authentic educational experience is always situated, relational, and partly unpredictable. Reproducibility, therefore, cannot be understood as an identical copy of experience, but as the recreation of the conditions that make experience possible.

The first condition of reproducibility concerns the formal structure of the game. Clear rules, legible goals, explicit constraints, and coherent mechanics constitute the transferable backbone of the experience. These elements can be replicated because they do not depend on individual participants, but on the design of the activity. It is this structure that allows the game to 'work' even in the absence of the original context. At the same time, the structure must be sufficiently open to accommodate different strategies; otherwise, reproduction is reduced to mechanical execution.

A second condition concerns the separation between structure and experiential content. What can be reproduced is the device, not the subjective experience it generates. Any attempt to reproduce emotions, learning times, or participants' reactions also leads to distortion. Authentic reproducibility accepts the impossibility of replicating experience in its full sense and focuses instead on the possibility of reactivating analogous processes: engagement, exploration, reflection, attribution of meaning.

A third fundamental condition is contextual adaptability. A transferable game must be capable of being modulated according to age, cultural context, prior competencies, and specific educational goals. Reproducibility is therefore not rigid, but parametric: what is reproduced is a set of relations among elements, not a fixed sequence of actions. This adaptability is what distinguishes a designed experience from a closed format.

A further condition concerns the role of the facilitator or educator. No gaming experience is fully reproducible without competent human mediation. The educator interprets the game, regulates its pacing, supports participants, values error, and favours reflection. Reproducibility therefore depends not only on design, but also on the capacity of those guiding the experience to understand its deeper meaning. Without this mediation, the game risks being reduced to procedure.

Finally, reproducibility requires clarity about the expected outcomes, not in terms of identical results, but in terms of types of learning. What must be reproducible is not that participants learn the same thing in the same way, but that they learn something relevant. Design must therefore make explicit which processes it intends to activate, problem solving, collaboration, critical thinking, awareness, while leaving open the concrete forms these processes will take. Weisberg, Hirsh-Pasek, and Golinkoff (2013) call for precisely this kind of nuanced approach: they argue that the educational potential of play is best realised not by simplifying the activity, but by preserving its complexity while providing appropriate structure.

1.7 Expected Outcomes: Not Identical Results But Different Types of Learning

To affirm that the reproducibility of a gaming experience requires clarity about expected outcomes does not mean wishing for all participants to reach the same results, nor to produce homogeneous and measurable learning according to standardised criteria. On the contrary, it means recognising that what can be designed and reproduced is not the final outcome of learning, but the nature of the cognitive, emotional, and social process that the experience intends to activate. In other words, the educational design of play does not aim to guarantee what each individual will learn in the same way, but how learning may occur.

To speak of types of learning implies a shift in perspective: from output to process. A type of learning defines the kind of transformation expected in the participant's experience, without prescribing its specific forms. One may design a game to foster problem solving, strategic thinking, collaboration, metacognitive reflection, decision-making under uncertainty, or the construction of symbolic meaning. These types do not produce identical results, because each subject traverses them starting from their own baggage of competencies, motivations, and lived experiences. Yet they are sufficiently clear to orient design and sufficiently open to accommodate difference.

This distinction is crucial for reproducibility. If a game is designed to transmit specific content uniformly, its reproduction will be fragile: a change of context, audience, or mediation will suffice for the experience to lose effectiveness. If, instead, the game is designed to activate a type of learning, reproduction becomes more robust. Even if content changes, or participants interpret the experience differently, the game continues to perform its educational function because what is reproduced is the field of cognitive possibilities.

An example clarifies this point. A game designed to develop critical thinking does not guarantee that all participants formulate the same arguments or reach the same conclusions. What makes the experience reproducible is the fact that, in different contexts, participants are placed in the condition of comparing information, evaluating alternatives, justifying choices, and reflecting on consequences. The result is different each time, but the type of learning critical thinking remains recognisable.

This clarity about expected outcomes also has an ethical and design function. It prevents confusing the success of the experience with the conformity of results and protects educational play from the risk of manipulation. When outcomes are defined as processes rather than as closed results, the participant retains a space of interpretive freedom. Learning is not imposed, but made possible. The game thus does not become an instrument of training, but an environment of guided exploration.

Finally, this conception allows for a more adequate evaluation of the experience. To evaluate a type of learning does not mean verifying whether everyone has learned the same thing, but observing whether the experience has effectively activated the intended processes. Reproducibility, in this sense, is not the repetition of the identical, but the coherence between design intention and lived experience, even when the latter takes different forms.

Ultimately, clarity about expected outcomes as types of learning is what makes possible a non-homogenising reproducibility. It makes it possible to design ludic experiences that, even while changing faces, contexts, and results, continue to produce meaningful learning. It is in this capacity to hold together intentionality and openness that designed play shows its most mature educational strength. In this sense, transferability as reproducibility is not a guarantee of uniformity, but a promise of reactivation. A well-designed game does not replicate identical experiences, but makes possible, each time, a new experience within a recognisable frame. It is precisely this balance between stability and openness that allows play to be at once artificial and alive, designed and unpredictable, reproducible and irreducibly personal.

2 Game-Based Learning Models and the Architecture of Play

Summary 2.1 A Structural Model of Game-Based Learning: Variables and Their Effects on the Learning Process. – 2.2 Elements, Relationships, and the Logic of Interaction. – 2.3 Feedback Loops and the Mechanism of Learning. – 2.4 Rules and the Architecture of Play. – 2.5 Uncertainty, Conflict, and the Conditions of Real Decision. – 2.6 How Games Work on the Mind: Play, Knowledge, and the Learning Conditions. – 2.7 When the Game Requires Something Already Known. – 2.8 The Surface of the Game and What Lies Under It. – 2.9 What Prior Knowledge Actually Does.

2.1 A Structural Model of Game-Based Learning: Variables and Their Effects on the Learning Process

This chapter moves from general theory to the internal architecture of games, examining rules, feedback, interaction, uncertainty, and the cognitive mechanisms through which play becomes a learning system.

Before presenting the table, it is worth stating clearly what the model proposes and what it does not. The framework builds on Garris, Ahlers, and Driskell (2002), whose influential research and practice model identified the structural variables through which games motivate and shape learning, and integrates them with the design principles articulated by Salen and Zimmerman (2004) in their foundational work on game mechanics and rules. It does not propose

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that all fifteen variables must be present in every instructional game, or that their effects on learning are uniform across all learners and all domains. It proposes something more modest and more useful: that these fifteen variables are the primary structural dimensions along which any game-based learning experience can be analysed, and that understanding the effect of each variable on the learning process gives the designer, the teacher, and the researcher a coherent framework for making and evaluating instructional decisions. The variables are grouped into four clusters: Rule Structures, Uncertainty and Decision-Making, Objectives and Outcomes, and Player Experience, each of which captures a distinct dimension of how games work on the mind. Within each cluster, the variables are related to one another, and those relationships are noted where they are most important. The table that follows maps each variable to its primary effect on learning, stated as directly as possible.

The model rests on a single foundational claim: that learning in games is not produced by any single feature of game design but by the interaction of multiple structural variables operating simultaneously on the learner's cognition, motivation, and social experience. A game that is strong on operational clarity but weak on meaningful uncertainty will produce procedural compliance without real thinking. A game that generates deep immersion but lacks clear goals will produce engagement without direction. A game that creates productive conflict but withholds the feedback needed to learn from it will produce frustration rather than understanding. The variables are interdependent, and the quality of the learning experience depends on how well they are balanced against one another, which is to say, on the quality of the design.

Table 1 Structural model of game-based learning: variables and their effects on the earning process

Rule Structures	Operational Rules	The explicit, stated instructions that govern what players can and cannot do during play	Establish procedural knowledge and enable action within the game world; reduce cognitive overload at entry by providing a clear behavioural framework; when well-designed, allow the learner to focus attention on decision-making rather than on decoding the game's basic mechanics
	Constitutive Rules	The underlying formal or mathematical logic that the operational rules express; the deep structure of the game's system	Develop structural and relational understanding of the domain the game represents; when grasped through play, produce knowledge that is closer to disciplinary understanding than to game knowledge; the primary mechanism by which games teach the logic of a field rather than merely its surface procedures

	Implicit Rules	The unwritten social norms and expectations that govern how the game is actually played in its social context	Shape the quality of collaborative and competitive interaction; determine whether the game functions as a productive social learning environment or degrades into conflict and disengagement; require explicit teacher management to align social behaviour with instructional purpose
Uncertainty and Decision-Making	Hidden Information	The deliberate withholding from one or more players of information that exists within the game world	Develops probabilistic reasoning and inference under incomplete information; trains the learner to act decisively on the basis of partial evidence; replicates the epistemic conditions of real professional practice more faithfully than any fully transparent problem set
	Randomness	The introduction of outcomes not fully determined by player decisions, through dice, cards, or algorithmic processes	Forces the learner to evaluate decisions by the quality of the reasoning that produced them rather than by their outcomes alone; develops probabilistic thinking and the capacity to distinguish good decisions from lucky ones; builds tolerance for uncertainty as a permanent condition of complex domains
	Opponent Behaviour	The uncertainty produced by the presence of other players whose decisions are not known in advance and whose goals may conflict with one's own	Develops strategic thinking and the capacity to reason about the intentions and likely responses of others; produces the adversarial cognitive demand that single-player environments cannot replicate; directly trains the interpersonal and competitive reasoning required in negotiation, clinical, legal, and market contexts
	Complex Decision Spaces	Game situations in which multiple options are available simultaneously, none obviously superior, each carrying consequences that extend beyond the immediate moment	Trains judgment under genuine uncertainty; develops the capacity to evaluate competing options with incomplete information and real consequences; produces the kind of decision-making demand that examinations, which present pre-specified problems with known correct answers, structurally cannot
	Conflict	The structural tension built into the game – against another player, against the system, or against the constraints of limited resources and capability	Generates the cognitive and motivational pressure without which engagement collapses and learning loses direction; when well-designed, mirrors the genuine tensions of the domain the game represents and produces understanding of how those tensions are navigated in practice
Objectives and Outcomes	Goals	What the player is trying to achieve; the game's explicit statement of success conditions	Provide direction and motivational structure; align the learner's effort with the instructional objective; when well-calibrated to the learner's level of prior knowledge, produce the challenge-competence balance that sustains productive engagement throughout play

	Procedures	The actions the player is permitted to take in pursuit of goals; the operational range of the game	Define the cognitive and strategic space within which learning occurs; procedures that are too narrow constrain learning to a single pathway; procedures that are too broad produce decision paralysis; well-designed procedures create a space that is open enough to require genuine thinking and constrained enough to keep that thinking productive
	Outcomes	How success or failure is measured and communicated within the game	Function as the game's primary evaluative feedback; when outcomes are clearly connected to the decisions that produced them, they support learning by closing the loop between action and consequence; when outcomes are poorly calibrated – too harsh, too forgiving, or insufficiently differentiated – they undermine the learning process by severing the connection between decision quality and result
Player Experience	Pleasure	The positive affective experience produced by the game, including aesthetic enjoyment, humour, social connection, and the satisfaction of competent performance	Reduces affective barriers to engagement; increases willingness to persist through difficulty; creates the emotional conditions under which risk-taking – the cognitive behaviour most productive of genuine learning – becomes possible; pleasure that is disconnected from learning content is motivating but not instructive
	Engagement	The sustained direction of attention and effort toward the game's demands	The necessary condition for all other learning effects; no variable in this model produces learning in the absence of engagement; engagement is produced by the interaction of challenge, meaning, and the player's sense that their decisions matter; it is the most important single predictor of whether the game will teach anything at all
	Challenge and Flow	The dynamic balance between the difficulty of the game's demands and the competence of the player meeting them; the state of absorbed, effortless attention that optimal challenge produces	When the balance is correct, produces the state of flow in which learning is most efficient and durable; when the balance is wrong – too easy or too hard – produces boredom or anxiety, both of which suppress learning; maintaining this balance across a heterogeneous learner population is the central practical challenge of instructional game design
	Immersion	The degree to which the player experiences the game's world as present and real; the suspension of awareness of the external environment	Deepens the transfer of learning by strengthening the connection between the game's scenarios and the real-world situations they simulate; high immersion increases the likelihood that knowledge developed during play will be accessible in non-game contexts; immersion is most educationally productive when the game's scenario is structurally faithful to the domain it represents, not merely visually convincing

Several relationships between variables deserve to be made explicit, because they are not fully captured by reading the rows of the table independently.

The relationship between operational rules and flow is direct and consequential. A game whose operational rules are unclear or inconsistently applied places a cognitive burden on the learner that competes with the cognitive work the game is designed to produce. The learner who is still trying to understand what they are allowed to do cannot simultaneously be exercising the judgment the game was designed to develop. Operational clarity is therefore not merely a matter of usability; it is a precondition for the flow state that makes learning efficient.

The relationship between constitutive rules and transfer is equally important and less commonly discussed. A learner who has understood a game's constitutive logic, who has grasped, through play, the formal relationships that the game's operational rules express, is in a position to transfer that understanding to new contexts, because constitutive logic is abstract and therefore portable. A learner who has mastered only the operational rules has acquired context-specific procedural knowledge that may not transfer beyond the specific game that produced it. The depth of learning a game is therefore closely related to the degree to which the learner has penetrated from the operational surface to the constitutive depth.

The relationship between hidden information and opponent behaviour creates, in combination, the conditions for the most demanding form of strategic reasoning that games produce: the reasoning of a player who must act on incomplete information in a situation where another intelligent agent is actively working against them. This combination, present in negotiation simulations, competitive market games, legal advocacy exercises, and a wide range of other knowledge-dependent instructional games, produces cognitive demands that are, in both their structure and their difficulty, closely analogous to the demands of professional practice in complex domains. It is the combination, not either variable alone, that generates this effect.

Finally, the relationship between immersion and transfer deserves emphasis because it runs counter to an assumption that is sometimes made in educational technology: the assumption that the more realistic a game's visual environment, the more effective it will be as a learning tool. Immersion that is produced by visual fidelity alone, by the convincing representation of a surface scenario, does not reliably produce the transfer of learning. Immersion that is produced by structural fidelity, by a game whose internal logic really mirrors the logic of the domain it represents, does. A visually simple game whose constitutive rules accurately represent the dynamics of a real-world system will produce more durable and more transferable learning than a visually spectacular game whose mechanics bear only a superficial relationship to the domain it claims to simulate. The map is not the territory, and the simulation is not the domain. But a simulation whose structure faithfully replicates the domain's structure is, for the purposes of learning, close enough to matter. There is a temptation, when thinking about games in educational contexts, to focus on the surface features, the points, the scenarios, the competitive dynamics, the narrative wrapping, and to treat these as the substance of what games are. This temptation should be resisted. The surface features of a game are real and they matter, but they are effects rather than causes. They are produced by something deeper and more structural: the system that lies beneath the surface and generates, through the interaction of its parts, everything the player encounters during play. To understand how games teach, one must understand how games work, and games work as systems. This is not a metaphor. It is a precise description of their architecture.

A system, in the sense relevant here, is a set of elements whose relationships with one another produce behaviour that none of the elements could produce alone. Wardaszko (2018) has examined this interdisciplinary challenge directly, arguing that simulation game design requires the integration of systems theory, complexity science, and learning theory into a coherent design methodology, a demand that distinguishes serious game design from both conventional instructional design and commercial game development. The elements of a game, its pieces, its rules, its players, its resources, its spaces, are not interesting in isolation. A chess piece standing alone on a table is an object. A chess piece on a board, in relation to other pieces, governed by rules that specify what it can and cannot do, is a participant in a system whose complexity vastly exceeds the sum of its components. This excess, the gap between the simplicity of the parts and the complexity of the behaviour they produce together, is what game designers and systems theorists alike call emergence, and it is one of the most important concepts in understanding both how games function and why they are educationally powerful.

2.2 Elements, Relationships, and the Logic of Interaction

To analyse a game as a system is to ask, first, what its elements are, and second, how those elements relate to one another. These are not the same question, and the second is more important than the first. A game's elements, the pieces, the cards, the spaces, the players, the resources, can be enumerated straightforwardly. But the relationships between those elements, the ways in which a change in one part of the system propagates through the others and produces consequences that were not specified in advance, are where the game's actual behaviour lives. A change in the value of a single resource in a strategy game does not merely affect the decisions that involve that resource directly. It ripples through the entire system, altering the relative value of every other resource, shifting the balance of strategies available to each player, and changing the conditions under which every subsequent decision will be made. The system is not a collection of independent parts. It is a web of interdependencies, and its behaviour at any given moment is the product of all those interdependencies operating simultaneously.

This structural fact has a direct implication for learning. When a student interacts with a game, they are not interacting with a series of isolated problems, each presenting a question and waiting for an answer. They are interacting with a system, and the understanding they develop through that interaction is, at its best, systemic understanding: the capacity to see how parts relate to wholes, how local decisions produce global consequences, how changes in one element of a complex structure ripple through the others in ways that are not always predictable and not always intended. This kind of understanding is precisely what the most demanding educational objectives require and what formal instruction, with its tendency toward the sequential presentation of isolated concepts, finds most difficult to produce. The system does not teach its parts one at a time. It teaches their relationships, all at once, through the experience of navigating them.

Consider a game like *SimCity* or its educational variants, in which the player manages the development of an urban environment. The game presents decisions about zoning, infrastructure, taxation, and public services, and each of those decisions feeds back into every other. A decision to reduce taxation increases residential development but reduces public revenue, which degrades infrastructure, which reduces property values, which reduces taxation further, a feedback loop that, if not managed, produces a cascade of consequences that no single decision, considered in isolation, would have predicted. The student who plays this game long enough to recognise this loop has learned something that no amount of instruction about urban economics can teach as directly: the felt sense of how systemic interdependence works, the visceral understanding that local decisions have global consequences, and that consequences loop back to alter the conditions under which future decisions will be made. This is not a metaphor for systems thinking. It is systems thinking, experienced from the inside.

2.3 Feedback Loops and the Mechanism of Learning

The concept of the feedback loop is central to both systems theory and learning theory, and the fact that games are structured around feedback loops is one of the primary reasons they are effective as learning environments. A feedback loop exists whenever the output of a system influences its subsequent input, whenever consequences circle back to alter the conditions that produced them. Games are built from feedback loops at every level of their design, from the immediate tactical feedback of a single decision to the long strategic arcs that shape the entire course of play.

In a zero-entry game, feedback loops are the primary mechanism by which knowledge is constructed. The player acts, receives feedback, adjusts their mental model of the game's logic, acts differently, receives different feedback, and gradually refines their understanding of the system's behaviour. This is the inductive learning process described in the preceding section, but it is worth examining its systemic dimension more carefully. The feedback loop in a well-designed game is not merely informative; it is also motivating. It tells the player not only what happened but, implicitly, that what happened was a consequence of what they did. This implicit attribution of causality, the sense that outcomes are connected to decisions, and that better decisions will produce better outcomes, is what sustains engagement through the difficulty of early play, when the player is still constructing the mental model that will eventually allow them to perform well.

The distinction between reinforcing and balancing feedback loops, familiar from systems theory, maps onto the learning process with some precision. A reinforcing feedback loop is one in which a change in one direction produces further change in the same direction: early success leads to resources that enable further success, or early failure leads to conditions that make further failure more likely. A balancing feedback loop is one in which a change in one direction produces pressure toward change in the opposite direction: a player who accumulates too many resources triggers responses from other players or the system that constrain further accumulation. Both kinds of loop are present in well-designed games, and both produce specific learning effects. Reinforcing loops teach the logic of momentum and compounding advantage, the understanding that early decisions shape the conditions of all subsequent decisions in ways that are not linear. Balancing loops teach the logic of equilibrium and constraint, the understanding that systems resist extreme states and that sustainable strategies are frequently those that work with the system's tendency toward balance rather than against it.

These are not trivial lessons. They are among the most important structural insights that any learner in any complex domain, economics, ecology, political science, medicine, engineering, needs to develop. And they are lessons that games teach not through explanation but through the repeated experience of navigating systems that are governed by precisely these dynamics. Empirical research supports this point: Reese, Tabachnick, and Kosko (2015) have shown that video game learning dynamics can be measured as multidimensional trajectories, capturing precisely the kind of iterative, feedback-governed development that static assessments cannot detect.

Perhaps the most intellectually striking feature of games as systems is emergence: the production, by the interaction of simple rules, of complex and often unpredictable behaviour. Emergence is the reason that chess, governed by a small number of rules that can be learned in an afternoon, has sustained centuries of strategic analysis without exhausting its possibilities. It is the reason that the simple rules of *Conway's Game of Life*, a cellular automaton with four rules governing the birth and death of cells, produce patterns of extraordinary complexity and variety. And it is the reason that a well-designed game can, through the interaction of its elements, generate situations that the designer did not specifically anticipate and that the player has never encountered before, but that are nonetheless entirely governed by the game's rules.

For learning, emergence has a specific significance. A game that produces emergent complexity gives the learner something that a static problem set cannot give: the experience of navigating real novelty. The problems the learner encounters in an emergent game are not pre-specified; they arise from the interaction of the game's elements and the choices of its players, and they are, in that sense, new each time. The learner who develops the capacity to handle emergent complexity in a game is developing a capacity that transfers to the handling of emergent complexity in the real domains the game simulates, because the cognitive demand is the same: the ability to reason about a situation that has not been seen before, using principles derived from situations that have. Empirical support for this claim comes from a striking recent study: Van Opheusden et al. (2023) demonstrated, using large-scale behavioural data from online chess, that expertise is associated with increased planning depth, the ability to simulate more moves ahead, a finding that directly links game-based practice to the development of forward-reasoning capacities that are domain-general.

This is a point of considerable educational importance, because much of what passes for knowledge in formal education is knowledge of anticipated problems: the capacity to recognise a problem type and apply the appropriate procedure. The broader scientific community has begun to recognise the generative potential of games: Long et al. (2023) argue in Nature that games can serve as methodological platforms for behavioural science, enabling researchers to collect ecologically valid data on decision-making, cooperation, and learning at a scale and with a realism that laboratory paradigms cannot match. This capacity is necessary but not sufficient for competence in complex real-world domains, where problems do not arrive pre-classified and solutions are rarely the straightforward application of a memorised procedure. The emergent game trains a different and, in some respects, more demanding cognitive skill: the ability to construct a response to a situation whose type is not immediately clear, using principles and strategies that must be assembled in real time under conditions of uncertainty and constraint.

2.4 Rules and the Architecture of Play

Rules are the foundation of any game. Without them, there is no game, only a collection of objects and an unstructured situation. But rules are not a single, homogeneous category, and the educational implications of game-based learning cannot be fully understood without a clear account of the different kinds of rules that structure play and the different relationships those kinds of rules bear to the learning process.

The most visible kind of rule is what game design theory calls the operational rule: the explicit instruction that governs play, the statement of what a player can and cannot do, when and under what conditions. Operational rules are what a player learns first, through the rulebook or the tutorial or the instructions of a more experienced player. They are the surface of the game's formal structure, and they are what most people mean when they say they are learning the rules of a game. In educational terms, operational rules function as the procedural knowledge the game requires: the know-how that enables action within the game's world.

But beneath operational rules lie a different and more fundamental kind of structure: what game design theory, drawing on the work of Salen and Zimmerman (2004), calls the constitutive rules. These are not the explicit instructions for play but the underlying formal or mathematical logic that those instructions express. The operational rule that a bishop in chess moves diagonally is an instruction. The constitutive logic beneath it is a set of mathematical relationships between positions on the board that determine, precisely and completely, what the bishop's presence on any given square implies for every other square in its range. Constitutive rules do not appear in rulebooks. They are the formal structure that the operational rules instantiate, and they are typically invisible to the casual player, present in the game's behaviour without being stated in its instructions.

The educational significance of this distinction is substantial. A student who has learned a game's operational rules knows how to play. A student who has grasped, through repeated play and reflection, something of the game's constitutive logic knows something about the formal structure of the domain the game represents. The student who plays a market simulation and learns, through the operational rules, how to buy and sell resources is acquiring procedural knowledge of the game's mechanics. The student who begins to understand, through the experience of play, why certain equilibria emerge, why certain strategies dominate others, and why the system behaves differently under different conditions of supply and demand is approaching the constitutive logic of the game, the formal relationships that the operational rules express. This deeper understanding is closer to disciplinary knowledge than to game knowledge, and its development through play is one of the primary mechanisms by which well-designed games produce real learning rather than merely the illusion of it.

There is a third kind of rule that the game design literature identifies, and it is perhaps the most neglected in educational accounts of game-based learning: the implicit rule. For a comprehensive treatment of how these layers of rule structure interact in game design, see Adams and Dormans (2012) and Fullerton (2024), both of whom offer detailed taxonomies of mechanical and formal game structures from a practitioner's perspective. Implicit rules are not written anywhere. They are the social norms and expectations that govern how a game is actually played in practice, the understandings about what constitutes acceptable behaviour, fair play, appropriate strategy, and the spirit of the game that players bring to any game situation and that shape the experience of play as powerfully as any written instruction. In a classroom game, implicit rules include expectations about how students should treat one another, how competitive behaviour should be modulated, and what kinds of strategic moves are considered legitimate within the social context of the educational setting. These rules are real, and they matter. A student who exploits a loophole in the operational rules to win a classroom game by means that other players experience as unsportsmanlike has technically followed the rules but violated the implicit norms that make the game a productive social experience. The management of implicit rules, the explicit discussion of what kinds of behaviour the game is designed to encourage and what kinds it is not, is one of the teacher's most important responsibilities in a game-based learning environment, and it is one that purely mechanical accounts of game design consistently underestimate.

2.5 Uncertainty, Conflict, and the Conditions of Real Decision

A game without uncertainty is not a game. It is a procedure. If every outcome is known in advance, there is nothing to decide and therefore nothing to play. The tension of play, the engagement that games produce and that makes them effective as learning environments, depends entirely on the presence of real uncertainty: the condition in which the player does not know what will happen next and must act on the basis of incomplete information, probability estimates, and judgment rather than certainty.

Game designers produce uncertainty through several distinct mechanisms, each of which has a specific relationship to the learning process. The first is hidden information: the withholding from one or more players of information that is present in the game's world but not available to them. Card games are the canonical example, but the principle applies across a wide range of educational game designs, from intelligence simulations in which each player knows only their own organisation's information, to market games in which each firm knows only its own costs and must estimate those of its competitors. Hidden information teaches a specific cognitive skill: the ability to reason under incomplete information, to make probabilistic inferences from partial evidence, and to act decisively on the basis of estimates rather than certainties. This is precisely the cognitive demand that most real-world professional situations make, and it is one that formal instruction, which typically presents complete and accurate information, rarely develops.

The second mechanism is randomness: the introduction, through dice, cards, or algorithmic processes, of outcomes that are not determined by player decisions alone. Randomness is educationally significant not because it makes games unpredictable, although it does, but because it forces the player to think in terms of probability and expected value rather than in terms of certain outcomes. The student who learns, through repeated play in a game that incorporates randomness, to evaluate decisions not by their actual outcomes but by the quality of the reasoning that produced them, to distinguish between a good decision that produced a bad outcome and a bad decision that produced a good outcome, is developing a form of probabilistic thinking that is fundamental to competence in any domain characterised by uncertainty, from medicine to finance to public policy.

The third mechanism is opponent behaviour: the uncertainty produced by the presence of other players whose decisions are not known in advance and whose goals may conflict with one's own. This is the uncertainty that game theory, in its classical formulations, was designed to analyse. The student who plays against another person in a competitive game is not merely navigating a complex system; they are navigating a system that is actively responding to their behaviour, adapting to their strategies, and attempting to defeat them. This adversarial dynamic produces a kind of learning that no single-player game or static problem set can replicate: the development of strategic thinking, the capacity to reason about what others will do, to anticipate responses to one's own actions, and to construct strategies that are robust to the counter-strategies an intelligent opponent is likely to deploy.

The fourth mechanism is the complex decision space: the creation, through the interaction of the game's elements, of situations in which many options are available, none of them obviously superior, and each of them carrying consequences that extend far beyond the immediate moment. Complex decision spaces teach not through the provision of correct answers but through the experience of real choice, the cognitive demand of evaluating multiple options under conditions of uncertainty, with incomplete information and real consequences within the game's world. This demand is, again, precisely the demand that complex real-world situations make, and it is what distinguishes the thinking required by a well-designed game from the thinking required by a well-designed examination. An examination typically asks the student to identify the correct answer to a pre-specified problem. A game asks the student to identify the best available option in a situation that was not pre-specified, under conditions that make certainty impossible. The difference between these two cognitive demands is not merely a matter of difficulty. It is a difference in kind, and it is a difference that matters deeply for the development of the judgment that competence in any serious domain requires.

Conflict, finally, is not a regrettable byproduct of competitive game design. It is a structural necessity. Without conflict, against another player, against the system, against the constraints of one's own limited resources and capabilities, there is no tension, and without tension there is no engagement, and without engagement there is no learning. The conflict built into a well-designed game is not the arbitrary conflict of a contrived obstacle but the structural conflict of a system whose elements are in real tension with one another. Managing that tension, finding ways through it, around it, or within it, is the cognitive work the game demands, and it is, at its best, the same cognitive work the domain the game represents demands of those who practice it in the real world. A game that produces this alignment between its internal demands and the demands of its target domain is not merely entertaining. It is, in the fullest sense of the term, educational.

2.6 How Games Work on the Mind: Play, Knowledge, and the Learning Conditions

A game begins before the first move. It begins when the player looks at the screen or the board or the scenario and decides, in the space of a few seconds, whether they can enter the world being offered to them. This decision is not conscious. It does not feel like a decision. But it determines everything that follows, because a player who cannot enter a game's world does not learn from it. They endure it. The difference between those two experiences is the difference between education and its absence, and it is produced, in large part, by what the player already knows before the game begins.

This is the first thing to understand about how games work on the mind: they do not work on empty minds. They work on minds that already contain something, knowledge, experience, partial understanding, misconception, and the nature of what the game produces depends directly on the nature of what was already there. A game that ignores this fact can still be entertaining. It cannot reliably educate.

In a game designed for players who know nothing of the subject, the opening minutes do a specific and demanding job. They must make the unfamiliar navigable. Not simple, navigable. The player does not need to understand everything immediately. They need to understand enough to act, and to receive from the consequences of their action enough information to act again, better. This is how learning begins in such games: not through explanation but through iteration. The player acts, observes, revises, acts again. The concept the game is designed to teach is not stated. It is demonstrated, repeatedly, through the logic of the game's own mechanics, until the player has constructed it from the inside out.

This process is reliable because it does not ask the player to bring anything to it except attention and a willingness to try. It works with what is universal rather than what is particular Every human mind capable of noticing that one action produces a better outcome than another is capable of learning from a well-designed zero-entry game. The learning is inductive: experiences accumulate until a general pattern becomes visible. The player who has watched a simulated population collapse after an environmental shift, and watched it recover after a trait mutation spreads through successive generations, has not been told about natural selection. They have encountered it. The difference between being told something and encountering it is, in terms of what the mind retains and can use, very large.

But this process has a ceiling. Inductive learning from game experience produces understanding that is concrete, reliable, and grounded in the specific mechanics of the game. It does not automatically produce understanding that can travel, that can be detached from the game's particular scenario and applied to cases that look different on the surface but share the same underlying structure. A student who has learned about natural selection through a population simulation may still struggle to recognise the same logic at work in the spread of antibiotic resistance, or in the evolution of market competition, because the surface features are different even though the deep structure is identical. The game has built a foundation. But a foundation is not a house. Something more must be built on top of it, and that building requires language, abstraction, and the teacher's deliberate intervention to make the connection between the game's logic and the wider conceptual world it belongs to.

2.7 When the Game Requires Something Already Known

A different kind of game works differently from the start. It does not build knowledge from the ground up. It takes knowledge the player already has and puts it under pressure. The player arrives at the game not empty but loaded, carrying a body of prior learning that the game will test, complicate, extend, and sometimes overturn. The opening minutes of such a game do not feel navigable in the way that a zero-entry game feels navigable. They feel demanding. They present a situation whose logic is only partly visible, whose decisions carry consequences the player cannot fully anticipate, whose feedback speaks in a language that requires prior study to read. For the player who has done that study, this is not confusion. It is recognition. The game is speaking a language they know, deploying concepts they have encountered in another register, the register of lecture, or textbook, or seminar, and asking them to use those concepts in conditions where using them is hard.

This hardness is not incidental. It is the point. A medical student who has memorised the pharmacology of a drug class has acquired information. A medical student who must apply that knowledge to a deteriorating virtual patient, under time pressure, with incomplete information, and with the constant possibility of error, is doing something qualitatively different. They are learning to think with what they know rather than merely knowing it. The distinction sounds simple. In practice it is the difference between a student who can reproduce correct answers on an examination and a student who can function in a situation where the correct answer is not given in advance and must be constructed from what is known and what is observed.

The feedback such a game provides works differently from feedback in a zero-entry game. It does not construct understanding. It addresses understanding already present and shows it where it is wrong, incomplete, or insufficiently precise. When the virtual patient's condition worsens after a clinical decision, the prepared student does not merely observe a bad outcome. They recognise the mechanism by which the outcome was produced. They connect the consequence back to the decision, and from the decision back to the knowledge that should have governed it and did not, or governed it incorrectly. This is a more demanding cognitive event than contingency learning. It requires the player to move in two directions simultaneously: forward from consequence to cause, and backward from cause to the knowledge structure that produced it. What the player learns from this movement is not new information but revised understanding, existing knowledge made more accurate, more nuanced, and more connected to adjacent knowledge than it was before the game began.

This kind of learning is what the educational literature means when it speaks of elaboration: the process by which knowledge already held is deepened, integrated, and made more resistant to the distortions that application always introduces. It is, by any reasonable measure, a higher cognitive achievement than the acquisition of new information. And it is only available to the player who arrives at the game with enough prior knowledge to make the movement between consequence and cause intelligible.

There is a clean way to state the difference between what zero-entry games require of the mind and what knowledge-dependent games require. Zero-entry games ask the mind to move from experience to principle. Knowledge-dependent games ask the mind to move from principle to experience, and then back to a revised principle. The first movement is inductive. The second is something more complex, a loop rather than a line, in which the player's existing understanding is tested against the game's reality and returned to them altered.

The loop matters because it is the mechanism by which real understanding develops, as distinct from the accumulation of information. A student can accumulate information without ever completing this loop. They can hold a large number of correct propositions in memory without those propositions ever having been tested against anything resistant enough to reveal their limits. The game, when it is well designed and when the player brings sufficient prior knowledge to it, provides precisely this resistance. It presents situations that cannot be handled by the mechanical application of a remembered rule. It requires judgment. And judgment, the capacity to apply general knowledge to particular cases in ways that account for the specific features of those cases, is not taught by instruction. It is developed by practice in conditions that make it necessary.

This is why the placement of a game in a learner's trajectory matters as much as the design of the game itself. Orvis, Horn, and Belanich (2008) provide empirical support from instructional videogames, showing that prior gaming experience interacts significantly with task difficulty in shaping both performance and motivation: novice players benefit most from lower initial challenge levels before progressing to more demanding scenarios. The instructional design literature converges on a complementary principle. Weinstein, Sumeracki, and Caviglioli (2018) identify retrieval practice, elaborative interrogation, spaced practice, and interleaving as strategies that consistently produce durable learning, and argue that instructional design must be informed by evidence about how memory and understanding actually work. Dirksen (2012) similarly argues that effective learning design must begin from an analysis of what learners already know, what they need to do, and where the gap between the two lies, an approach that maps directly onto the distinction between zero-entry and knowledge-dependent games developed in this chapter. The implication is practical as well as conceptual: designing for how people actually learn, rather than for how we assume they should learn, is what distinguishes effective game-based learning from weaker counterparts. A complementary warning comes from Brusso (2013), who demonstrated that unrealistic initial goal-setting impedes performance in videogame-based training, identifying overconfidence in prior ability as a source of early failure. Sakkal and Martin (2019) replicate this concern in a music-learning context, showing that prior experience with a game moderates both skill transfer and the role of explicit instruction. A knowledge-dependent game placed too early produces not elaboration but confusion; it does not accelerate learning but short-circuits it. A zero-entry game placed too late produces not discovery but boredom, because it reconstructs a conceptual structure the student already possesses.

The right game at the right moment in the learner's development is not a luxury of good curriculum design. It is the condition under which game-based learning works at all. Meta-analytic evidence consistently supports this view: Vogel et al. (2006) found that interactive simulations and computer games produce better cognitive outcomes than traditional instructional methods, particularly when challenge is aligned with learner competence, while Hays (2005) notes that the effectiveness of instructional games depends heavily on their integration into a broader instructional context.

2.8 The Surface of the Game and What Lies Under It

Every game has a surface: the scenario, the characters, the visual environment, the immediate drama of decision and consequence. And every instructional game has something beneath that surface: the concept, the principle, the disciplinary logic that the game was built to teach. The relationship between surface and depth varies across the spectrum from zero-entry to knowledge-dependent design, and this variation matters for learning because the degree to which the concept is visible at the surface of the game determines how much work the learner must do to connect the experience of play to the content of the subject.

In a zero-entry game, the surface and the depth are designed to be close together. The drama of organisms competing for limited resources is, already, a representation of natural selection close enough to the surface that a player with no prior knowledge can begin to grasp it through play. The narrative does not decorate the concept from outside; it enacts it. The player who inhabits the narrative is, in the act of inhabiting it, constructing the concept. This proximity of surface and depth is one of the central design achievements of a good zero-entry game, and it is harder to produce than it looks. It requires that the game's mechanics be not merely analogous to the concept but structurally identical to it, that the game's internal logic be the concept's logic, expressed in the language of play rather than the language of the discipline.

In a knowledge-dependent game, the relationship between surface and depth is more complicated and, in well-designed cases, more intellectually honest. A simulation of international treaty negotiation has, at its surface, a story of states, diplomats, and competing interests. Beneath that surface lies the formal logic of cooperation under conditions where no authority can enforce agreements, where each party calculates its own advantage, and where the history of past interaction shapes the credibility of present commitments. None of this deeper structure is directly visible in the drama of the negotiation. It must be brought to the surface by a player whose prior knowledge provides the tools to see it. The student who lacks those tools plays a shallower game, interesting, perhaps, but not instructive in the way it was designed to be. The student who possesses those tools plays a richer one, in which each decision is shadowed by the theoretical framework that makes its implications legible.

This is not a failure of the game's design. It is a feature of a game designed for players at a particular stage of development, with a particular body of knowledge already in place. Research by Hamdaoui, Khalidi Idrissi, and Bennani (2018) adds nuance to this picture: their modelling work on learner profiles in educational games reveals that the relationship between playing style and learning style is neither fixed nor straightforwardly predictive, suggesting that individual differences in how learners engage with game structures are themselves variables that adaptive design must account for. The game makes a bet on its players. It bets that they know enough to see what the game is really about. When the bet pays off, the learning it produces is of a kind that no other instructional method produces as efficiently. This distinction between games that teach new knowledge and games that mobilise existing knowledge maps directly onto Chee's (2016) theoretical contrast between games-to-teach, instrumental environments designed to transmit predetermined content, and games-to-learn, performative environments that invite learners to enact disciplinary understanding in the context of meaningful, goal-directed activity: the experience of a theory under load, tested against the resistance of a simulated reality that does not arrange itself to confirm what the student already believes.

2.9 What Prior Knowledge Actually Does

It is worth being precise about what prior knowledge does in a knowledge-dependent game, because the common account of it that it makes the game easier, more accessible, more productive, is true but incomplete. Prior knowledge does make the game more accessible. But in the best cases it does something more significant than that. It makes the game generative: it makes the game capable of producing, in the player's mind, understanding that did not exist before and that the prior knowledge alone, without the game's intervention, could not have produced.

This is the cognitive event that justifies the investment of prior study. The student who has learned contract law from textbooks and lectures holds a body of doctrine in memory. That doctrine is, in isolation, inert: it describes the world but does not engage with it. The moot court simulation changes this. It places the doctrine under adversarial pressure, requiring the student to use it against another person who is using it differently, in a situation where the outcome is uncertain and the stakes, within the game's logic, are real. What the student discovers in this experience is not new doctrine. They discover the limits of the doctrine they already hold, the places where it underdetermines the outcome, where judgment must supplement rule, where the opponent's argument reveals a possibility in the law that the student had not considered. This discovery is, in the strictest sense, the production of new understanding from existing knowledge. It is not the acquisition of information. It is the transformation of information into understanding, the process by which what is known becomes, through the pressure of application, really understood.

Prior knowledge, in this account, is not the road the game runs on. It is the material the game works with. The game is the process; the prior knowledge is what gets processed. And what comes out of the process, when the game is well designed and the player is well prepared, is something neither the game nor the prior knowledge could have produced alone. It is the specific product of their encounter: understanding that has been earned through the difficulty of application, tested against the resistance of a world that does not simplify itself to accommodate what the learner already believes, and refined by the experience of being wrong in conditions where being wrong teaches something that being right never could.

3 Digital Games and Contemporary Learning Environments

3.1 Digital Games in Learning Contexts

This chapter situates game-based learning within digital environments, video games, artificial intelligence, motivation, and the cooperative or competitive structures that shape contemporary educational design.

Video games combine advanced human–computer interaction with sophisticated visual processing technologies, and have found significant application across education, healthcare, sports, and professional training. Research on their cognitive effects has revealed effects beyond domain-specific knowledge: Feng, Spence, and Pratt (2007) found that even brief exposure to action video games significantly reduced gender differences in spatial cognition, suggesting that game-based training can address systematic gaps in cognitive skills that have real consequences in fields such as engineering, mathematics, and the sciences. Research by Pérez-Marín et al. (2020) illustrates this potential through a

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multimodal instructional approach that integrates visual, auditory, and literacy-based learning channels. Designed with attention to learners' cognitive habits and expectations, the method was empirically tested with a cohort of students in a digital teaching environment, yielding measurable improvements in overall learning outcomes and a predictive accuracy of approximately 77 per cent.

A complementary line of research explores the application of deep reinforcement learning to video game environments in the context of musical instrument training. Dong (2023) describes a system in which a game agent's decisions guide the learner's actions in real time, combining deep learning with reinforcement learning to construct an adaptive gameplay algorithm. In this framework, reinforcement learning operates through three core elements: action, reward, and observation. The agent cannot access complete environmental information directly; it must instead rely on observation to infer the state of the system. Because no single prior-knowledge policy can fully specify optimal behaviour across all scenarios, the system generates and refines scripts from sampled combinations of actions, rewards, and observations. In practical terms, when a learner's performance meets the expected standard, the system provides positive feedback and appropriate rewards; when performance falls short, the feedback loop guides further adjustment. The overall outcome is a dynamically calibrated learning experience in which the game agent continuously optimises the learner's trajectory toward mastery.

This case should be read through a dual lens: gaming culture on one side and learning systems on the other. It shows how a digital game can operate not merely as entertainment, but as a complex social environment in which patterns of behaviour are continuously produced, reinforced, and potentially transformed.

From a gaming perspective, *League of Legends* exemplifies a highly competitive and cooperative structure. Its design requires players to act under pressure, coordinate rapidly with teammates, and manage the consequences of individual error within a collective framework. This combination is central to the game's appeal, yet it is also one of the principal sources of tension. In such an environment, frustration is rarely private: it becomes social, immediate, and visible through interaction. Toxicity, therefore, should not be understood simply as a moral failure of isolated individuals, but as a phenomenon partly embedded in the architecture of competitive multiplayer play itself.

What makes Riot Games particularly noteworthy is that it does not frame toxicity solely as a disciplinary issue. Rather, the company approaches it as a problem of human behaviour, one that can be studied, interpreted, and reshaped. This marks an important conceptual shift. Instead of assuming that online hostility is generated only by a small minority of pathological 'trolls', Riot's research suggests that most toxic behaviour emerges from ordinary players experiencing moments of stress, anger, or disappointment. Such a finding is profoundly important. It implies that antisocial conduct in online games is not an exception produced by a deviant fringe, but a situational response that can arise within the average participant when the environment activates frustration.

Seen through a learning-oriented framework, this insight opens a broader pedagogical question: if behaviour can deteriorate under certain design conditions, can it also be improved through intentional design? Riot's experiments suggest that it can. By drawing on psychological principles such as priming, the company treats the game not only as a competitive platform but also as a space for behavioural intervention. In this sense, game design becomes a subtle form of educational design. The objective is no longer limited to teaching players how to win more effectively; it extends to shaping how they communicate, collaborate, and regulate emotion in shared digital spaces.

This is where the passage acquires particular depth. Learning, in this context, is not formal instruction but social conditioning through experience. Players are constantly learning what kinds of behaviour are tolerated, rewarded, ignored, or discouraged. Every interface choice, moderation system, and pre-game message contributes to an invisible curriculum of online conduct. Riot's work demonstrates that digital environments teach, even when they do not explicitly present themselves as educational. They teach habits of reaction, norms of interaction, and models of community.

The openness of Riot's research further strengthens the importance of the case. By sharing findings with academics and external collaborators, the company positions the game as a large-scale behavioural laboratory, one capable of generating insights that reach beyond the boundaries of e-sports. This makes *League of Legends* an especially revealing case study for anyone interested in digital citizenship, online learning communities, or the ethics of platform design. The game becomes, in effect, a microcosm of the internet itself: a place where cooperation and hostility coexist, and where systems can either intensify conflict or redirect it toward more constructive forms of engagement.

Ultimately, the passage suggests that the future of online gaming cannot be separated from the question of how people learn to live together in virtual spaces. A successful game is not only one that attracts millions of players or generates enormous revenue, but one that understands that player experience is inseparable from the quality of social relations it produces. In that sense, Riot's work points toward a larger truth: digital platforms do not merely host behaviour, they actively shape it. And if they can shape it negatively, they may also be designed to cultivate empathy, restraint, and cooperation.

3.2 The Video Game as a Designed Experience

If it is true that the educational strength of designed play lies in its capacity to hold together intentionality and openness, then the videogame today represents its most evident and, in many respects, most mature expression. Not because it is intrinsically superior to other forms of play, but because it renders visible and practicable on a large scale that tension between structure and freedom which characterises every meaningful ludic experience.

The video game is born entirely as an artificial product. Understanding why games engage so powerfully requires attention to the psychology of the player as much as to the design of the system: Hodent (2020) draws on cognitive psychology, neuroscience, and UX research to explain the perceptual and motivational mechanisms that make game experiences compelling, arguing that effective game design is ultimately applied cognitive science. Madigan (2016) approaches the same question from the perspective of social and motivational psychology, documenting how variable reward schedules, social comparison, mastery orientation, and the need for competence and autonomy shape player behaviour in ways that have direct implications for instructional design. Neuroscientific research lends substance to this characterisation: Palaus et al. (2017), in a systematic review of neuroimaging studies of video gaming, document consistent patterns of structural and functional neural change associated with gaming experience, particularly in regions governing attention, visuospatial processing, and cognitive control. The broader neuroscience of learning provides essential context: Dehaene (2021) identifies attention, active engagement, error feedback, and consolidation as four pillars of effective learning, and these map with remarkable precision onto the structural features of well-designed educational games. Carey (2015) adds that the conditions under which learning feels hardest, varied, spaced, and effortful, are often those under which it becomes most durable. Game-based learning naturally instantiates many of these conditions through variable challenge, interleaved skills, and continuous retrieval during play. At the behavioural level, Green, Li, and Bavelier (2010) demonstrated that action video game playing drives perceptual learning that transfers beyond the game to untrained tasks. Blumberg (2011) and Blumberg et al. (2013) further show that recreational game play deserves serious attention for its relationship with cognitive skill acquisition, particularly in attention, spatial reasoning, and executive function. Every component of the video game is designed: rules, environments, timing, feedback, and possible paths. Nothing is left to chance, and yet nothing is completely determined. It is in this paradox that the video game finds its strength: it constructs a possible world, a coherent system that invites action and exploration, and the player inhabits an experience designed to be traversed.

One of the reasons for the extraordinary spread of videogames lies precisely in this capacity to adapt to the rhythms of contemporary life. They can be played in brief sessions or in prolonged immersion, in solitude or in relation, asynchronously or collectively. The time of play is not imposed from outside, but negotiated by the experience itself. In this elastic time, learning ceases to be a linear path and becomes an iterative process made up of attempts, errors, returns, and progressive discoveries. The videogame does not necessarily accelerate learning, but it makes it inhabitable.

Accompanying this temporal flexibility is the extraordinary breadth of the playing population. Videogames no longer belong to a specific age range or social group. Children, adolescents, adults, and older people access them with different motivations, competencies, and expectations. Yet within the same ludic structure, each constructs a singular path. The game is the same; the experience never is. It is here that the non-homogenising reproducibility characteristic of designed play becomes evident: what repeats is the frame, not the lived experience.

Price and technological accessibility further contribute to this diffusion. Mobile devices, flexible distribution models, and intuitive interfaces lower thresholds of entry and make videogames an everyday presence. But accessibility is not only an economic or technical question. It is also a cognitive one: progressive tutorials, immediate feedback, and support systems allow the player to learn while playing, without the need for explicit mediation. Knowledge is not explained, but shown; not imposed, but discovered.

As a global product, the videogame crosses geographical and cultural boundaries, speaking a visual and interactive language that often precedes the verbal one. Yet this globality does not produce uniformity. The same mechanics take on different meanings depending on context, cultural practices, and communities of reference. Videogames thus demonstrate that it is possible to design scalable experiences without erasing difference, offering common structures that accommodate plural interpretations.

The centrality of visual and sensory content further strengthens this experiential dimension. In the videogame, rules are not only declared, but embodied in environments, movements, and sounds. The consequences of actions are visible, immediate, often reversible. This makes learning a situated, concrete experience, deeply linked to action. One learns by doing, but also by observing, anticipating, and interpreting signals. The intelligence required is not only logical, but perceptual, emotional, and strategic.

One of the most significant aspects of the videogame, in this perspective, is its capacity to adapt to the player. Dynamic difficulty levels, alternative paths, and personalised progression systems allow the experience to maintain a delicate balance between challenge and competence. The game does not ask the same thing of everyone, but asks of each person something that is possible and, at the same time, slightly beyond. It is in this space that the desire to continue playing and learning finds nourishment.

Around the game, finally, communities, shared narratives, and practices of reflection and cultural production develop. The videogame does not end with the play session: it continues in forums, videos, discussions, and user-created modifications. Learning extends beyond the device and becomes social, distributed, participatory. Designed play thus shows its capacity to generate ecosystems of meaning, not only isolated experiences.

In this framework, the videogame appears as a paradigmatic form of contemporary play: profoundly artificial, yet capable of producing authentic experiences; rigorously designed, yet open to the unexpected; reproducible, but never identical to itself. Its educational strength does not reside in the content it transmits, but in the type of experience it makes possible.

This reflection, however, does not end with the videogame. Other educational media from simulations to interactive laboratories, from virtual worlds to immersive narrative media share some of these characteristics and raise similar questions. What the videogame makes particularly visible is a broader transformation: the emergence of learning environments designed as experiences, in which knowledge is not only communicated, but lived. It is in this horizon that play, in its multiple forms, continues to offer contemporary pedagogy one of its most fertile fields of experimentation.

If designed play represents one of the most mature forms of intentional educational experience, scientific research has had and continues to have a decisive role in legitimising its use, testing its limits, and clarifying the conditions of its effectiveness. From the earliest experiments onward, what unites the most significant research is not the search for a 'winning formula', but the acceptance of play as an experimental environment in which learning emerges from the interaction among subject, system, and context.

One of the most influential strands is that of game-based learning, which developed between the late 1990s and the early 2000s. Squire (2013) provides a panoramic account of this development, characterising video game-based learning as an emerging paradigm for instruction and tracing its conceptual foundations from situated cognition and experiential learning to contemporary research on digital literacy and transmedia engagement. Empirical research with young populations confirms the breadth of these effects: Evans et al. (2013) investigated youth engagement with video games and found evidence of positive effects on both learning outcomes and motivational engagement, with game characteristics related to challenge, agency, and feedback identified as the principal drivers of educational benefit. Gee (2003) has shown that many commercial videogames incorporate sophisticated learning principles: gradual progression, immediate feedback, situated learning, and the possibility of failing without sanction. These studies do not limit themselves to measuring the effectiveness of games as teaching tools, but analyse their structure as a distributed cognitive system. The value of play does not lie in explicit content, but in the way it compels the player to think, decide, and reflect on their own actions.

Another relevant field of research is that of serious games and simulations. In contexts such as medical, military, or managerial training, numerous studies have shown how simulated environments make it possible to develop complex competencies decisional, relational, ethical that are difficult to train through traditional methods. Here experimentation is central: the game becomes a safe laboratory in which high-risk scenarios can be explored without real consequences. Research highlights how the effectiveness of these environments does not depend on their 'realism', but on the coherence of the rule system and the quality of feedback.

More recent strand concerns research on adaptivity and personalisation. Within the domain of serious games for science education, immersion has emerged as a particularly studied variable: Cheng, She, and Annetta (2015) found that game immersion experience has a hierarchical structure and differentially impacts science learning at different levels of depth, while a subsequent study by Cheng et al. (2017) qualified these findings, showing that immersion is not uniformly beneficial and that its value depends critically on how it is aligned with the specific learning objectives of the game. Solenthaler et al. (2018) offer a decade-long perspective on intelligent educational games for learning spelling and mathematics, documenting both the progress made and the persistent challenges of building adaptive systems that respond meaningfully to individual learner trajectories rather than simply tracking performance metrics. Game-based learning engagement itself has received systematic theoretical and empirical attention: Ke, Xie, and Xie (2016) combined theory-driven and data-driven approaches to map the multidimensional structure of engagement in educational games, identifying cognitive, affective, and behavioural components that interact dynamically during play. Alongside digital approaches, board games represent a persistent and often underexplored medium: Bayeck (2020) offers a multidisciplinary review of research on board gameplay and learning. Within multiplayer digital environments, the role of self-explanation as a learning mechanism has received specific attention: Hsu, Tsai, and Wang (2016) found that integrating self-explanation prompts into a multiuser game significantly improved the acquisition of scientific concepts, with the combination of collaborative play and metacognitive reflection producing gains that neither element achieved alone. A complementary analysis of the group dynamics at work in such settings is offered by Bluemink et al. (2010). Pearce et al. (2009) provide rich ethnographic evidence for the social depth of multiplayer game communities: their study of emergent cultures in online and virtual world environments shows that players construct complex social structures, shared norms, identity practices, and collective knowledge systems that go far beyond what any single game's design explicitly prescribes. For educational designers, this finding has an important implication: the social and cultural dynamics of multiplayer environments are not merely contextual noise but generative learning resources that can be deliberately cultivated. At the design level, Zea et al. (2009) advance a collaborative learning-centred vision of educational multiplayer videogames, arguing that the design must go beyond technical multiplayer functionality and deliberately engineer interdependence, shared goals, and structured communication if collaboration is to produce real cognitive gains rather than merely simultaneous parallel play., whose group-level study of multiplayer game collaboration found that individual participants actively shape the collective interaction in non-trivial ways, a finding that underscores the importance of attending to within-group heterogeneity when designing collaborative game-based learning activities. At the interactional level, Rogerson, Gibbs, and Smith (2018) have documented what they term the mutuality of cooperation and competition in boardgame play: players routinely cooperate to maintain the social fabric of the game even while competing for individual advantage, a dynamic that has direct implications for how competitive game structures can be designed to sustain rather than erode prosocial behaviour., documenting its particular strengths in developing social cognition, strategic reasoning, and collaborative problem-solving. Studies in educational data mining and learning analytics show how the systematic collection of data on players' actions makes it possible to analyse learning processes in real time. Play thus becomes not only an educational tool, but also a tool of scientific observation: an environment in which behaviour, strategies, and difficulties emerge in traceable form.

It is in this context that artificial intelligence and machine learning technologies open radically new possibilities. Yet this expansion of capability brings with it a structural tension that Ontañón and Zhu (2021) term the personalisation paradox: the more precisely a system models an individual user in order to personalise their experience, the more it risks constraining the freedom and unpredictability that make the experience really educational. Resolving this paradox, building adaptive systems that personalise without prescribing, remains one of the central design challenges of AI-augmented game-based learning. AI makes it possible to design games capable of dynamically adapting to the player, not only by regulating the level of difficulty, but by modifying scenarios, narratives, feedback, and learning paths on the basis of observed behaviours. The game ceases to be a static system and becomes a reactive environment, capable in turn of learning.

From the standpoint of research, this means being able to experiment with highly personalised forms of learning without renouncing reproducibility. Educational intentionality remains inscribed in the design of the system, while the concrete experience is modulated by the interaction between player and algorithm. It is no longer only content or rules that are designed, but dynamic relations between system and subject.

The possible applications are multiple. In education, AI-supported games can accompany individualised learning pathways, identifying cognitive styles, strengths, and difficulties without resorting to explicit tests. In training and professional contexts, intelligent simulations can adapt complex scenarios negotiation, leadership, crisis management to the choices of the participant, offering qualitative and not merely quantitative feedback. In clinical and rehabilitative contexts, adaptive games can support therapeutic pathways, continuously calibrating cognitive and emotional effort.

Pedagogical research is also transformed by this. The use of AI in games makes it possible to observe not only whether learning occurs, but how it occurs: which strategies emerge, how they change over time, and which conditions favour engagement or abandonment. Play thus becomes a privileged space of scientific experimentation, in which education is not reduced to a dependent variable, but observed as a complex process.

Looking ahead, these technological possibilities reinforce a thesis that has already emerged: the value of educational play does not lie in the promise of simple solutions. At the leading edge of this development, Kanervisto et al. (2025) report in Nature the construction of World and Human Action Models capable of supporting gameplay ideation, AI systems that model human decision-making within game environments and generate plausible action sequences, opening the possibility of systems that can both learn from players and adaptively shape the experiences they encounter. Van Eck (2010) situates these developments within a broader cognitive framework, arguing that the learning sciences provide the conceptual tools needed to understand when and how games support cognition, and that the most productive research agenda combines theoretical rigour with attention to the specific affordances of particular game genres and designs. but in its capacity to sustain controlled yet open experiments, designed yet not rigidly prescriptive. AI and machine learning do not replace educational design, but amplify its reach, making possible a design that accepts difference, uncertainty, and a plurality of outcomes.

In this sense, play, especially in its digital and intelligent form, continues to represent one of the most fertile terrains for educational research capable of combining scientific rigor and experiential openness. Not a model to be applied, but an environment to be explored.

3.3 The Contemporary Scenario of Game-Oriented Learning

Game-oriented learning does not arise in a theoretical vacuum, nor as a contingent response to pedagogical fashions. Rather, it is situated within a profoundly transformed horizon, in which technological innovations, cultural shifts, economic tensions, and new individual expectations converge. Understanding this scenario is a necessary condition for evaluating the meaning and potential of play as an educational device.

First of all, learning processes themselves are undergoing a radical transformation. The idea of knowledge transmitted in a linear, stable, and cumulative way is in crisis in the face of contexts characterised by the rapid obsolescence of skills and an almost unlimited availability of information. In this framework, learning no longer means merely acquiring content, but developing the capacity to orient oneself, select, interpret, and rework knowledge autonomously. Play experiences, with their exploratory and situated structure, respond to this need because they train thought in action, not mere memorisation. Couch, Towne, and Wozniak (2018) argue that technology's most transformative educational potential lies not in automating existing instructional processes but in personalising learning at scale, enabling every student to progress at the pace and in the mode that best suits their cognitive profile. Game-based and simulation-based learning environments are, in this framework, among the most powerful tools available, precisely because they combine personalisation, active engagement, and immediate feedback in a single integrated experience. Trinh (2022), writing in Nature, reports that gamifying instruction in notoriously difficult subjects produces measurable gains in student engagement and comprehension, with participants attributing their improved performance not to reduced difficulty but to transformed motivation, a finding that illustrates the practical value of game-based approaches precisely where conventional instruction struggles most. The value of such situated engagement has been documented in field-based contexts: Chen, Liu and Hwang (2016) found that the combination of game mechanics with multistage guidance strategies significantly improved both performance and motivation in mobile learning environments. Augmented reality represents a further frontier for situated game-based learning: Dunleavy (2014) has identified the design principles specific to AR learning environments, including narrative immersion, physical engagement, and the blending of virtual information with real-world spaces, that distinguish them from both screen-based games and conventional field instruction, opening new possibilities for contexts where learning benefits from direct engagement with physical environments., suggesting that well-scaffolded game-based experiences can extend effective learning beyond the classroom.

New generations bring with them expectations deeply different from those of the past. Davidson (2017) frames the same challenge from an institutional perspective: universities, she argues, must be fundamentally redesigned to prepare students for a world of rapid change, cultivating adaptability, collaborative problem-solving, and the capacity for continuous self-directed learning rather than the passive accumulation of certified knowledge. Aoun (2017) characterises this shift in terms that are directly relevant to game-based learning: in an age of artificial intelligence, the most valuable educational outcomes are those that develop humanics, the distinctively human capacities for systems thinking, entrepreneurship, cultural agility, and creative problem-solving, that machines cannot replicate. Game-based simulations, which demand precisely these capacities rather than the retrieval of stored information, are in this sense aligned with the deepest educational challenges of the present moment. Having grown up in interactive digital environments, accustomed to reactive and personalised systems, they struggle to recognise value in educational experiences that do not provide engagement, agency, and the possibility of choice. Turkle (2011) traces a deeper consequence of this condition: as technology increasingly mediates social interaction and self-presentation, young people develop an expectation of continuous responsiveness from the environments they inhabit, an expectation that static educational formats are structurally unable to meet, and that well-designed game-based learning is uniquely positioned to address. This does not imply a reduced attention span or a rejection of complexity, but a different demand for meaning: what cannot be experienced, negotiated, and traversed struggles to be recognised as significant. Play intercepts these expectations not because it simplifies content, but because it renders learning a participatory experience.

At the same time, education is called to confront a growing tension between new and old contents. On the one hand, forms of knowledge related to technologies, data, artificial intelligence, and the complexity of systems emerge; on the other, the great cultural, historical, scientific, and humanistic contents that have structured critical thought over time remain central. The challenge is not to choose between tradition and innovation, but to find devices capable of putting them in dialogue. Play, as a designed experience, makes it possible to reinterpret 'old' contents in new contexts, rendering them once again open to questioning.

A further decisive factor is the need to develop critical sense and the capacity to interpret contexts of increasing ambiguity. Contemporary decisions personal, professional, civic take place ever more often under conditions of uncertainty, incomplete information, and conflict of values. Learning can no longer limit itself to providing correct answers, but must train the formulation of pertinent questions, the evaluation of alternatives, and the management of ambiguity. Play experiences, especially those based on simulation and open scenarios, make it possible to exercise these competences in protected but cognitively complex environments.

New computational and forecasting techniques, including those based on artificial intelligence and machine learning, further redefine the scenario. On the one hand, they offer powerful tools for analysing data, anticipating scenarios, and personalising learning paths; on the other, they make evident the need to understand the limits, opacities, and ethical implications of such systems. Play can become a privileged space for critically exploring these technologies, not only as tools, but as objects of reflection.

Finally, this scenario is situated in a context of multilateral values and globalised culture, inserted into an economy that, paradoxically, tends to regionalise itself. People are exposed to a plurality of values, narratives, and worldviews, often in tension with one another. Learning must therefore prepare not for adherence to a single model, but for coexistence with difference, the negotiation of meanings, and the understanding of local contexts within global dynamics. Play, thanks to its capacity to stage different perspectives and simulate complex systems, offers a language suited to exploring this plurality without reducing it.

In this intertwining of technological, cultural, generational, and economic factors, learning oriented toward play experiences emerges not as a definitive solution, but as a device capable of holding together complexity and accessibility. Play does not promise certainties, but training; it does not transmit answers, but constructs contexts in which answers may be sought. It is in this capacity to offer intentionally designed experiences, yet open to interpretation and desire, that play today finds its deepest legitimation.

3.4 A First Framework for Videogames and Artificial Intelligence

Videogames and artificial intelligence can be understood within the same theoretical framework if they are considered not as tools, but as designed environments of experience. Both operate through systems of rules, computational models, and feedback that transform the user's action into situated learning. In this perspective, educational value does not reside in the content transmitted, but in the structure of interaction that makes the experience possible.

At the centre of this framework is the concept of the intentional design of open contexts. The videogame embodies this logic by rendering the rules of the system visible and allowing the player to explore them through action. AI, particularly in its machine learning applications, extends this possibility by introducing systems that not only react, but adapt. Learning is no longer only that of the user, but also that of the system, giving rise to a dynamic relation in which experience and design co-evolve.

A second theoretical pillar is non-homogenising reproducibility. Videogames and AI make it possible to design experiences replicable at scale without producing identical outcomes. What is reproduced is the type of learning exploration, decision, interpretation, reflection not the final result. The structure remains stable, while the experience differentiates itself according to the choices, competencies, and context of the subject. This distinction makes it possible to combine scalability and personalisation, two central requirements in contemporary education.

A third element is the centrality of action and feedback. In the videogame, every action generates an immediate and interpretable response from the system; in AI, this feedback can become progressively more refined, adapting to observed behaviours. Learning thus emerges as an iterative process: attempt, error, adjustment. This dynamic makes deep learning possible because it binds knowledge to lived experience and not to mere exposure to information.

The theoretical framework also includes a new conception of the time of learning. Videogames and AI break traditional didactic linearity, introducing flexible, cyclical, and personalised times. Time is no longer imposed by the curriculum, but shaped by the interaction between subject and system. This makes learning more adherent to individual needs and better able to sustain motivation over the long term.

Finally, videogames and AI share an ethical and cultural dimension. Both shape behaviours, values, and ways of interpreting the world. To place them within an educational framework means recognising their formative power and assuming responsibility for their design. Play and artificial intelligence are not neutral: they direct attention, reward certain actions, render some paths visible and obscure others. Educational design must therefore make these mechanisms transparent and open to questioning.

In sum, videogames and artificial intelligence meet within a theoretical framework that may be defined as a pedagogy of designed experience: an approach in which learning emerges from the intentionally designed interaction between subject and system, in contexts that are replicable yet open, adaptive yet not deterministic. It is in this space that digital play and AI find a common legitimation as educational devices of the present and the future.

3.5 Winner and Loser

When we think about games, we often default to a very narrow image: one winner, everyone else defeated. Competition appears to offer the most intuitive grammar of play. A game, in this common view, is a contest that produces a victor, and the function of the players is to strive toward that singular end. Yet this assumption obscures one of the most revealing aspects of games: they organise outcomes in many different ways. Not all games crown a single champion. Some identify a single loser. Some divide players into groups of winners and losers. Some require that all players win or fail together. Others suspend the distinction altogether.

This is not a minor observation. The way a game distributes victory and defeat shapes the experience of participation, the emotional texture of the activity, the meaning of error, and the type of learning that becomes possible within it. If we want to understand the educational value of games, especially for adult learners, we must begin by recognising that 'game' is not one fixed structure. It is a family of structures, each of which organises effort, risk, cooperation, and achievement differently.

A useful place to begin is with a counterintuitive example: *Jenga*. *Jenga* does not fit neatly into the model of one winner triumphing over a field of losers. Strictly speaking, the game is organised around a different logic: one player loses, and everyone else wins. The tower stands for as long as the collective sequence of actions sustains it. Tension accumulates with every move, not because one player is visibly dominating the others, but because the whole structure grows increasingly unstable. The decisive moment comes when one player causes the tower to collapse. That player loses. The others, by implication, survive the failure and therefore win.

This configuration matters because it reverses the usual narrative of success. The centre of the game is not the glorious ascent of a champion but the avoidance of a final, irreparable mistake. In *Jenga*, the drama lies in sustaining equilibrium under pressure. The key skill is not conquest but care, judgment, and the management of risk. That is already enough to show that games are not reducible to simple domination structures. They may be organised around collapse rather than triumph, fragility rather than accumulation, survival rather than conquest.

By contrast, the most familiar competitive format is the classical one winner, all others lose structure. Here the game is explicitly designed to produce a single victorious outcome. Many board games, sports competitions, quiz formats, and strategy games operate in this way. Whether in Monopoly, Risk, or a tournament race, the logic is clear: only one participant can occupy the final winning position. Such games heighten comparison, focus attention on performance differentials, and reward the accumulation of advantage over time. Their appeal lies partly in their clarity. The outcome is easy to interpret, and the hierarchy it creates is immediate.

This structure can be exhilarating because it sharpens motivation and makes progress legible. But it also comes with a cost. It concentrates value in one endpoint and often renders all other outcomes deficient. In educational environments, especially with adults, this can be productive in some circumstances but counterproductive in others. A single-winner structure can intensify effort, but it can also increase fear of failure, reduce willingness to experiment, and amplify the symbolic weight of losing. The pedagogical question is therefore not whether such games are good or bad in themselves, but what kind of behaviour they solicit and what emotional economy they create.

An even purer version of competitive symmetry appears in two-player, zero-sum games: one wins, one loses. Chess is perhaps the clearest example. So too are many racquet sports, duels, and head-to-head strategic games. In these cases, the relationship between gain and loss is direct and transparent. One player's progress is inseparable from the other's setback. This form is especially powerful for developing strategic adaptation, anticipation, and close attention to an opponent's intentions. It produces a highly concentrated experience of reciprocal challenge. It also makes learning visibly cyclical: one learns not only from one's own errors, but from the pressure exerted by the other player's intelligence.

And yet even here, the simplicity of the structure should not mislead us. A two-player competitive game is not merely a mechanism for separating the strong from the weak. It is also a system in which each player's competence gives shape to the other's learning. A novice opponent produces one kind of game; a sophisticated opponent produces another. Thus the educational value of such games lies not only in the outcome, but in the quality of the encounter. Competition, in this sense, is also a form of mutual structuring.

Beyond these classical cases, games often produce multiple winners and multiple losers. This occurs in team games, qualifying formats, threshold-based systems, and many multistage competitions. In football, basketball, or volleyball, for example, one team wins and another loses. Here victory and defeat are distributed collectively rather than individually. The result no longer belongs to a single person, even though individual contributions remain important. This changes the meaning of play profoundly. Responsibility is shared. Coordination matters. Individual excellence must be integrated into collective rhythm. One can perform brilliantly and still lose; one can make mistakes and still be carried by the group. The game teaches not only execution, but interdependence.

There are also games in which some individuals succeed while others fail without the field collapsing into a single winner. In elimination rounds, qualification systems, or games with multiple success thresholds, the outcome is pluralised. Several players may 'make it', while others do not. This is particularly important if one wants to move beyond the idea that games always produce a single apex position. Some games recognise differentiated success. They sort participants into groups rather than into an absolute hierarchy. This can be pedagogically useful because it permits competition without making recognition infinitely scarce.

A very different structure emerges in fully cooperative games, where all players win together or all players lose together. In such games, the real opponent is not another player but the system itself: the spreading disease in Pandemic, the puzzle in an escape room, the constraints of time, the limits imposed by rules or scenario. Here the game becomes a rehearsal for coordination under shared pressure. The meaning of error changes dramatically. A mistake is not simply one person's failure but part of a collective problem-solving process. Success depends on communication, role differentiation, timing, trust, and the capacity to read a situation from multiple perspectives.

This form has obvious relevance for learning. It lowers the symbolic penalty attached to individual failure and shifts attention from rank to contribution. It encourages participants to see intelligence as distributed across the group rather than concentrated in a single performer. Especially in adult education, where many learners carry anxieties related to judgment, competence, and exposure, cooperative structures can create psychologically safer ways to engage with challenge. They do not eliminate difficulty. On the contrary, they often make difficulty more complex. But they reframe it as a shared task rather than as a public test of individual worth.

There are also games in which nobody exactly wins, but one or more players lose. These are often penalty-based or elimination-centred experiences, where the main tension lies in avoiding error rather than achieving a triumphant endpoint. Such games can be socially intense and highly engaging, but they also reveal that not all game structures are organised around positive victory conditions. Some are organised negatively, around exclusion, collapse, or survival. Their emotional centre is caution, suspense, and the management of vulnerability.

At the other end of the spectrum are games in which multiple players may succeed in different ways, or in which the distinction between winning and losing becomes secondary. Narrative role-playing games, sandbox environments, creative simulation spaces, and many forms of open-ended play do not always culminate in a singular result that can be neatly scored. Their value lies in exploration, expression, improvisation, construction, and interpretation. Here the game is less a machine for ranking participants than a space for generating experience. One might say that the 'outcome' of such play is not victory but transformation: a new understanding of the system, a new story, a new possibility, a new configuration of meaning.

This matters enormously for any serious theory of play and learning. If we reduce games to the one-winner model, we miss their broader cultural and educational significance. Games can train direct competition, but they can also cultivate restraint, resilience, cooperation, experimentation, shared problem solving, and creative participation. The educational question is therefore not simply whether games motivate learners. It is what kind of relational structure a given game creates, and what kind of learner that structure calls into being.

A single-winner game invites one kind of subject: ambitious, comparative, outcome-oriented. A one-loser game invites another: careful, self-monitoring, attentive to thresholds of collapse. A cooperative game invites yet another: relational, communicative, strategically collaborative. Open-ended play invites still another: exploratory, imaginative, intrinsically motivated. Each of these forms generates different patterns of attention, different attitudes toward error, different experiences of success, and different modes of participation.

For this reason, any attempt to connect play and learning must avoid speaking of 'the game' in the singular, as though all games carried the same pedagogical logic. They do not. The way victory and defeat are distributed is not a superficial detail. It is one of the deepest organising principles of a game, and one of the clearest indicators of what that game can teach. If we take this seriously, then play becomes far more than a motivational device. It becomes a repertoire of structures through which different forms of learning can be designed, enacted, and experienced.

And perhaps this is the most important conclusion. Games do not merely entertain different people in different ways. They model different worlds. Some worlds reward solitary superiority. Some punish error. Some make success collective. Some multiply possible achievements. Some suspend victory altogether in favour of discovery. To think seriously about games is therefore to think seriously about the architectures of participation we place before learners. And to think seriously about learning is to ask not only what knowledge is transmitted, but under what conditions people are invited to act, to risk, to fail, to persist, and to succeed.

3.6 Motivational and Behavioural Variables

The motivational force of a game is never produced by rules alone, nor by theme alone, nor even by the skill of the players. It arises, more fundamentally, from the way the game distributes outcomes: who may win, who may lose, whether success is exclusive or shared, whether failure is individualised or collective, and whether victory is defined at all. These structures are not merely formal devices. They shape the affective and cognitive conditions of participation. They determine what players attend to, how they interpret risk, how they relate to one another, and what kind of effort they are prepared to sustain. In this sense, every game contains an implicit model of motivation.

The model in which one wins and all others lose is perhaps the clearest expression of agonistic play. Its defining feature is the scarcity of recognition: only one player may occupy the position of success, and the value of that success is intensified precisely because it is denied to everyone else. Such a structure generates a strong motivational economy of comparison. Players are driven not simply to perform well, but to prevail over others. What is cultivated here is not only ambition, but a particular disposition toward rivalry, measurement, and differentiation. The player learns to read advantage relationally, to treat progress as positional, and to interpret achievement as meaningful insofar as it exceeds the performance of others. This model is therefore especially effective in training competition and confrontation. It can heighten concentration, sharpen strategic awareness, and intensify commitment. At the same time, because it binds recognition to a singular outcome, it may also amplify the symbolic weight of failure. Motivation becomes inseparable from exposure: the desire to win is coupled with the risk of being publicly defeated.

A rather different motivational structure emerges in games where one player loses and all others win. At first sight, this may seem like a minor variation on competitive play; in fact, it produces a distinct experiential logic. Here the central dramatic event is not the triumphant ascent of a winner but the collapse produced by a loser. The game's energy is organised around the avoidance of a terminal mistake. As a result, motivation shifts away from expansion and toward maintenance, vigilance, and control. Players are not driven primarily by the desire to dominate, but by the need to remain composed under increasing pressure. Such games foreground attention and endurance. They reward steadiness, calibration, timing, and the capacity to sustain performance in conditions of growing fragility. The pleasure they offer is therefore not mainly the exhilaration of superiority, but the tension of continued survival within an unstable system. From the standpoint of learning, this structure is especially significant because it places value on persistence and self-regulation. It teaches that the decisive challenge is not always to surpass others, but sometimes to remain attentive enough not to become the point at which the system fails.

The model in which all players win together, or all players lose together alters the motivational field more radically still. Here the game ceases to be a site of direct opposition among participants and becomes, instead, a structured encounter with a common challenge. The obstacle may take the form of time, complexity, uncertainty, a hostile scenario, or the internal logic of the system itself; but in every case, the relevant fact is that success is shared and failure is shared. This configuration redistributes motivation from comparison to interdependence. Players are encouraged to coordinate rather than outmanoeuvre, to communicate rather than conceal, to recognise complementary capacities rather than seek singular distinction. What such games strengthen is not merely cooperation in the superficial sense of working alongside others, but a more demanding form of collective intelligence: the capacity of a group to think, decide, adapt, and solve problems in ways that exceed the resources of any one member taken alone. The motivational power of this structure lies in contribution rather than domination. One remains engaged because one's action matters to the whole, and because the whole, in turn, makes individual action meaningful. Particularly in educational contexts, this model has considerable importance, since it lowers the punitive force of individual error while preserving challenge, and thereby creates conditions more favourable to trust, distributed reasoning, and sustained participation.

Finally, there are game forms in which no definitive winner is established, and in which the traditional opposition between victory and defeat recedes or disappears altogether. In these cases, the game is not primarily organised as a contest but as a space of exploration, experimentation, narration, construction, or discovery. Its motivational structure is therefore less extrinsically oriented toward a terminal outcome and more intrinsically tied to the generativity of the activity itself. What such games favour is exploration and creativity, precisely because they loosen the pressure of evaluative closure. When players are not compelled to direct all effort toward the capture of a final winning position, they are often more willing to improvise, to test unconventional possibilities, to remain in uncertainty, and to pursue curiosity as a legitimate mode of engagement. The absence of a defined victor does not weaken motivation; rather, it reconfigures it. Engagement is sustained not by rivalry or survival, but by the unfolding richness of the possibility space. This is especially important for any theory of learning that seeks to value invention as much as mastery. In such environments, creativity is not an ornamental supplement to performance; it becomes the principal form through which participation acquires meaning.

Taken together, these different configurations show that games do not motivate through a single universal mechanism. They produce distinct motivational regimes. A single-winner game calls forth ambition, comparison, and strategic opposition. A single-loser game cultivates vigilance, restraint, and resilience under pressure. A fully cooperative game mobilises mutual reliance, communication, and collective problem-solving. An open-ended game invites curiosity, improvisation, and imaginative experimentation. Each structure forms a different relation between the player and the possibility of success; each distributes risk and recognition differently; each teaches, implicitly, a different way of inhabiting challenge. For this reason, any serious engagement with play especially in relation to learning must resist the temptation to speak of games as though they constituted a homogeneous category. What matters is not simply that a learning experience is 'game-based', but what kind of game it resembles, what kind of motivation it elicits, and what kind of subject it asks the participant to become.

3.7 Cooperative and Competitive Structures in Educational Design

Suppose you enter a classroom. Or rather, suppose you enter what appears to be a classroom but which, on closer inspection, reveals itself to be something more ambiguous a space in which the boundaries between play and instruction have been deliberately, perhaps mischievously, dissolved. You will need, before proceeding, to make a distinction. There are two kinds of dissolution and confusing them leads to error.

The first kind is the *serious game*: a complete world, self-enclosed, governed by its own internal logic, designed not for pleasure alone but for the transformation of whoever inhabits it. The second kind *is gamification:* not a world but a dressing, a set of signals points, badges, levels, leaderboards applied to an environment that remains, underneath its new costume, an environment of instruction. Both produce effects. Both alter the learner. But they do so as two different cities alter the traveller who passes through them: one by immersing, the other by orienting.

The question of which produces the greater effect is, like most questions of this kind, answerable and yet unsatisfying in its answer. Nebel, Schneider, and Rey (2016) examined social competition and learning across different group sizes in educational videogames, finding that competition effects on learning are moderated by group size in ways that challenge simple predictions: individual competition against a single opponent produces different cognitive and motivational dynamics than competition within larger groups, with implications for how competitive structures should be calibrated to instructional goals. Meta-analytic evidence awards the stronger aggregate effect on achievement and motivation to gamification, understood, in Deterding et al.'s (2011) foundational definition, as the use of game design elements in non-game contexts. Kim et al. (2018) provide an extensive review of gamification applications in learning and education. Kapp, Blair, and Mesch (2014) offer a practitioner-oriented complement, translating gamification research into concrete design tools and techniques for learning professionals: their field book documents how elements such as points, badges, leaderboards, narrative, and challenge levels can be systematically combined to produce motivationally rich instructional environments, while emphasising that gamification is most effective when it builds on real learning goals rather than decorating content with superficial game mechanics. At the level of individual elements, Landers, Bauer, and Callan (2017) conducted a goal-setting experiment specifically on leaderboards, finding that the effect of leaderboard feedback on task performance depends critically on the nature of the goal it is paired with: leaderboards enhance performance when paired with learning goals but can inhibit it when paired with purely performance-focused goals, a nuance that should inform any deployment of competitive ranking in an educational context. The scientific foundations of this field are traced by Landers et al. (2018), who provide a historical and prospective account of gamification science, arguing that the field requires more rigorous experimental design and clearer theoretical grounding if its claims about motivational and learning effects are to be distinguished from the artefacts of poorly controlled studies., documenting both its motivational power and the conditions under which its effects erode when extrinsic rewards crowd out intrinsic engagement. Yet the serious game, quieter in its claims, demonstrates a more persistent intimacy with something the numbers call intrinsic motivation the kind of engagement that does not require a scoreboard to justify itself. To understand why, one must be willing to think about desire.

There are, the psychologists tell us, two varieties of desire in learning. One looks outward: it wants the reward, the recognition, the visible proof of advancement. The other looks inward: it wants the thing itself the problem solved, the idea understood, the experience completed. Gamification speaks fluently to the first. Serious games, by the nature of their architecture, tend to cultivate the second. This is not a moral distinction; it is a structural one. A city of mirrors and a city of canals are not better or worse than each other. They simply produce different kinds of attention in those who walk through them.

To go further, one requires the vocabulary of a discipline that has spent considerable effort thinking about what happens when rational agents interact. Economics or more precisely, that subdiscipline which calls itself game theory offers a set of categories that, applied to the classroom, illuminate what might otherwise remain obscure.

Consider the competitive situation. In it, one learner's ascent is composed, at least in part, of another learner's relative descent. This is what game theory describes with the cold elegance of the phrase zero-sum: the gains and the losses balance precisely, like a perfectly maintained ledger. The leaderboard is the purest expression of this logic. It does not merely report performance; it constructs a rank, and in constructing a rank, it makes visible the very comparison that motivates the competitor. Gamification, in its more familiar forms, tends toward this architecture: the points accumulate, the rankings shift, the learner is invited to want not merely progress but position.

Serious games acknowledge competition too they may have winners and losers, victors and the defeated but their competitive dynamics are typically embedded within a larger structure that gives them meaning beyond mere rank. One competes, in a serious game, within a world that has already asked something of you: your attention, your investment, your willingness to accept its premises. The competition, when it appears, is therefore coloured differently.

Now consider the cooperative situation. Here, the learner discovers something that competitive logic conceals: that the total available to be won can be enlarged by collaboration. Game theory names this positive-sum, and the name is quietly revolutionary, because it proposes that gain need not be extracted from another's loss that it can be, under the right conditions, generated collectively. When learners work together in teams, share strategies, distribute cognitive labour, and construct understanding in common, they are participating in what is, structurally, a cooperative game. The empirical literature confirms that serious games create conditions hospitable to this form of engagement. Experimental evidence goes further: Greitemeyer (2013) found that playing video games cooperatively, as opposed to competitively or alone, significantly increased empathic concern among participants, while Greitemeyer and Cox (2013) demonstrated that cooperative gameplay produced measurable increases in cooperative behaviour in subsequent tasks. Designing videogames to exploit these social affordances for educational ends has become a recognised field of practice: González-González and Blanco-Izquierdo (2012) analyse the specific design choices, shared goals, complementary roles, visible interdependence, that make social videogames effective for educational use, providing practical guidance for designers who wish to harness cooperative dynamics for learning. These findings suggest that the social structure of game design is not merely a contextual variable but an active shaper of participants' motivational and interpersonal orientations. Landers and Armstrong (2017) tested the Technology-Enhanced Training Effectiveness Model and found that game-based instructional designs significantly enhance learning outcomes when they are integrated with clearly defined learning objectives rather than appended as motivational overlays. It also confirms and this detail deserves emphasis that environments characterised by psychological safety, by the absence of punitive consequence for error, significantly enhance intrinsic motivation. Fear, it turns out, is not a neutral variable. It occludes the very curiosity it is sometimes invoked to sharpen.

Three conclusions follow from this mapping, and they have the quality of good conclusions: they illuminate what was already present in the evidence, but arrange it so that its shape becomes visible for the first time.

The first is that competitive design serves the purpose of activation. When a teacher needs to mobilise effort rapidly, to convert inertia into engagement, to make a routine task temporarily legible as a contest worth entering, competitive gamification works. It works because it constructs incentives, and incentives, as any student of economics will confirm, reliably alter behaviour. The learner who might otherwise drift is anchored, briefly, by the visible presence of a reward.

The second is that cooperative design serves the purpose of depth. When the instructional aim is understanding rather than performance when the teacher is asking the learner not merely to produce a correct answer but to inhabit a problem, to turn it over, to discover its underside then cooperative structures are the more appropriate architecture. They do not merely reward; they transform the social space of learning into something resembling what game theory calls a coordination problem: a situation in which the best outcome for each depends on finding alignment with the others.

The third conclusion is perhaps the most interesting, because it refuses the simplicity of the previous two. It proposes that the most effective learning environments are neither purely competitive nor purely cooperative, but that they hold both logics in productive tension. This is not a counsel of moderation; it is a structural observation. Competition without cooperation narrows learning into performance and excludes the learner who perceives the rank order as already settled against them. Cooperation without the friction of incentive creates conditions for what economists, with their talent for austere naming, call free-riding the tendency of some participants to reduce their contribution when it cannot be individually observed. The classroom, like most complex systems, is a social dilemma: individuals and collectives do not automatically want the same things, and the work of pedagogical design is precisely to construct conditions under which their interests converge.

A taxonomy, at this point, becomes useful not as a cage for the ideas, but as a provisional map, the kind that one carries knowing it will require revision. Le Hénaff et al. (2015) have examined the role of social identity in team game-based learning, finding that group identification, but not anonymity alone, significantly shaped performance, with implications for how team composition and social context should be managed in cooperative game-based learning environments. At a broader civic level, Kahne, Middaugh, and Evans (2009) have documented that participation in certain types of games, particularly those involving civic scenarios, political simulation, and collective problem-solving, is associated with higher levels of civic knowledge, political engagement, and community participation among young people, suggesting that the prosocial potential of well-designed game-based learning extends beyond the classroom. Raphael et al. (2010) provide the conceptual and design framework needed to operationalise this potential: their account of games for civic learning identifies the structural features, authentic civic problems, multiple stakeholder perspectives, consequential choices, and deliberative reflection, that must be present for a game to function as a real instrument of civic education rather than mere entertainment with a civic veneer. Whitton (2011) offers theoretical grounding for this approach: her game engagement theory, developed specifically for adult learners, argues that the effectiveness of game-based learning depends on the creation of an environment that balances challenge, curiosity, control, and fantasy in ways responsive to adult motivational structures. At the level of design, Garneli, Giannakos, and Chorianopoulos (2017) have shown empirically that the combination of narrative, gameplay mechanics, and making activities produces differentiated effects on student performance and attitudes, suggesting that no single element of serious game design is sufficient on its own.

Zero-sum structures find their proper application in contests, leaderboards, and the rapid ignition of short-term effort. Positive-sum structures belong to peer instruction, collaborative inquiry, and the patient construction of conceptual understanding. Coordination structures illuminate those moments when a group of learners must align on a shared framework a common method, a shared premise, a collectively negotiated interpretation. And the logic of the social dilemma illuminates the dynamics of group work itself: the persistent possibility that the collective good and individual interest will diverge, unless the design of the task makes cooperation the rational as well as the generous choice.

What this mapping ultimately reveals is that gamification and serious games are not two delivery mechanisms for the same content. They are two different grammars of motivation, two different ways of structuring the relationship between the learner and the act of learning. Gamification speaks the language of incentive and comparison. Serious games speak the language of immersion and meaning. Neither is sufficient alone.

The closing argument can therefore be unfolded by making explicit the steps compressed in the preceding synthesis. When we say that game-based learning improves achievement and motivation, we are saying something that sounds simpler than it is. Achievement and motivation are not a single substance that either increases or does not. They are, rather, two distinct phenomena that can be present in very different proportions and for very different reasons. A learner can achieve without being motivated driven forward by the architecture of reward and consequence, producing correct outputs the way a mechanism produces outputs, reliably and without investment. And a learner can be motivated without achieving deeply engaged with a problem, fascinated by its contours, and yet lacking the structure that converts fascination into measurable progress. The ideal, naturally, is both. But the path to both is not a single road.

This is where the distinction between activation from outside and activation from within becomes decisive not as a metaphor, but as a precise description of two different causal chains.

To activate from outside is to construct, around the learner, a set of conditions that make effort the rational response. The leaderboard says: your position is visible, and visibility implies consequence. The badge says: there is a threshold, and crossing it will be registered. The timer says: time is finite, and inattention has a cost. None of these mechanisms require the learner to care about the content. They require only that the learner care about the reward, the rank, or the avoidance of loss and this, as any honest observer of human behaviour will confirm, is a far easier condition to satisfy. Extrinsic motivation is, in this sense, democratically available: it does not wait for curiosity to arrive. It produces movement in its absence.

But movement is not the same as direction, and direction is not the same as destination. The learner who moves because of external pressure moves for as long as the pressure persists. Remove the leaderboard, and the ranking ceases to matter. Remove the badge, and the threshold becomes arbitrary. The improvement in achievement that competitive mechanics produce is real the empirical record is unambiguous on this point but it is, structurally, contingent. It depends on the continued presence of the external scaffolding that produced it. This is not a flaw unique to game-based design; it is a general feature of extrinsically motivated behaviour, known since the earliest days of educational psychology and confirmed with stubborn consistency ever since.

To activate from within is a different matter entirely, and considerably more difficult to engineer. It requires not the construction of external pressure but the creation of internal conditions a state in which the learner's own curiosity, sense of competence, desire for understanding, or need for autonomy becomes the engine of engagement. Serious games, at their best, attempt precisely this: they build worlds coherent enough and rewarding enough in themselves that the learner's motivation becomes, gradually, a function of the world rather than of the reward for inhabiting it. The learner who is activated from within continues after the class ends. They think about the problem in the corridor. They return to it. When we say that the classroom can make learning feel like something the learner 'choose', we are not describing an illusion a pedagogical sleight of hand in which the teacher's agenda is concealed behind the appearance of autonomy. We are describing something more interesting and more demanding: the real production of autonomous motivation through carefully designed conditions. This is what the psychological literature on self-determination theory has argued for decades that autonomy is not simply given or withheld, but that it can be cultivated, that environments can be designed in ways that make the learner's own will the proximate cause of their engagement.

The hybrid design that this chapter advocates accomplishes this in two stages competitive and cooperative ones.

Competitive mechanics generate the initial movement. This is the first stage, and it is, frankly, the less elegant of the two but it is indispensable. The learner who has not yet been activated cannot choose to engage; they are, in the relevant sense, not yet present as a learner. Competitive mechanics solve this problem by making engagement the path of least resistance. They lower the activation energy of effort. They do not ask the learner to care about the content; they ask only that the learner respond to incentive, which is a far more modest and reliable request. The movement they generate is preliminary a first step that does not yet know where it is going.

Cooperative structures sustain it**.** This is the second stage, and it is where the transformation occurs. Once the learner is moving, the question becomes whether the environment can convert that movement into something with its own internal momentum something that continues not because the pressure is maintained but because the learner has, in the course of moving, discovered a reason to continue. Cooperative structures create the conditions for this conversion. They place the learner in relation to others in ways that produce real interdependence: I need your understanding to advance my own, and you need mine. This interdependence is not merely social; it is cognitive. Explaining something to another person clarifies it. Encountering another's confusion illuminates one's own unexamined assumptions. The cooperative structure, in other words, makes the learning itself the reward gradually, imperfectly, but real.

And it is in this gradual, imperfect process that the learner arrives at the experience of having chosen. Not because no one designed the environment someone did, with considerable care but because the design has, at its best, worked itself invisible. The scaffolding has been removed, or rather, the learner has grown tall enough that they no longer notice it. What remains is the problem, the understanding, and the learner who has, somewhere in the architecture of a well-designed classroom, become the kind of person who finds that particular combination sufficient. This is not a small achievement. It is, in fact, the central ambition of education restated here, as so many central ambitions eventually are, in the language of the age.

4 Prior Knowledge, Competence, and Differentiated Game Design

Summary 4.1 From Zero-Entry Designs to Experience-Dependent Architectures. – 4.2 Variable Prior Knowledge and the Conditions of Meaningful Play. – 4.3 Prior Competence, Achievement, and Motivation. – 4.4 The Knowledge Base as a Prerequisite for Deep Play. – 4.5 Designing for Knowledge Variability: The Problem of the Mixed Cohort. – 4.6 A Framework for Distinguishing Zero-Entry from Knowledge-Dependent Game Mechanics.

4.1 From Zero-Entry Designs to Experience-Dependent Architectures

This chapter focuses on prior knowledge as a decisive design variable, distinguishing zero-entry experiences from mechanics that require established competence, achievement orientation, and differentiated learning pathways.

Any serious account of game-based learning must eventually confront a variable that much of the general literature treats with insufficient precision: the prior knowledge that the learner brings to the game before the game begins. The question is not merely psychological not simply a matter of confidence, curiosity, or affective readiness but epistemological and structural. It concerns the relationship between what the learner already knows and what

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the game is capable of teaching, and it has direct implications for the design of instructional games at every level of complexity.

The simplest formulation of the problem runs as follows. A game designed for educational purposes is not a neutral container into which any learner may step with equal facility. It is, rather, a structured environment whose internal logic presupposes certain cognitive resources in the player. Some games presuppose very few such resources; others presuppose a great many. The character of the learning experience and, more fundamentally, whether learning occurs at all depends in considerable part on the alignment or misalignment between what the game demands and what the learner already possesses. This alignment is not automatic. It must be designed for, and designing for it requires a taxonomy of games according to the prior knowledge they presuppose.

At one end of the spectrum sit what may be termed zero-entry games: instructional designs that require no domain-specific prior knowledge and that construct the conceptual apparatus of the subject from first principles within the game environment itself. The learner arrives, in the relevant sense, empty or at least, the game proceeds as though they do, requiring nothing beyond the general cognitive capacities that any adult or adolescent learner may be presumed to possess: the ability to follow rules, to observe consequences, to form elementary hypotheses, and to revise them in the light of feedback.

Zero-entry games are most naturally suited to the introduction of opening concepts ideas that are, by definition, prerequisite to everything that follows in each domain, and that therefore cannot themselves presuppose prior domain knowledge without generating an infinite regress. They are also, it should be noted, the most discussed category in the general literature on game-based learning, perhaps because they are the most tractable to experimental study: the absence of prior knowledge as a confounding variable simplifies the measurement of learning gain.

A canonical example from the natural sciences is the family of games designed to introduce the concept of natural selection. This pedagogical logic of building concepts from the inside out through structured game experience is closely aligned with what Barab et al. (2009) call transformational play: environments in which learners are positioned as protagonists who must apply academic knowledge to solve problems that matter within the game world, thereby constructing understanding through consequential action rather than passive reception. Games such as *Birdstrike* or the earlier *Evolution* simulations ask players to manage populations of organisms across successive generations, allocating traits and observing differential survival rates. The player need not bring no prior knowledge of genetics, population biology, or evolutionary theory. The game constructs these concepts ostensively through the accumulation of experience within the simulation rather than propositionally. The player does not read that organisms with advantageous traits survive at higher rates; they observe it, repeatedly, as a consequence of their own decisions. The conceptual content emerges from the experience of play rather than preceding it.

A parallel example from economics and social science is the *Trading Game*, long used in development education, in which groups of learners are allocated unequal resources and tasked with producing goods through exchange. No prior knowledge of comparative advantage, terms of trade, or market structure is required. The game generates, through the friction of negotiation and the visibility of outcome disparity, an experiential ground from which these concepts can subsequently be abstracted. The teacher's role, in such designs, is not to transmit the concept before the game begins but to name and formalise it after to provide the conceptual vocabulary that the learner now has an experience to attach it to.

This is the distinctive epistemological structure of the zero-entry game: it produces knowledge from the inside out, beginning with experience and proceeding toward abstraction, inverting the traditional sequence of instruction in which abstraction precedes and conditions experience. It is, in this respect, aligned with constructivist theories of learning, and its pedagogical power derives precisely from the fact that it does not demand prior knowledge as a condition of entry. The learner's ignorance is not an obstacle; it is, in a carefully designed zero-entry game, the very resource the game is built to transform.

4.2 Variable Prior Knowledge and the Conditions of Meaningful Play

The situation changes substantially and the design requirements become correspondingly more complex when the game presupposes prior domain knowledge as a condition of meaningful engagement. Here the learner's existing cognitive structures are not merely a biographical fact but a functional prerequisite: the game cannot be played meaningfully, and the learning it is designed to produce cannot occur, unless the player brings to it a sufficient base of prior knowledge on which the game's demands can operate.

This category of game represents, it should be argued, the majority of instructional games designed for advanced secondary or tertiary education, and its relative neglect in the introductory literature reflects a bias toward novice learners that the field has not always been transparent about. When prior knowledge is a structural variable rather than an incidental one, the design of the game must grapple with questions that zero-entry designs can comfortably ignore: What does the player need to know before the game begins? How variable is that prior knowledge across a given population of learners? And how does variability in prior knowledge translate into variability in the learning experience the game produces?

Consider a medical education example. Simulation-based games designed to develop clinical reasoning such as those used in virtual patient platforms like *Body Interact* or *SimMan* presuppose a substantial base of anatomical, physiological, and pharmacological knowledge. A learner who approaches such a simulation without having first internalised the relevant organ systems, disease mechanisms, and drug interactions will not merely perform poorly; they will be cognitively unable to engage with the game's decision structure in the way the design intends. The game presents a patient with chest pain and requires the learner to order investigations, interpret results, form a differential diagnosis, and initiate treatment. Each of these steps requires not curiosity but knowledge specific, structured, retrievable knowledge that has been encoded through prior study and that the game now asks to be activated, applied, and extended under conditions of uncertainty and time pressure. The prior knowledge is not context for the learning; it is the mechanism through which learning occurs. Without it, the game produces not education but confusion.

A second example, drawn from the domain of history and political science, is the family of negotiation simulations used in international relations pedagogy among the most well-documented being Statecraft and the various Model United Nations formats adapted for digital play. These games require players to represent states in a world-system, conduct diplomacy, form alliances, manage domestic constraints, and respond to international crises. The instructional literature on such simulations consistently demonstrates that their effectiveness as learning instruments is strongly conditioned by the depth of prior knowledge players bring to them. Students who enter the simulation with a working knowledge of the states they represent, the historical precedents that shape their interests, and the formal structures of international institutions engage with the game at a qualitatively different level from those who do not. The former group uses the game to test, apply, and deepen existing understanding; the latter group uses it if they can be said to use it productively at all merely to acquire surface familiarity with a domain whose underlying logic they have not yet grasped. The game, in other words, produces different learning from different learners not because those learners differ in intelligence or motivation, but because they differ in the cognitive resources they bring to the experience.

4.3 Prior Competence, Achievement, and Motivation

In recent years, video games have increasingly come to be recognised as compelling instruments for learning, owing in large measure to their remarkable capacity to draw individuals into immersive educational experiences and to sustain their attention with unusual intensity. The expansion of edutainment, together with the widespread adoption of mobile learning games, has made it imperative to evaluate the educational value of such media and to understand more clearly the behaviours that unfold within gameplay.

The idea that one may learn through play is by no means new. Scholars have long observed that play allows children to rehearse social situations, to explore emotional possibilities, and to encounter forms of resolution that extend beyond the immediate boundaries of the play experience itself. In this sense, play is not merely an intrinsically motivating activity; it is also a means through which children construct alternate realities shaped by perception, imagination, and desire. It offers a symbolic space in which real-life tensions, frustrations, and unmet wishes may be negotiated and, at times, temporarily resolved.

Video games intensify these formative qualities through the distinctive affordances of the digital medium. Their interactivity invites players not simply to observe a narrative, but to inhabit it actively: to pursue goals, make decisions, confront challenges, and experience the consequential sense of agency that emerges from meaningful participation. Among the many elements that scholars have identified as contributing to video game enjoyment, the experience of self-efficacy remains critical. When children engage in gameplay, they may develop competencies that foster persistence, satisfaction, and a heightened sense of mastery. Even more significantly, games create conditions in which curiosity may be gratified and achievement felt in immediate and tangible ways.

Enjoyment, indeed, lies at the heart of entertainment, and video games are no exception. People turn to entertainment media above all in search of enjoyment, and gaming derives much of its appeal from the pleasure inherent in the act of play itself, regardless of whether success is ultimately attained. Yet enjoyment is not merely a desirable by-product of gameplay; it is a necessary precondition for continued engagement. A player is unlikely to return to an activity that is not experienced as enjoyable, and without such enjoyment, motivation and persistence are markedly less likely to endure. For this reason, enjoyment assumes a central role in achievement: it encourages players to continue learning, refining, and mastering the game, whereas boredom or dissatisfaction often lead to disengagement and, consequently, to failure in learning.

Within the literature on motivation and achievement, perceived competence has attracted sustained scholarly interest. Dweck and Leggett (1988), among others, have shown that perceptions of competence are closely intertwined with implicit theories of ability and with the goals individuals pursue in achievement settings. Motivation research has therefore approached competence from multiple angles: as the desire to become competent, to appear competent, to feel competent, or to avoid appearing incompetent in the eyes of others. Video games provide especially fertile ground for such processes, as they offer repeated opportunities for trial, error, feedback, adjustment, and eventual success. A player's experience of competence often emerges when accomplishment is attributed not to chance, but to personal effort, skill, and strategic adaptation.

Empirical work further suggests that enjoyment is closely linked to the satisfaction of the basic psychological needs identified in Self-Determination Theory, namely autonomy, competence, and relatedness. Research has shown that the fulfilment of these needs not only correlates with enjoyment but also explains a considerable proportion of its variance. From this perspective, enjoyment may be understood not simply as pleasure, but as the experiential consequence of intrinsic need satisfaction.

It is against this theoretical backdrop that the present study investigates the factors likely to influence both enjoyment and achievement in a mobile learning game. Drawing upon Cognitive Evaluation Theory, Bandura's (1986) Social Cognitive Theory, and Harter's (1978) Theory of Competence Motivation, the study develops a conceptual model through which these relationships may be examined. In doing so, it contributes to research on media enjoyment by incorporating variables such as game attitude, prior experience, and intensity of use, all of which have received comparatively limited attention in earlier models. Moreover, while much of the existing literature has focused on voluntary engagement with entertainment games, less is known about how students are motivated and how they achieve intended outcomes when gameplay is assigned within educational contexts.

Accordingly, the study is guided by three central research questions: first, which factors shape enjoyment and achievement in a mobile learning game; second, how perceived competence relates to an individual's attitude toward the game and frequency of play; and third, how prior experience contributes to the development of perceived competence.

Self-Determination Theory provides an essential framework for understanding these dynamics. According to Ryan and Deci (2000), both intrinsic and extrinsic factors may either support or undermine motivation. One of its mini-theories, Cognitive Evaluation Theory, proposes that events and conditions which enhance an individual's sense of competence and autonomy strengthen intrinsic motivation, whereas experiences that diminish these perceptions weaken it. At its core lies the principle that changes in one's perception of competence directly influence intrinsic motivation, which in turn gives rise to feelings of enjoyment and interest. In games and sports alike, intrinsic motivation appears to be the central motivational force. Unlike many other activities, gaming is not only intrinsically motivating but also uniquely structured to satisfy psychological needs. Players rarely seek rewards external to the game; indeed, they often willingly pay for the opportunity to participate in the gaming experience itself. It therefore seems reasonable to suggest that games are pursued, above all, as sources of intrinsic satisfaction.

In this context, perceived competence has often been discussed alongside self-efficacy. Both constructs are associated with goal pursuit, behavioural engagement, skill development, and learning. Yet competence, particularly in the language of Self-Determination Theory, extends beyond the simple possession of skills. It includes an individual's appraisal of their ability to coordinate those skills effectively in meaningful and challenging situations. Self-efficacy, by contrast, has often been treated as a more strictly cognitive perception of one's capability to perform a task. Even so, the two remain deeply related in the study of motivation and achievement.

Prior game experience is one factor expected to shape perceived competence. Researchers have argued that earlier gaming experience, together with the development of skills such as spatial reasoning, problem-solving, reaction speed, and control accuracy, can substantially affect gameplay behaviours and learning outcomes. Yet competence should not be reduced to the possession of such skills alone. Rather, it concerns one's confidence in mobilising them under changing and demanding conditions. The interactivity of games, and the player's ability to make an impact within the virtual world, may produce a strong sense of control, agency, and efficacy. Since perceived competence in any domain develops through a history of successes and failures, it is reasonable to assume that mastery experiences in gaming contribute to stronger competence beliefs over time. Prior research in adjacent domains, such as information technology, supports this proposition, showing that experience-based mastery is positively associated with self-efficacy. On this basis, the study proposes the first hypothesis: that prior game experience will be positively related to perceived competence.

Perceived competence is also expected to influence attitude toward the game. Educational research has consistently regarded attitude toward a subject as an important predictor of performance. Students' attitudes are central to the achievement of educational goals, and the successful integration of digital games into instructional settings depends in no small part on the perceptions students hold toward such media. If learners are to use games as educational tools, their attitudes toward them must be monitored with care. Positive perceptions of competence may dispose players to welcome challenge, acquire new skills, and form favourable judgments about the gaming experience. Although empirical work directly linking perceived competence and game attitude remains limited, existing studies suggest that more competent gamers tend to report more positive attitudes toward computer games and technology more broadly. The second hypothesis therefore posits that perceived competence will be positively related to game attitude.

A related relationship concerns the intensity of game use. Bandura (1997) argued that individuals with stronger self-efficacy beliefs are generally more active and more persistent in their efforts. Feelings of competence within gameplay may therefore strengthen intrinsic motivation and encourage sustained engagement. Those who perceive themselves as capable are more likely to involve themselves in tasks that offer challenge and permit the pursuit of self-referenced goals, whereas those who feel less competent may withdraw from such opportunities. Intensity of use may thus be understood in two complementary ways: as repeated exposure to situations that reinforce competence, and as an outward sign of a player's willingness to continue participating because past experiences within the game have been marked by achievement and mastery. Studies in the field of computer technology have found that individuals with higher self-efficacy tend to use computers more frequently. Extending this logic to gaming, the third hypothesis proposes that perceived competence will be positively related to intensity of use.

Perceived competence is further expected to shape enjoyment. In Harter's (1978) Theory of Competence Motivation, competence is understood as a need for challenge and reflectance, and successful attempts at mastery are thought to strengthen perceived competence while simultaneously enhancing intrinsic motivation. Individuals who feel competent are naturally drawn to remain involved in an activity, and Harter argued that those who regard themselves as highly competent in an achievement domain experience more positive affect. To demonstrate competence is, in a meaningful sense, to encounter joy. Previous research has repeatedly shown positive relationships between perceived competence and enjoyment across a variety of contexts, including physical education and digital gaming. Particularly relevant is work showing that perceptions of in-game competence and autonomy are significantly associated with game enjoyment. The fourth hypothesis, therefore, states that perceived competence will be positively related to enjoyment.

Finally, perceived competence is expected to contribute to gaming achievement itself. The logic here parallels achievement processes in formal education. In schools, achievement is rewarded through mastery, progression, and external affirmation from teachers and parents. In games, comparable rewards are found in mastery of mechanics, advancement through levels, and recognition from peers. Players who perceive themselves as competent are more likely to persevere when faced with failure, to recover quickly from setbacks, and to continue striving toward the goals they have set for themselves. Such persistence reflects achievement motivation in its clearest form: the drive to pursue excellence through repeated effort and engagement with difficult tasks. In gaming, this motivation manifests as the willingness to practise, to fail, to try again, and ultimately to master the skills required for success. Empirical studies in educational settings have already demonstrated strong links between perceived competence and achievement outcomes. On this basis, the fifth hypothesis proposes that perceived competence will be positively related to achievement.

The present study proposed a conceptual model grounded in Cognitive Evaluation Theory, Bandura's (1986) Social Cognitive Theory, and Harter's (1978) Theory of Competence Motivation in order to examine the extent to which enjoyment and achievement in a mobile learning game may be predicted by an individual's perceptions of competence. In addition to competence, the model incorporated several related variables, namely prior gaming experience, intensity of use, and attitudes toward computer games, all of which proved to be significantly associated with how competent players perceived themselves to be.

It is important to note, however, that media enjoyment is not a simple or linear phenomenon. Touati and Baek (2018) investigated precisely these questions in a mobile learning game context, finding that perceived competence, game attitude, and intensity of use collectively predicted both enjoyment and achievement, a result that highlights the interdependence of motivational and cognitive dimensions of gameplay. As Vorderer, Klimmt, and Ritterfeld (2004) have observed, enjoyment constitutes a complex process, shaped by multiple psychological dimensions rather than by any single causal mechanism. For this reason, the model advanced in this study does not seek to reduce enjoyment to a fixed sequence of effects. Its purpose, rather, is to illuminate some of the principal constituents of game enjoyment, with particular emphasis on the combined role of perceived competence and game attitude. At the same time, the model demonstrates that achievement, a central concern within any learning environment, is not separate from enjoyment but directly connected to it. In this respect, the findings also offer empirical support for the conceptualisation of enjoyment as an attitude, as proposed by Nabi and Krcmar (2004), according to which enjoyment emerges from the interaction of cognitive, affective, and behavioural dimensions.

As anticipated, the strongest relationship in the model was found between prior gaming experience and perceived competence. This result is especially revealing. Most participants evaluated their *Minecraft* skills as either moderate or high, suggesting that they possessed well-established beliefs in their capacity to coordinate the skills they had acquired through earlier gameplay. The finding accords closely with the broader literature, which has consistently shown that previous mastery experiences contribute substantially to self-perceptions of competence. From an educational standpoint, the implication is clear: instructors and designers must attend carefully to students' prior familiarity with particular types and genres of commercially available games before integrating them into formal learning settings. The greater the learner's previous experience with a game, the more likely that learner is to approach the experience with a stronger sense of competence.

The model also examined the relationship between perceived competence and attitude toward the game, and here too the results were unequivocal. Students who regarded themselves as more competent also expressed more favourable attitudes toward the game. This finding echoes earlier research suggesting that competent gamers are generally more disposed to evaluate computer games positively. Such an outcome is particularly important in educational contexts, where attitudes toward a medium may significantly influence whether it is embraced as a legitimate and effective learning tool.

Beyond this, the study demonstrated that students who held more positive attitudes toward computer games also reported higher levels of enjoyment. This result is consistent with previous research in the field of technology use, which has identified a positive association between favourable attitudes and enjoyment. Yet the significance of the present finding lies in the fact that it does more than merely replicate earlier observations: it suggests that game attitude may itself act as a predictor of enjoyment, thereby indicating a reciprocal relation between the two. Enjoyment may shape attitudes, but attitudes may also predispose individuals toward enjoyment. Such a relationship lends further empirical weight to the view of enjoyment as an attitudinal construct, one composed of intertwined cognitive judgments, affective responses, and behavioural inclinations. Significantly, these same three dimensions were reflected in the scale used in the study to assess participants' attitudes toward games.

With regard to the relationship between perceived competence and intensity of use, the results likewise confirmed the study's expectations and aligned with the existing literature. Participants who viewed themselves as highly competent had engaged with the game more frequently. This finding is readily intelligible within the framework of Bandura's (1986) Social Cognitive Theory, which holds that individuals with stronger perceptions of self-efficacy are generally more active, persistent, and committed in the activities they undertake. In the context of this study, intensity of use, measured through the number of hours students devoted to gameplay, may be interpreted as an expression of their willingness to confront challenging tasks that, while demanding, remained within the bounds of their perceived abilities. It also reflects their capacity to persist in the pursuit of clearly defined goals. In this respect, the study's findings are in keeping with prior work showing a positive relationship between computer self-efficacy and frequency of computer use. What the present research adds is the validation of this same principle within the more specific domain of mobile game-based learning. These findings reinforce the central role of perceived competence within the ecology of game-based learning. Competence does not function merely as an isolated psychological state; rather, it appears to occupy a pivotal position from which a range of related outcomes emerge. It is shaped by prior experience, expressed in patterns of continued use, and reflected in the attitudes learners form toward the gaming medium itself. Most importantly, it intersects with both enjoyment and achievement, thereby linking motivational and educational processes in a particularly meaningful way.

What emerges, then, is a vision of mobile learning games not simply as entertaining tools, but as environments in which prior knowledge, self-belief, emotional engagement, and behavioural persistence converge. If students enter such environments already feeling capable, they are more likely to approach the experience positively, to persist in it, to enjoy it, and ultimately to achieve within it. The educational significance of this conclusion is considerable. It suggests that successful game-based learning depends not only on the design of the game itself, but also on the learner's experiential history and on the psychological meanings that gameplay acquires for that learner. In this sense, competence is not merely one variable among many; it is the axis around which the learner's entire relationship to the game may begin to turn.

4.4 The Knowledge Base as a Prerequisite for Deep Play

This observation points toward a principle that the literature has formulated in various ways but that deserves to be stated with some directness: in knowledge-intensive game-based learning environments, the quality of play is a function of the quality of preparation, and preparation means the prior acquisition of domain knowledge that the game will subsequently mobilise. The game does not replace this preparation; it builds upon it. It is, in the most precise sense of the term, a 'transfer environment', a space in which knowledge already acquired in one context is retrieved, reorganised, and applied in another. The learning that occurs is not the learning of new facts but the deepening of existing understanding: the discovery of relationships between concepts previously held in isolation, the testing of theoretical propositions against the resistance of simulated reality, the development of judgment in conditions where knowledge alone is insufficient and where its application requires the exercise of real reasoning.

This distinction between knowledge acquisition and knowledge mobilisation is fundamental to understanding why prior knowledge is not merely a predictor of game-based learning outcomes but a structural condition of the kind of learning that the most sophisticated instructional games are designed to produce. A game that requires prior knowledge is not a more demanding version of a game that does not; it is a different kind of educational instrument, operating on a different epistemological register. Where the zero-entry game produces knowledge from experience, the experience-dependent game produces understanding from knowledge and understanding, as any educator who has grappled with Bloom's upper taxonomy will recognise, is a qualitatively different achievement from the possession of information.

A third example serves to make this concrete. In legal education, the use of moot court simulations and case-based negotiation games increasingly delivered in digital, or hybrid formats depends entirely on the prior acquisition of substantive legal knowledge. A simulation of contract dispute resolution, for instance, requires the learner to have internalised the doctrinal categories of offer, acceptance, consideration, breach, and remedy before the game can function as a learning environment for the higher-order skills of legal argument, strategic reasoning, and professional judgment. The game does not teach these categories; it assumes them. What it teaches and what no amount of doctrinal study alone can teach with comparable efficiency is the capacity to deploy those categories under adversarial conditions, to recognise the moments at which doctrine must yield to strategy, and to understand, through the experience of defeat as well as victory, that legal reasoning is never merely the application of known rules to known facts.

4.5 Designing for Knowledge Variability: The Problem of the Mixed Cohort

The practical implication that follows from this analysis is one that instructional designers and teachers alike must confront honestly: when a game presupposes prior knowledge, and when the learner population is heterogeneous with respect to that knowledge, the game will not produce equivalent learning across the cohort. This is not a failure of the game; it is a structural consequence of the relationship between prior knowledge and the depth of play the game makes possible. It does, however, generate a real design problem.

Several responses to this problem are available in the literature. The first is sequential design: the deliberate construction of a learning pathway in which the game is positioned as a culminating or integrative activity, preceded by explicit instruction that ensures all learners have acquired the prerequisite knowledge base before the game begins. This approach preserves the integrity of the game's design but requires careful attention to the alignment between the preparatory instruction and the game's specific knowledge demands. The second is adaptive design: the construction of game environments that dynamically adjust their complexity and knowledge demands in response to the player's demonstrated competence, providing scaffolding for less-prepared learners while extending challenge for more advanced ones. This approach is technically demanding and, in its fully realised form, remains more an aspiration than a widespread reality, though developments in intelligent tutoring systems and adaptive game mechanics have brought it closer to practical implementation. The third is explicit differentiation: the acknowledgment, at the level of task design and assessment, that learners with different levels of prior knowledge will engage with the game differently, and that this differential engagement represents not inequity but the natural consequence of different stages of development within a domain.

None of these responses dissolves the fundamental relationship between prior knowledge and the quality of game-based learning. They manage it with varying degrees of elegance and effectiveness but they do not transcend it. The relationship remains. Prior knowledge is not a nuisance variable to be controlled out of the study of game-based learning; it is one of its constitutive conditions, and any account of how games teach that fails to take it seriously will be, in direct proportion to that failure, an incomplete account.

4.6 A Framework for Distinguishing Zero-Entry from Knowledge-Dependent Game Mechanics

Any attempt to build a coherent framework for distinguishing zero-entry games from knowledge-dependent ones must begin by resisting a temptation that is, in the context of educational design, almost irresistible: the temptation to treat the distinction as a simple matter of difficulty. It is not. A game can be extraordinarily difficult without presupposing prior domain knowledge, consider the cognitive demands of *Tetris*, or the strategic complexity of Chess at its highest levels, both of which are, in the relevant sense, self-contained worlds whose rules generate all the knowledge the player needs to engage with them. Conversely, a game can be, in its moment-to-moment mechanics, relatively undemanding, while nonetheless requiring that the player bring to it a substantial body of prior knowledge in order for the experience to produce the learning it was designed to produce. Difficulty and knowledge-dependency are orthogonal dimensions, and a framework that conflates them will misclassify precisely the cases that most need to be distinguished.

The framework proposed here rests instead on five primary dimensions, each of which captures a distinct aspect of the relationship between the game's design and the prior knowledge of its players. These dimensions are not independent of one another, they are, as will become apparent, systematically related, but separating them analytically allows for a precision that treating them as a single undifferentiated variable would foreclose.

The first dimension is what may be called the knowledge entry threshold: the minimum body of knowledge that a player must possess before the game can function as a learning environment rather than merely as an experience. In a zero-entry game, this threshold is, by design, set at or near zero with respect to domain-specific knowledge. The game's internal mechanics are sufficient to construct, from the ground up, whatever conceptual apparatus the player will need. The rules, the feedback loops, the visible consequences of decision, these are the game's primary instructional language, and they speak to any player capable of following them regardless of what that player knew before arriving. In a knowledge-dependent game, the epistemic entry threshold is set substantially above zero. The game's internal mechanics presuppose that certain concepts, relationships, and procedures are already available to the player as cognitive tools, and they operate on those tools rather than constructing them. The threshold is not a flaw in the design; it is, in a well-designed knowledge-dependent game, a deliberate architectural choice that reflects a clear theory of where in the learner's developmental trajectory the game is intended to intervene.

The second dimension is feedback intelligibility: the degree to which the feedback the game provides is interpretable without prior domain knowledge. This dimension is closely related to the first but distinct from it in an important way. A game may have a low epistemic entry threshold, requiring little prior knowledge to begin, but may nonetheless produce feedback that only becomes fully intelligible to a player who already possesses some domain understanding. In a well-designed zero-entry game, feedback is constructed to be self-interpreting: the consequence of an action is visible, immediate, and legible without reference to any external framework. The organism dies because the environment changed and its traits were no longer advantageous; the player sees this happen and the causal logic is embedded in the visual representation itself. In a knowledge-dependent game, feedback frequently requires prior knowledge to be decoded. The virtual patient's oxygen saturation falls following the administration of a particular drug; the learner who does not already know the drug's mechanism of action cannot interpret this feedback as evidence of a specific error in clinical reasoning. The feedback is present and precise, but its meaning is opaque to the unprepared player. It is, in this sense, a message written in a language the player must already speak.

Another dimension is the locus of knowledge construction: whether the primary cognitive work the game requires is the construction of new knowledge from experience, or the application and reorganisation of existing knowledge under novel conditions. This dimension maps most directly onto the epistemological distinction between acquisition and mobilisation that was elaborated in the preceding section, and it is perhaps the most fundamental of the five. In a zero-entry game, the locus of knowledge construction is internal to the game: the player builds understanding through the accumulation of experience within the simulation, moving from concrete encounter to abstract principle through a process that the game's design scaffolds and guides. The game is, in this sense, a complete epistemological environment, a world that generates its own meaning from within. In a knowledge-dependent game, the locus of knowledge construction is partially external to the game: the player arrives with a cognitive structure already in place, and the game reorganises, deepens, and tests that structure by placing it under conditions that formal instruction alone cannot replicate. The game is not a world that generates meaning from within; it is a crucible that transforms meaning already acquired elsewhere.

A different dimension is narrative and conceptual transparency: the degree to which the game's surface narrative or scenario is sufficient to carry the conceptual content, or whether the conceptual content exists at a level of abstraction that the narrative can only partially represent. Zero-entry games tend toward high narrative transparency: the story of organisms competing for survival, the drama of unequal exchange between trading partners, the visible inequality of allocated resources, these surface narratives carry the conceptual content close enough to the surface that a player with no prior knowledge can grasp the connection between what they are doing and what they are learning. Knowledge-dependent games tend toward lower narrative transparency, not because their designs are less careful, but because the concepts they are designed to teach exist at a level of abstraction that cannot be fully materialised in a surface narrative without distortion. A simulation of international treaty negotiation can represent the drama of diplomacy with considerable vividness, but the conceptual structures of neorealist international relations theory, or the formal logic of iterated prisoner's dilemmas in international cooperation, cannot be read directly off the surface of the game experience. They require a conceptual vocabulary that the player must bring to the game in order to see what the game is, at its deepest level, about.

The last dimension is the role of prior experience as generative versus merely facilitative. This is the most subtle of the five, and it requires some care to state precisely. In many accounts of game-based learning, prior knowledge is treated as a facilitator, something that makes the game easier, more accessible, more productive. This framing is correct but incomplete. In the most sophisticated knowledge-dependent games, prior knowledge is not merely facilitative but generative: the learning that the game produces is not simply more learning of the same kind, rendered easier by prior preparation, but a qualitatively different kind of learning that could not occur in the absence of that preparation. The legal student who brings real doctrinal knowledge to the moot court simulation does not merely perform better than the unprepared student; they have a different experience, one in which the friction between doctrine and strategy produces insights of a kind that are, in the strictest sense, unavailable to the student who does not yet possess the doctrinal foundation. Prior knowledge, in such designs, is not the road surface that makes the vehicle run more smoothly; it is the fuel without which the vehicle does not run at all.

These five dimensions knowledge entry threshold, feedback intelligibility, locus of knowledge construction, narrative and conceptual transparency, and the generative versus facilitative role of prior experience are not independent of one another, and understanding their interrelations is essential to understanding how they connect to the broader principles of good game design.

The connection to well-established game design principles becomes visible when one considers what the game design literature, from Salen and Zimmerman's (2004) initial work on rules and play to more recent contributions on meaningful decision-making, identifies as the core requirements of a well-designed game. These requirements include, at minimum: that the player understands the rules sufficiently to act; that actions produce feedback that is interpretable; that the game maintains a dynamic balance between challenge and competence, of the kind that Csíkszentmihályi's concept of flow describes; that the game provides a sense of meaningful progress; and that the game's internal logic is coherent enough to sustain the player's sense of agency, their conviction that their decisions matter and that the game is responding to them rather than merely processing them.

Each of these principles is, it turns out, inflected differently depending on where a given game sits on the spectrum from zero-entry to knowledge-dependent design. The principle of rule comprehensibility, for instance, has a straightforward application in a zero-entry game: the rules must be learnable from within the game, through play, without reference to external instruction. In a knowledge-dependent game, the same principle applies but with a crucial modification: some of the rules, not the procedural rules of the game's mechanics, but the conceptual rules of the domain the game simulates, are not learnable from within the game and must be acquired before the game begins. A well-designed knowledge-dependent game is therefore explicit about this requirement; it communicates clearly to the teacher if not always to the student, what prior knowledge is necessary for the game's rules to be fully intelligible.

The flow principle, the balance between challenge and competence, is similarly inflected. In a zero-entry game, this balance is managed entirely within the game's mechanics, through adaptive difficulty, progressive complexity, or the graduated introduction of new rules. In a knowledge-dependent game, the balance has an additional dimension: the degree to which the player's prior knowledge brings their competence into alignment with the game's demands. A player whose prior knowledge is insufficient for the game's epistemic entry threshold will experience the game not as flow but as anxiety, not the productive anxiety of a challenge at the edge of one's competence, but the paralysing anxiety of incomprehension. A player whose prior knowledge substantially exceeds the game's demands will experience the opposite: not flow but boredom, the disengagement of someone who has been placed below their level. The management of this additional dimension of the flow balance is one of the central design challenges of knowledge-dependent games, and it is one that the literature has not yet resolved with complete satisfaction.

The principle of meaningful agency, the conviction that decisions matter, connects to the framework in a way that is perhaps the most illuminating of all. In a zero-entry game, agency is produced by the game's mechanics: the player acts, the game responds, and the response is visibly connected to the action in a way that confirms the player's causal efficacy. In a knowledge-dependent game, the sense of agency has an additional and more demanding source: it requires that the player understand not merely that their decision produced a consequence, but why it did, A medical student who administers the wrong drug and watches the patient deteriorate has experienced a consequence; but they have experienced meaningful agency only if they understand, through the prior knowledge they bring to the simulation, what went wrong and why. Without that understanding, the consequence is visible but opaque, a reminder of ignorance rather than an occasion for learning.

The framework, considered as a whole, therefore suggests a principle that is both analytically useful and practically actionable: that the design of an instructional game should begin not with the question of what the game will teach, but with the question of where in the learner's epistemic trajectory the game is intended to intervene. A game positioned at the beginning of that trajectory before any domain knowledge has been acquired must be designed to construct knowledge from experience, to make feedback self-interpreting, to carry its conceptual content at the surface of its narrative, and to generate meaningful agency from its mechanics alone. A game positioned further along that trajectory after a body of domain knowledge has been acquired through prior instruction can and should be designed differently: to mobilise rather than construct, to deepen rather than introduce, to make the player's prior knowledge the engine of an experience that formal instruction, however careful, cannot replicate. Both kinds of game have their place. Both can be designed well or badly. But they cannot be designed according to the same principles and treating them as though they can is the most common and the most consequential error in the field.

5 Cooperation and Competition in Gaming

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5.1 From Play Structures to Game Theory: Competition, Cooperation, and the Architecture of Negotiation

This chapter connects game structures with broader educational traditions, including negotiation, cooperation, competition, and the enduring relevance of Montessori-inspired approaches to active learning.

If we reconsider the taxonomy of games through the lens of game theory and negotiation theory, an important insight emerges: the way a game distributes winners and losers is not merely a descriptive feature of its ending, but a clue to the deeper logic by which value, risk, attention, and motivation are organised throughout the experience. In this sense, the simple typology one wins and all others lose; one loses and all others win; all win or all lose; no definitive

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winner can be reread as a spectrum of relational structures, each of which corresponds, more or less closely, to different families of strategic interaction. Some games are fundamentally distributive, that is, oriented around the allocation of scarce value. Others are integrative, that is, oriented toward the co-creation, preservation, or expansion of value through coordination. Still others inhabit intermediate or hybrid spaces, in which competition and cooperation are intertwined.

This shift in perspective is important because game theory, in its most elementary form, asks not simply who wins, but what kind of strategic world players inhabit. Do players face one another as rivals over a fixed and limited good? Do they have incentives to cooperate? Can value be enlarged through coordination? Is the interaction zero-sum, negative-sum, or positive-sum? And how does the structure of interdependence alter behaviour, trust, and motivation? Once these questions are introduced, the taxonomy of play becomes far richer. What appeared at first to be a classification of endings becomes, more profoundly, a classification of possible social orders.

The model in which one wins and all others lose is the clearest approximation of what negotiation theory would call a distributive or allocative structure. In a distributive game, what one player gains is typically understood as coming at the expense of others. Value is fixed, scarce, and contested. The logic is positional. The central problem is allocation: who gets the prize, the territory, the resource, the symbolic recognition, or the advantageous ranking? This is the world of zero-sum or near-zero-sum competition. The strategic imagination it produces is one of comparison, leverage, timing, and tactical superiority. Players are encouraged to conceal intentions, exploit asymmetries, defend advantages, and weaken the position of rivals. In negotiation theory, this is the logic of bargaining over a fixed pie.

What such a structure trains is not only competition in the everyday sense, but a more specific orientation toward scarcity. One learns to treat interaction as a field of claims and counterclaims, where value precedes the interaction and must be captured rather than generated. The psychological consequences are significant. Motivation is sharpened by exclusivity; ambition is intensified because recognition is scarce. But just as important, the relation to others becomes fundamentally adversarial. The other player is not a partner in problem-solving but an obstacle to one's own success. In game-theoretic terms, strategic reasoning is directed toward maximising one's position under conditions of direct conflict of interest. In educational or institutional settings, such games can be productive when the aim is to cultivate strategic acuity, resilience under pressure, or the ability to operate in strongly competitive fields. Yet they also normalise a view of interaction in which value is presumed fixed and social relations are organised by rivalry.

And yet even within this distributive universe, there are nuances. A game in which one wins and all others lose is not simply a mathematical allocation problem; it is also a cultural model of social order. It teaches that success is exceptional, that only one position ultimately counts, and that achievement acquires value through exclusion. This has deep implications when such structures are imported into educational design. The lesson conveyed is not only about effort or skill, but about the meaning of excellence itself. Excellence becomes singular, comparative, and scarce. From a negotiation perspective, this aligns closely with hard positional bargaining: a mode of interaction in which each actor presses for maximum gain within a fixed set of possibilities.

The model in which one loses and all others win occupies a more ambiguous position. At first glance, it still appears distributive, since it separates participants into a negative outlier and a surviving majority. But strategically and motivationally it functions rather differently. Its core is not the capture of a scarce prize but the avoidance of catastrophic loss. The relevant game-theoretic structure here is often less a pure zero-sum contest than a system of fragile equilibrium. The dramatic centre is not triumph but breakdown. What matters is not who accumulates the most value, but who becomes the point at which the system fails.

This shifts the underlying strategic logic in important ways. In a classical distributive game, players seek advantage. In a one-loser structure, players seek survival under shared conditions of instability. The game may still produce asymmetry in its outcome, but the path toward that outcome is governed by tension, endurance, and collective exposure to risk. Everyone operates within the same precarious field; what distinguishes the loser is not that others have conquered them, but that they have failed to remain within the tolerances that the game demands. In negotiation terms, this resembles situations in which multiple actors face a shared threshold of breakdown, even if only one will ultimately bear the visible cost. Consider markets, organisations, or alliances in which the key strategic question is not who can dominate, but who can avoid being the actor that triggers collapse. The interaction remains competitive, but it is structured by fragility rather than by conquest.

Motivationally, this is a crucial distinction. The one-loser model cultivates vigilance, restraint, and emotional regulation more than aggression. Its strategic lesson is that the decisive challenge is often not maximising gain, but managing exposure. In negotiation theory, one might say that this model is sensitive to loss aversion and to the management of thresholds beyond which recovery becomes impossible. It therefore sits at an interesting intersection: formally, it still separates winners from losers; experientially, however, it does not celebrate exclusive appropriation so much as disciplined persistence. It reveals that not all competitive systems are organised around the same motivational economy. Some reward expansion; others reward tenacity.

The model in which all players win together, or all players lose together corresponds much more clearly to an integrative structure. Here we move from the logic of allocation to the logic of coordination. Value is no longer treated as fixed and pre-divided among rivals. Instead, the central question becomes whether players can combine information, roles, and actions in such a way that a desirable outcome becomes possible for all. In game theory, these are the conditions of non-zero-sum interaction, and in negotiation theory they define the terrain of integrative bargaining. The aim is not merely to divide what already exists, but to enlarge the field of gains, identify complementarities, align incentives, and produce joint value.

This is a profound shift, because it alters the very meaning of rationality. In a distributive game, rationality often means defending one's interests against encroachment. In an integrative game, rationality requires recognising that one's interests may be advanced precisely through the success of others. The strategic question becomes: what can we achieve together that none of us could secure alone? Cooperation in this sense is not sentimental or merely moral; it is structurally intelligent. It rests on the recognition of interdependence. Communication, trust, role differentiation, and shared situational awareness become central resources. The 'best move' is no longer the one that weakens the opponent, but the one that increases the collective capacity to respond effectively to the problem at hand.

This is why such games are especially powerful for thinking about negotiation, learning, and institutional design. They make visible what many adversarial models obscure: that some of the most important human problems are not distributive but integrative. In organisational life, in professional collaboration, in public problem-solving, and in many educational settings, the key challenge is not deciding who gets the larger share of a fixed good but creating conditions under which better outcomes become jointly achievable. A cooperative game models precisely this possibility. It trains participants to search for alignment, to pool partial knowledge, to interpret differences as resources rather than threats, and to understand that collective intelligence is not reducible to the intelligence of the most talented individual. In negotiation theory, this is the domain of interest-based bargaining, mutual gains, and value creation.

At the same time, it would be naïve to imagine that integrative structures eliminate conflict. On the contrary, they often require more sophisticated forms of negotiation. Roles must be coordinated, priorities must be balanced, trade-offs must be managed, and trust must be continuously sustained. What changes is not the disappearance of tension, but the orientation of tension. The conflict is no longer primarily over who defeats whom, but over how the group can organise itself so as to avoid shared failure and realise shared gain. In this sense, integrative games are often more cognitively demanding than distributive ones. They require players not only to optimise their own choices, but to reason about the system as a whole.

The model in which no definitive winner is defined extends this integrative logic even further, though in a different register. These are games in which the very framework of allocative victory is loosened or suspended. Because there is no single terminal outcome to be captured, the interaction is less easily described in terms of fixed-pie bargaining or even joint-pie enlargement. Instead, the relevant metaphor is one of open possibility spaces. Players are not simply negotiating over the distribution of value, nor even only collaborating to secure a common victory. They are exploring, constructing, interpreting, and sometimes inventing value as they go. Such games are not best understood as distributive or integrative in the narrow technical sense; rather, they point toward a more generative mode of interaction in which the field itself remains open to transformation.

From the standpoint of negotiation theory, this is particularly interesting because it resembles situations in which the parties are not merely dividing or maximising known interests, but discovering new interests, redefining preferences, or reframing the problem altogether. In practical negotiation, this is often the moment at which real creativity appears: when actors stop assuming that the structure of the problem is fixed, and begin to imagine new arrangements, new categories, or new forms of value. Open-ended games cultivate precisely this disposition. Their motivational force comes not from scarcity or even only from coordination, but from the freedom to experiment within a meaningful space. Curiosity becomes a strategic resource. Ambiguity becomes productive rather than merely threatening. The absence of a fixed winner encourages participants to dwell longer in exploration, and this often yields outcomes that could not have been specified in advance.

Seen from this broader perspective, the taxonomy of games becomes a map of different strategic worlds. The one-winner model corresponds to distributive and allocative logics, where value is scarce and rivalry is central. The one-loser model reveals a form of competitive interaction structured less by exclusive gain than by shared exposure to breakdown, and thus highlights the strategic importance of vigilance, resilience, and loss avoidance. The all-win-or-all-lose model aligns with integrative logic, in which coordination, mutual reliance, and joint problem-solving create possibilities unavailable to isolated actors. The no-definitive-winner model points beyond both distributive and conventional integrative frameworks toward generative environments of exploration, where value is not simply allocated or combined, but discovered and invented.

This has important implications for any theory of learning informed by play. It also calls for terminological precision: as Klabbers (2009) has carefully argued, the concepts of 'game' and 'simulation' are frequently conflated in the literature, yet they rest on distinct architectural logics, a distinction that matters considerably when designing experiences for specific educational purposes. Kriz (2017) extends this analysis by identifying the different types of gaming simulation applications and the conditions under which each is most appropriate, providing a practical taxonomy for instructional designers. If different game structures correspond to different strategic logics, then they also cultivate different habits of mind. Distributive games teach positional reasoning, competitive comparison, and the management of scarcity. Integrative games teach coordination, shared problem-solving, and the recognition of interdependence. Open-ended games teach reframing, experimentation, and creative emergence. None of these capacities is trivial. In real institutional and professional life, adults must often move among all three worlds: there are moments of competition, moments of cooperation, and moments in which the problem itself must be reinvented. A serious pedagogy of play would therefore not privilege one model absolutely, but would understand each as training a different strategic disposition.

The crucial point, however, is that these structures do more than produce different outcomes; they imply different anthropologies. A distributive game imagines human actors as rivals over scarce goods. An integrative game imagines them as interdependent problem-solvers. An open-ended game imagines them as explorers of possibility. To choose one structure rather than another is therefore also to choose what kind of subject one wishes to cultivate. Do we want learners who primarily know how to compete, learners who know how to coordinate, or learners who know how to invent? Most likely, any mature educational vision must make room for all three. But it must also know when each is appropriate, and what kind of world each game silently teaches people to inhabit.

For this reason, bringing game theory and negotiation theory into the analysis of play does not reduce games to abstract models. On the contrary, it reveals just how socially and pedagogically consequential their structures are. A game is never only a pastime. It is a miniature political order. It organises scarcity or abundance, opposition or reciprocity, closure or openness. It teaches players what to expect from others, what to fear, what to seek, and what forms of intelligence are rewarded. And that is why the study of play, when taken seriously, becomes inseparable from the study of learning, collaboration, and institutional imagination itself.

From the perspective of negotiation theory, these game structures can also be illuminated through a more explicit conceptual vocabulary. The one-winner, all-others-lose model is closely aligned with the logic of the fixed-pie bias, that is, the assumption that the value at stake is limited and that any gain for one party necessarily implies a loss for another. In such settings, players are encouraged to think positionally, to defend their share, and to calculate moves in relation to the likely BATNA the Best Alternative to a Negotiated Agreement available if the current interaction fails. By contrast, cooperative structures in which all players win or lose together more readily evoke the language of mutual gains, since the relevant question is not how to divide a predetermined resource, but how to coordinate action so that all parties improve their situation simultaneously. This, in turn, connects to the idea of Pareto efficiency, where an outcome is preferable if at least one party is made better off without making another worse off; many cooperative and integrative games can be read as simplified models of the search for such outcomes. Finally, open-ended games with no definitive winner point toward the broader process of value creation, in which the most important achievement is not the allocation of an existing benefit but the discovery of new possibilities, new combinations, and new forms of advantage that were not visible at the outset. What game structures therefore reveal, in negotiation terms, is that human interaction may be organised around claiming value, preserving value, sharing value, or creating value and each of these logics calls forth a different motivational, cognitive, and relational disposition.

Now that the notion of game structure has been introduced also through the lens of negotiation theory it becomes possible to take a further step. Structure describes the broad relational architecture within which players act: who may win, who may lose, whether value is scarce or shareable, whether interaction is adversarial, cooperative, fragile, or open-ended. It tells us something fundamental about the strategic world that the game creates. Yet structure alone does not fully explain how the experience unfolds in practice. To understand how games actually generate engagement, guide behaviour, and make learning possible, one must move from the level of structure to the level of mechanics.

If structure is the architecture of a game, mechanics are its operative grammar. They are the recurrent devices through which action is organised, decisions are made, feedback is delivered, and progress becomes legible. A game may be structured around competition, but what does that mean in concrete terms for the player? It may require the accumulation of resources, the timing of moves, the anticipation of opponents, the management of uncertainty, the repetition of patterns, the balancing of risk, the coordination of roles, or the exploration of an open environment. These are mechanics. They are the means through which a game shapes not only what players do, but how they think, what they notice, and what kinds of effort they learn to sustain.

This distinction matters because game mechanics are where the connection between play and learning becomes most visible. A structure may define the overall logic of a game, but mechanics are what actually train the player. They direct attention, reward certain forms of action, make some errors costly and others recoverable, and create the conditions under which competence emerges. For this reason, mechanics can be understood as mediating devices between the formal design of a game and the forms of learning it enables.

At this point, a useful way of synthesising the relationship between game mechanics and learning is through three broad modes: replication, adaptation, and exploration. These should not be treated as rigid categories, nor as mutually exclusive stages, but as distinct orientations through which both play and learning may be organised.

The first of these is replication. In this mode, the player is asked to recognise a pattern, internalise a rule, repeat a sequence, refine a movement, or reproduce an effective behaviour until it becomes stable and reliable. Many games contain such mechanics, even when they are not immediately visible as 'drill'. Pattern recognition, timing, memorisation, procedural repetition, and the gradual reduction of error all belong to this domain. Replication is what allows the player to move from awkward novelty to embodied familiarity. It is the logic of rehearsal, of practice, of building fluency through repeated engagement with a structured challenge.

In learning terms, replication corresponds to the consolidation of initial and basic competence. It is the mode through which one acquires a syntax, a technique, a procedure, or a repertoire of basic responses. Without replication, there can be no real mastery, because the learner never crosses the threshold at which action becomes sufficiently stable to support more complex forms of judgment. And yet replication is often misunderstood, especially in contemporary educational discourse, because repetition is easily mistaken for mere mechanical imitation. In fact, its deeper pedagogical function is to create the conditions for confidence, automaticity, and precision. It is what frees cognitive and emotional resources for more demanding tasks later on. A player who has not yet stabilised the basics cannot meaningfully improvise; a learner who has not yet internalised core patterns cannot effectively transfer or transform them.

The second mode is adaptation. Here the player is no longer dealing with a stable environment in which repetition alone is sufficient. The situation changes. Opponents respond. Conditions shift. Resources fluctuate. Information is incomplete or unstable. The player must therefore adjust, recalibrate, and reinterpret what has already been learned in light of new circumstances. Adaptation is the domain of situational intelligence. It requires one to perceive differences that matter, to abandon rigid scripts when necessary, and to modify action without losing coherence.

Mechanically, adaptation appears wherever a game asks players to manage uncertainty, react to changing conditions, negotiate with others, make trade-offs, coordinate under pressure, or adjust strategy in response to feedback. Unlike replication, which aims at fluency through repetition, adaptation aims at meaningful responsiveness. It assumes that competence is not simply the ability to execute a learned pattern, but the ability to reconfigure that pattern under variable conditions.

In learning terms, adaptation corresponds to transfer, application, and contextual intelligence. It is the mode in which knowledge proves its value not by remaining unchanged, but by surviving transformation. One may know the rules of a system in the abstract, but true understanding appears when one can act effectively as the system shifts. This is why adaptive mechanics are especially relevant to adult learning. Adults rarely learn in order to reproduce stable routines alone; they learn in order to act in environments that are socially complex, professionally demanding, and often unpredictable. A game that trains adaptation therefore mirrors more faithfully the actual conditions under which adult competence must operate.

The third mode is exploration. If replication stabilises action and adaptation reorients it, exploration opens it. In this mode, the player is not primarily trying to reproduce a known solution or to adjust an existing strategy within familiar constraints. Instead, the player is invited to enter a field of possibility in which discovery, experimentation, recombination, and invention become central. Exploration is the mode in which the game becomes not only a system to be mastered, but a world to be inquired into.

Mechanically, exploration appears in open-ended navigation, sandbox play, emergent problem-solving, narrative branching, simulation, experimentation with tools or environments, and the discovery of hidden or evolving rule systems. It rewards curiosity rather than immediate efficiency. It tolerates ambiguity. It allows the player to remain in uncertainty longer, not as a sign of failure, but as a necessary condition of finding something not yet given.

In learning terms, exploration corresponds to generative learning. It is the mode through which learners form hypotheses, make unexpected connections, test possibilities, and produce knowledge rather than merely receive or apply it. Here learning approaches inquiry, design, and creativity. What matters is not simply whether the learner can perform correctly, but whether the learner can discover new ways of seeing and acting. Exploration is particularly important in any educational vision that values innovation, imagination, and epistemic agency. It is the mode through which learning becomes transformative rather than merely accumulative.

These three orientations replication, adaptation, and exploration can now be linked back to the different structures of games. Competitive games with a largely distributive or allocative logic, in which one wins and the others lose, tend to privilege mechanics of comparison, optimisation, resource control, tactical adjustment, and positional reasoning. Such games often combine replication and adaptation. Replication is needed because the player must first internalise rules, patterns, or effective techniques. Adaptation is needed because the presence of opponents means that no pattern remains sufficient for long; strategy must continually respond to changing moves and constraints. In these games, learning often takes the form of learning under pressure: the ability to maintain competence while observing, anticipating, and countering others.

Games structured around fragile equilibrium, such as those in which one player loses and all others win, create a different mechanical emphasis. Here the key mechanics often involve pacing, sustained attention, self-regulation, precision, and the management of escalating risk. These mechanics still rely in part on replication, since players must develop procedural control and consistency. But they also depend on adaptation, because the system becomes progressively more unstable, demanding moment-by-moment recalibration. The player learns not how to dominate, but how to endure without becoming the point of rupture. This makes such games especially revealing from an educational perspective, since they train the often neglected capacities of steadiness, restraint, and error sensitivity.

Games with a strongly integrative structure, in which all players win together or lose together, are typically organised around mechanics of information sharing, coordination, role differentiation, negotiation, distributed decision-making, and joint problem-solving. These mechanics are deeply adaptive, since they require players to adjust not only to the game state but to one another. Yet they also contain an exploratory dimension, because complex cooperation often depends on the ability to generate new combinations of action, reinterpret partial information, and imagine solutions that no individual player would have produced alone. In such cases, learning is not merely individual competence plus social interaction; it becomes really collective intelligence. The player learns to think with others, through others, and sometimes beyond the limits of solitary understanding.

Finally, games with no clearly defined winner, or with open-ended outcomes, tend to privilege exploration in its fullest sense. Their mechanics often invite discovery, creative recombination, narrative construction, improvisation, experimentation, and world-building. Here the player is not compelled to move toward a single evaluative endpoint. Instead, the experience becomes one of dwelling within a space of meaningful possibilities. The learning that emerges from such mechanics is correspondingly open, inventive, and generative. It is less about proving mastery than about producing perspective. Such games are especially valuable when the aim is not simply to teach what is already known, but to create the conditions under which learners may ask new questions, imagine alternatives, and develop forms of agency not reducible to efficiency or correctness.

Seen in this way, game mechanics can be understood as engines of learning orientation. They do not merely make games enjoyable, nor do they function only as superficial motivational devices. They organise the learner's relation to action, difficulty, and possibility. Some mechanics teach one to repeat until stable. Others teach one to adjust until effective. Others teach one to explore until something new becomes thinkable. This is why the relation between play and learning should not be formulated in the simplistic claim that 'games help people learn'. A more precise and far more useful question would be: which mechanics cultivate which learning processes, under which structural conditions, and toward what forms of competence?

This question is particularly consequential for adult learning. Adults do not merely require engagement in the narrow sense; they require environments in which initial competence, contextual flexibility, and creative inquiry can be meaningfully combined. A well-designed game does not trivialise learning by making it easy. On the contrary, it densifies learning by placing repetition, variation, and discovery within a coherent experiential form. It allows one to move from replication, which builds confidence and procedural fluency, to adaptation, which supports transfer across changing contexts, and finally to exploration, which opens the possibility of innovation, reinterpretation, and new value creation.

What emerges, then, is not a decorative connection between games and education, but a deeper theoretical claim: games matter educationally because they are capable of organising different regimes of learning within a single experiential architecture. They can discipline attention, stabilise practice, cultivate responsiveness, and release imagination. And it is precisely in this capacity to hold together mastery, flexibility, and discovery that play may become not simply an aid to learning, but one of its most articulate forms.

5.2 Montessori's Inspiration: "Help Me to Do It by Myself"

Within the contemporary framework of the relationship between gaming and learning, play can be recognised as an authentic educational device only when it is situated within clearly defined pedagogical conditions. It becomes learning not simply by virtue of being a playful or digital experience, but insofar as it activates processes of exploration, decision-making, verification, error, correction, and the re-elaboration of lived experience. From this perspective, learning becomes self-sustaining because the subject, by progressively experiencing mastery, efficacy, and the meaningfulness of action, strengthens their motivation to continue, to deepen their engagement, and to transfer what has been acquired to further contexts. The initial conditions that make this dynamic possible concern above all the presence of a structured and intelligible environment, the availability of autonomy within clear limits, the calibration of challenge in relation to the player's competencies, the possibility of receiving immediate feedback, and the presence of reflective mediation capable of transforming experience into awareness. From this point of view, the Montessori message retains a surprising relevance even within the universe of video games: its theoretical core should not be sought in an opposition between traditional materials and digital technologies, but rather in the idea that the subject learns deeply when they are able to act within a prepared environment, exercise guided freedom, self-correct, and construct meaning through activity. In Montessori pedagogy, the prepared environment is an ordered space designed so that the child may orient themselves and act autonomously: a classic example is the arrangement of materials on accessible shelves, which allows the child to choose, use, and put away objects independently; in the field of video games, an analogous principle can be found in those games that offer explorable spaces, legible interfaces, and progressive goals, thereby enabling the player to learn through direct interaction with the environment. Likewise, the principle of freedom within limits is expressed in Montessori education through the possibility granted to the child to choose which activity to undertake, yet within shared rules and an ordered context; in educationally meaningful video games, this corresponds to the presence of authentic, though not arbitrary, choices, as occurs in construction or problem-solving games, in which the subject is free to experiment with different strategies while remaining within structural constraints that shape the experience. Another central element is self-correction: many Montessori materials incorporate control of error, allowing the child to recognise an inconsistency independently as occurs, for example, with solid cylinder blocks or sequencing materials, which in themselves 'reveal' the mistake without requiring immediate external correction;

similarly, many video games enable the player to understand directly, through system feedback, whether a choice has been effective, thus fostering autonomous regulation of action. The principle of active concentration also finds a meaningful transposition into the digital domain: Montessori observed that when children are engaged in an activity suited to their developmental needs, they are capable of sustaining intense and prolonged attention; in well-designed video games, this same dynamic may emerge when challenge is calibrated so as to be neither trivial nor frustrating, but sufficiently engaging to sustain perseverance and cognitive immersion. Finally, the role of the adult, understood not as a controller but as a discreet guide, can today be reinterpreted in the educational work of selecting, accompanying, and re-elaborating the video game experience: just as the Montessori educator observes, intervenes sparingly, and prepares the conditions for learning, so too parents and teachers can orient the use of video games by choosing digital environments consistent with educational aims and by helping the learner verbalise strategies, emotions, and discoveries. It follows that the video game, if designed and selected according to pedagogical criteria, can be interpreted as a digital prepared environment, capable of supporting autonomy, concentration, problem-solving, and the construction of meaning; conversely, when it privileges only immediate stimulation, extrinsic reward, or the passive consumption of experience, it moves away from an authentically educational logic. The contemporary actualisation of Montessori within the context of gaming therefore consists in recognising that the educational value of digital play does not depend on the medium itself, but on the quality of the experiential architecture it makes possible.

There are some video games that can be related to aspects of Montessori learning, although with one important qualification: no video game truly coincides with the Montessori method, because Montessori is not a set of tools but a pedagogical vision grounded in a prepared environment, autonomy, self-correction, concentration, and freedom within limits. Some games, however, embody dynamics that are very close to these principles.

The most immediate example is *Minecraft Education*.[1] Its open structure, along with the possibility of building, exploring, solving problems, and collaborating, makes it close to the Montessori idea of a prepared environment: not an environment that imposes a single path, but a legible space in which the subject can choose, act, and learn through direct experience. *Minecraft*'s educational platform presents it precisely as an environment that fosters creativity,

1 The website of *Minecraft Education* can be accessed at the following link: `https://education.minecraft.net/it-it`.

problem solving, collaboration, and student agency. In Montessori terms, one might say that it offers a context in which the child or young person does not simply receive content, but actively constructs meaning through action.

A second very interesting example is *The Witness*. Here the parallel concerns above all autonomous discovery, concentration, and learning through the progressive structuring of experience. The game does not over-explain, does not guide in an intrusive way, and entrusts the player with the task of observing, formulating hypotheses, making mistakes, and recognising patterns. This too is very close to the Montessori idea that deep learning arises when the subject is placed in a position to discover an internal logic through activity, rather than through continuous external instruction. The official description emphasises precisely that the game offers an open world with hundreds of puzzles, and that each puzzle introduces a new idea without 'filler'.[2]

A third case is *Baba Is You*, which can be linked above all to the principle of self-correction and the active understanding of rules. In this game, the rules are not hidden they are manipulable objects, and by changing them the player directly understands how the system changes. This is especially interesting from a Montessori perspective because it recalls materials that make the structure of error visible and allow the subject to correct themselves independently. The game officially presents itself precisely as a puzzle in which the rules are interactive blocks that the player can change in order to transform how the level works.

Another example, more oriented toward the scientific domain, is *Kerbal Space Program* in its educational version, *KerbalEdu*.[3] Here the affinity with Montessori emerges in the relationship between experiment, error, revision, and concrete learning: the player builds, tests, fails, modifies, and tries again. Knowledge is not passively received but arises from interaction with a system that returns coherent consequences to the choices made. *KerbalEdu* was presented as an official educational version designed to support school-based and independent learning in mathematics and science.

Games that are not Montessori in any strict sense, yet still share some Montessori-adjacent qualities such as self-directed exploration, environmental learning, historical immersion, systems thinking, and learning through consequence rather than constant verbal instruction.

A particularly useful case is the *Assassin's Creed* series, above all through its Discovery Tour experiences. Ubisoft presents Discovery

2 Steam Store: `https://store.steampowered.com`.

3 Further information on *Kerbal Space Program* and *KerbalEdu* is available at `wiki.kerbalspaceprogram.com`.

Tour as a violence-free, educational, interactive experience that lets players explore Ancient Egypt, Ancient Greece, and the Viking Age at their own pace through guided tours, quizzes, and historically curated environments. Ubisoft also states that these experiences were created with historians and specialists, and even provides curriculum guides developed with McGill University's Technology Learning & Cognition Lab. In a Montessori-inflected reading, this matters because the learner is placed inside a richly structured environment and allowed to move, observe, and discover rather than simply receive information passively. The strongest parallel is therefore not with 'Montessori materials' in a narrow sense, but with the idea of a prepared environment that invites autonomous exploration and meaning-making.

If one looks beyond Discovery Tour to the broader *Assassin's Creed* games, the connection becomes more complex but still interesting. The mainline games are not Montessori-like in their entirety, since they are built around combat, scripted progression, and external objectives. Yet they do offer something pedagogically valuable: highly detailed historical worlds that reward observation, navigation, contextual inference, and the linking of place to culture, architecture, politics, and everyday life. In that sense, they can support a form of situated historical imagination. The educational value lies less in direct instruction and more in how the environment itself becomes cognitively suggestive. Discovery Tour makes that logic explicit and classroom-friendly, but the larger series already points in that direction by turning historical setting into an explorable system rather than a static backdrop.

A second family of games worth adding is the universe of grand strategy games from Paradox. These are especially relevant not so much for children in a Montessori classroom, but for adolescents, university students, and adult learners. Games such as *Crusader Kings*, *Europa Universalis*, *Victoria*, *Hearts of Iron*, or *Stellaris* are built around long-term decision-making, systemic interdependence, trade-offs, uncertainty, and emergent consequences. The official description of *Crusader Kings III* emphasises ruling a noble house through intrigue, war, alliances, and dynastic development in a living medieval world, while *Europa Universalis* is framed around using war, trade, or diplomacy across centuries of history. These are not games of immediate reward and mechanical repetition; they are games of complex systems, delayed consequences, and strategic interpretation.

From an educational perspective, Paradox games are valuable because they train a form of systems literacy. The player must understand that no single decision exists in isolation: taxation affects stability, diplomacy affects war, succession affects legitimacy, religion affects cohesion, trade affects power, and long-term planning matters more than immediate gratification. This makes such games especially relevant for learning processes based on adaptation and exploration. They teach players to read complex environments, revise assumptions, anticipate indirect effects, and tolerate ambiguity. In Montessori terms, they are far removed from the early-childhood classroom, but they still resonate with a broader pedagogical principle: learning deepens when the environment itself reveals structure through interaction and consequence rather than through constant top-down explanation.

If Montessori's legacy is to be meaningfully reinterpreted within contemporary game studies, the crucial point is not to identify digital artefacts that merely resemble classroom materials, but to understand how certain interactive environments reactivate, under new technological conditions, a pedagogical logic centred on autonomy, ordered exploration, self-correction, and the gradual construction of meaning through activity. From this perspective, commercially successful and widely recognisable titles such as *Minecraft Education*, *The Witness*, and *Baba Is You* are significant not because they 'apply' Montessori in any literal sense, but because they demonstrate that mainstream game culture can already host experiential structures that are pedagogically resonant with Montessori principles. *Minecraft Education*, used in more than 40,000 school systems across 140 countries, presents an open-ended environment in which creativity, collaboration, agency, and problem-solving are foregrounded; *The Witness* organises learning through sustained observation, inference, and discovery across an explorable world of over 500 puzzles; and *Baba Is You* makes rules themselves manipulable, thereby rendering error, revision, and conceptual restructuring directly perceptible to the player.

What these cases reveal, at a theoretical level, is that the educational relevance of gaming does not depend primarily on whether a title is explicitly designed for schooling, but on the quality of the experiential architecture it affords: whether it invites the learner to test hypotheses, regulate action, recognise patterns, and transform uncertainty into intelligibility. In this sense, the contemporary question is no longer whether digital games can support learning, but how they may be designed, selected, and interpreted as environments in which curiosity, imagination, and creativity function not as ornamental by-products, but as the generative core of cognition itself. That issue becomes even more pressing today because current development infrastructures are actively lowering the threshold for creating new simulations and interactive worlds. Epic's current developer ecosystem, for example, explicitly frames Unreal Editor for *Fortnite* as a tool for designing, developing, and publishing games directly into *Fortnite*, while *Fortnite*'s broader developer platform emphasises accessible creation, rapid iteration, and distribution to large audiences.[4] Some games are Montessori-adjacent not because they reproduce Montessori pedagogy directly, but because they create environments in which learners can act autonomously, perceive the consequences of their choices, correct themselves, sustain attention, and construct meaning through interaction with a coherent world. In younger learners this may take the form of tactile or exploratory digital environments; in older learners it may take the form of historical, strategic, or systemic simulations. The pedagogical continuity is not in the surface form of the game, but in the deeper logic of prepared environment, meaningful action, feedback, and self-directed discovery. Under these conditions, the future of gaming and learning should not be framed as a choice between commercially known games and purpose-built educational tools. Rather, the field is moving toward a continuum in which established commercial titles provide visible cultural models, while new authoring tools and development platforms make it increasingly feasible to produce bespoke simulations, experimental pedagogical games, and domain-specific learning environments. Yet technological accessibility, by itself, is not enough. A really educational orientation requires that design begin from learners' needs their rhythms of attention, developmental thresholds, and modes of engagement while at the same time remaining guided by ambition: the ambition to create experiences that do more than adapt to existing preferences, and instead expand the learner's powers of inquiry, invention, interpretation, and world-making. In that sense, the deepest continuity between Montessori and contemporary digital play lies in a shared conviction that education should not be reduced to the transmission of content or the optimisation of performance, but should cultivate the subject's capacity to explore, imagine, create, and become.

Learning through exploration has often been associated with early discovery, intuitive manipulation, and the gradual acquisition of elementary competences. Yet one of the most significant challenges for contemporary educational theory is to recognise that exploratory learning is not exhausted at the introductory level, nor is it limited to the acquisition of basic procedural familiarity. On the contrary, exploratory learning becomes even more decisive when the object of knowledge is complex, dynamic, relational, and only partially accessible through linear exposition. In such cases, learning cannot rely solely on declarative transmission, because the learner is not simply asked to memorise stable information, but to enter into systems of interdependence, to grasp structures that unfold over time, to test hypotheses, and to understand how variables interact within evolving environments. This is precisely why advanced learning so

4 Epic Games Developers: `https://dev.epicgames.com`.

often requires forms of conceptualisation that are inseparable from simulation, experimentation, and iterative engagement. Complexity is not mastered by passive reception alone; it must be encountered, modelled, manipulated, and progressively rendered intelligible through action.

From this perspective, game-based learning acquires a particular epistemological relevance. Its importance does not lie merely in motivational enhancement, nor in the frequently repeated claim that games make learning 'fun'. Its deeper significance lies in the fact that games can provide structured environments in which complex concepts become experientially available without being reduced to simplistic content delivery. A well-designed game or simulation can stage systems rather than isolated facts; it can make causality visible, render feedback immediate, and expose the learner to the consequences of decisions within a bounded but meaningful world. This is especially important when dealing with advanced notions that require not only comprehension but conceptual restructuring: ecological interdependence, historical causality, economic trade-offs, systems thinking, formal logic, scientific modelling, ethical conflict, urban design, or strategic coordination. In all these cases, understanding depends not only on knowing that something is the case, but on grasping how and why a set of relations produces certain outcomes rather than others. Simulation becomes pedagogically powerful because it offers a mode of access to complexity that is neither purely abstract nor merely empirical but mediated through an interactive structure in which the learner can observe, intervene, revise, and infer.

This is also why the trajectory of exploratory learning must be understood as extending from sensorial and intuitive discovery toward increasingly advanced forms of conceptual engagement. The educational value of exploration does not disappear when formal knowledge becomes more demanding; rather, it changes level. At an elementary stage, exploration may support orientation, curiosity, and the first discrimination of patterns. At a more advanced stage, it supports model-based reasoning, interpretive flexibility, and the capacity to move between concrete manipulation and abstract understanding. In this sense, exploratory learning is not opposed to conceptualisation; it is one of its conditions. Concepts become intellectually alive when they emerge as responses to problems encountered in activity, when they organise and clarify experience, and when they allow the learner to move from confusion toward intelligibility. A purely expository model may communicate definitions, but it often fails to generate the conditions under which those definitions become necessary for thought. By contrast, simulated and game-like environments can create such necessity by confronting learners with situations in which intuitive action alone is insufficient and where deeper conceptual tools must be developed in order to proceed.

This point is crucial if one wishes to avoid a false opposition between play and rigor. The educational force of play does not reside in the suspension of difficulty, but in the reconfiguration of difficulty into a form that can be inhabited, explored, and gradually mastered. Through rules, constraints, objectives, and feedback loops, game environments can transform abstraction into lived problem space. They can invite the learner to dwell within uncertainty rather than flee from it, to experiment without the fear of irreversible failure, and to discover that error is not the negation of learning but one of its primary engines. In this respect, the game functions not as a diversion from knowledge but as a medium through which knowledge becomes investigable. Especially in relation to complex domains, simulation enables the learner to encounter not only answers but the conditions under which answers are produced, tested, and revised.

At this point, it becomes possible to address a deeper philosophical claim: learning through play must be understood simultaneously as the overcoming of ignorance and as the production of knowledge. These two dimensions are distinct but inseparable, and an adequate account of game-based learning must preserve both. To conceive learning only as the overcoming of ignorance would reduce it to a deficit model, in which the learner is defined primarily by lack and education is tasked with filling an absence. This aspect is undoubtedly real: all learning involves the recognition that something is not yet understood, mastered, or articulated. In this sense, ignorance is not simply a negative condition but the starting point of inquiry. To learn is to move from opacity to greater clarity, from indeterminacy to structured understanding, from error or incompleteness toward more adequate forms of interpretation and action. Game-based environments support this movement particularly well because they externalise ignorance in an actionable way. The learner encounters resistance, inconsistency, failed strategies, unanticipated outcomes, and unresolved questions; these reveal the limits of current understanding and make ignorance visible without turning it into stigma. Within play, ignorance can be experienced as challenge rather than humiliation, as the threshold of discovery rather than the mark of inadequacy.

Yet learning cannot be reduced to the removal of what is missing. If it were only that, the learner would remain positioned as a receiver of predetermined truth, and education would be conceived merely as correction, adaptation, or completion. Real learning always contains a productive dimension: it generates new meanings, new strategies, new relations, and sometimes new forms of knowledge that were not simply waiting to be deposited into the learner's mind. This is especially evident in exploratory and game-based contexts, where the learner often does more than recover an already fixed answer. They produce interpretations, construct solutions, invent pathways, test original combinations, and in some cases contribute to emergent forms of shared understanding. Even when the domain is highly structured, the act of learning remains productive because understanding is not the passive internalisation of content but the active organisation of experience. One does not merely eliminate ignorance; one constructs a new cognitive order.

The coexistence of these two dimensions is essential because each corrects the limitations of the other. If learning is defined only as overcoming ignorance, education becomes conservative in the narrowest sense: it transmits established knowledge but risks underestimating invention, interpretation, and agency. If, on the other hand, learning is defined only as the production of knowledge, education risks losing contact with disciplinary rigor, conceptual precision, and the accumulated structures of thought that make meaningful inquiry possible. The learner must both inherit and transform, both receive and produce, both enter a world of already articulated meanings and generate new relations within it. Game-based learning is uniquely capable of holding these two poles together because it typically places the learner in environments where existing constraints are real, but outcomes are not wholly prescribed. The player must discover what is already true of the system, yet also generate situated responses within it. They must understand rules, but also exploit, combine, reinterpret, or strategically inhabit them. This dual movement mirrors a profound truth about education itself: one learns by discovering what one does not yet know, but also by becoming capable of making something intellectually new happen.

The role of simulation is particularly important here. Simulation is not pedagogically valuable simply because it imitates reality; indeed, its strongest educational function often lies not in realism as such, but in the selective construction of intelligible worlds. A simulation can isolate variables, slow down processes, make hidden mechanisms visible, and allow repeated experimentation under controlled conditions. In doing so, it creates a space where ignorance can be confronted analytically and where knowledge can be produced through intervention. The learner is not outside the system looking in; they are inside a model, acting within it, and discovering both its constraints and its possibilities. This is why simulation is so important for advanced conceptual learning. It allows thought to become operative. It enables learners to move beyond verbal acquaintance with complexity toward a form of mediated participation in it. Such participation does not eliminate the need for explanation or abstraction; rather, it gives explanation a concrete problem-space and gives abstraction a field of application.

In game-based learning, then, the pedagogical challenge is not simply to motivate learners, nor merely to visualise content, but to design experiences in which the reduction of ignorance and the production of knowledge become mutually reinforcing. An effective learning game does not simply tell the learner what they previously did not know, nor does it leave them in a purely expressive environment detached from disciplinary substance. Instead, it orchestrates a movement in which the learner identifies limits, confronts resistance, forms hypotheses, tests possibilities, revises mental models, and gradually constructs a more differentiated understanding of the domain. Such an experience is both receptive and generative. It is receptive because the world resists arbitrary interpretation: there are structures to discover, concepts to master, and constraints that cannot be ignored. It is generative because understanding arises only through the learner's active effort to organise, reinterpret, and expand what the experience affords.

This is why curiosity, imagination, and creativity remain central even in the learning of advanced and conceptually demanding material. Curiosity is what makes ignorance bearable and transforms it into inquiry. Imagination is what allows the learner to project possibilities, to model alternatives, and to think beyond immediate appearance. Creativity is what enables the formation of novel connections, strategies, and explanatory frameworks. Without these dimensions, the encounter with complexity becomes inert or merely reproductive. With them, learning becomes a process through which the learner not only enters an already existing order of knowledge but also becomes capable of inhabiting it critically and productively. In the context of play, these resources are not secondary embellishments; they are the very means by which conceptual difficulty becomes approachable. Games can sustain them because they provide a protected but demanding space in which uncertainty is structured, experimentation is legitimate, and understanding develops through cycles of action and reflection.

A sophisticated account of learning through play must therefore reject both naïve instrumentalism and romantic spontaneism. It cannot treat games merely as attractive wrappers for curricular content, nor can it celebrate exploration in the absence of conceptual depth. Rather, it must understand game-based learning as a form of epistemic design: the construction of environments in which learners can move from not-knowing toward understanding while also participating in the active production of meaning. This is especially important in an age in which digital technologies increasingly facilitate the creation of simulations and interactive worlds. The question is no longer whether such environments can be built, but what educational vision should guide their construction. If the aim is really formative, then the task is to create experiences that begin from learners' needs, but do not end there; experiences that acknowledge uncertainty, but do not abandon rigor; experiences that allow ignorance to become inquiry and inquiry to become knowledge. In this sense, the highest promise of learning through play lies precisely in its ability to unite what education too often separates: conceptual discipline and imaginative freedom, epistemic humility and intellectual production, the recognition of what is not yet known and the courageous making of what can newly be understood.

Any serious reflection on play must begin by resisting its reduction to mere diversion, amusement, or compensatory leisure. Across different historical formations, play has repeatedly occupied a far more consequential place: it has served as ritual practice, as a structuring principle of social life, as a mode of symbolic transmission, and as a means through which communities stage values, hierarchy, conflict, belonging, and transformation. The central issue, therefore, is not whether play is 'serious' or 'superficial' in itself, but under what cultural conditions it is understood as a meaningful human activity, and under what conditions it is diminished into a secondary or trivialised form of entertainment.

A foundational point of departure for this argument remains Johan Huizinga's *Homo Ludens*, a work whose enduring significance lies precisely in its refusal to treat play as a marginal residue of childhood or as an ornamental supplement to culture. Huizinga's decisive thesis is that play is older than culture in any narrowly institutional sense, and that culture itself, in many of its most decisive expressions, arises in and through ludic form. Play, for Huizinga, is not an accidental feature of civilisation but one of its generative conditions. It is a voluntary activity, set apart from ordinary life by a specific temporality and spatiality, governed by rules, shaped by tension and uncertainty, and sustained by the consciousness that what occurs within it possesses a distinct order and meaning. Yet this separateness does not render play socially irrelevant; on the contrary, its very formal differentiation from ordinary life allows it to become a privileged site for the production of symbols, roles, allegiances, and shared worlds. Huizinga's argument is thus profoundly anti-reductionist: law, war, poetry, ritual, competition, public ceremony, and even forms of political order cannot be fully understood if one ignores the ludic structures that inform them. Play is not external to civilisation; it is one of the modes through which civilisation first articulates itself.

This insight has far-reaching consequences. To say that culture unfolds in a ludic register is not to suggest that all cultural life is playful in any colloquial sense, but rather that many of its most durable forms depend upon the staging of rules, the acceptance of symbolic constraints, the performance of ordered conflict, and the creation of bounded spaces of meaning. Huizinga shows that contest, representation, ceremony, and symbolic enactment are not peripheral embellishments of social life: they are among the ways societies make themselves visible to themselves. In this light, play appears not as the opposite of seriousness, but as one of seriousness's most ancient and paradoxical conditions. It is precisely because play creates a provisional world a world with its own rules, stakes, and internal coherence that it becomes capable of bearing meanings of extraordinary weight. The apparent 'unreality' of play is what enables it to mediate reality at a deeper level: through ritualised action, communities rehearse order, confront antagonism, negotiate values, and give form to collective imagination.

From this perspective, the social centrality of play becomes much easier to recognise. Competitive festivals, public games, ceremonial contests, strategic board games, performative celebrations, and communal sports all testify to the fact that play has often functioned as an institution of social cohesion rather than as a private pastime. In many historical settings, playful forms have created occasions for collective participation, organised temporal rhythms, marked sacred or civic calendars, and offered visible grammars through which a community could dramatise excellence, fate, chance, discipline, courage, rivalry, and honor. Even where play appears light or festive, its social function may be dense with symbolic meaning. It may serve to reaffirm communal bonds, to render conflict manageable through rule-bound form, or to transmit dispositions and sensibilities that exceed the explicit content of the activity itself.

At the same time, the cultural meaning of play is never fixed. The same society may at one moment elevate play into a privileged medium of collective self-understanding, and at another relegate it to the margins as distraction or leisure commodity. This ambivalence becomes especially visible in modernity, where the growing separation between labour and leisure, utility and gratuitousness, productivity and recreation has often encouraged a diminished conception of play. Within such frameworks, play is frequently tolerated as recovery from work, as private entertainment, or as a developmental tool for children, but it is less often acknowledged as a constitutive mode of symbolic, social, and even epistemic activity. Such a narrowing has had significant consequences: once play is confined to the sphere of the non-essential, its formative, communal, and world-disclosing dimensions become harder to perceive. What earlier societies might have understood as a meaningful practice of ordering life can come to appear as something secondary, unserious, or culturally negligible.

And yet this modern reduction remains inadequate. Play acquires deep significance whenever it does more than merely occupy time whenever it organises relations, gives visible form to shared values, trains perception, shapes conduct, or mediates between the individual and a wider symbolic order. Its significance is profound when it becomes a way of inhabiting a community, rehearsing an ethos, or entering into a world of meanings that exceeds immediate utility. By contrast, play appears superficial when it is understood solely as consumption, distraction, or an endlessly replaceable stimulus devoid of symbolic or formative density. But even this distinction must be handled carefully. An activity that seems frivolous at the level of surface appearance may perform important social and cultural work, while an activity publicly celebrated as meaningful may in practice be emptied of depth and reduced to spectacle. The issue, then, is not the form of play alone, but the interpretive horizon within which it is situated.

This is precisely why Huizinga remains so valuable for contemporary debates, including those surrounding digital culture and game-based learning. His work reminds us that the deepest question is not whether play should be admitted into serious domains such as education, culture, or civic life, but why those domains have so often forgotten their own ludic genealogy. If play has historically served as a matrix for the formation of law, art, ritual, competition, and collective meaning, then its educational relevance cannot be restricted to motivation or enjoyment alone. It must also be understood as a mode through which human beings enter rule-governed worlds, test possibilities, assume roles, confront uncertainty, and participate in the making of significance. In that sense, play is not merely an accessory to culture; it is one of the elementary processes through which culture becomes thinkable, inhabitable, and transmissible.

A more adequate account of play, therefore, must hold together its dual character. On the one hand, play is marked by freedom, contingency, and apparent non-necessity; on the other, it is capable of sustaining some of the most consequential forms of human seriousness. It is both bounded and expansive, artificial and constitutive, set apart from life and deeply formative of life. Its social centrality lies precisely in this paradox. Play creates a space in which action is neither entirely determined by practical necessity nor detached from meaning; it allows human beings to inhabit structures of order without being reduced to mere function. For this reason, the history of play is inseparable from the history of how societies imagine the relation between freedom and form, rule and invention, community and performance, pleasure and value. To study play is therefore not to examine a peripheral cultural ornament, but to inquire into one of the primary ways in which human worlds are symbolically organised and existentially experienced.

5.3 The Role of Play in Learning

The learning processes linked to play constitute one of the most underexplored yet most promising frontiers in educational theory and practice. Play is too often misunderstood as a secondary activity: a break from effort, a reward after 'serious' work, or a pedagogical ornament added to make instruction more palatable. Such a view radically underestimates its significance. Play is not external to learning; it is one of the most fundamental modes through which human beings engage with reality, test limits, interpret systems, negotiate rules, rehearse identities, and construct meaning.

From early childhood onward, play functions as a sophisticated cognitive, emotional, and social mechanism. Through play, individuals do not merely express themselves; they organise experience. They formulate hypotheses, explore causal relations, experiment with possible actions, and learn to manage uncertainty. They discover not only what works, but what happens when things fail. In this sense, play is not the opposite of discipline. It is a particular form of discipline voluntary, immersive, and often intrinsically sustained.

What makes play so powerful in learning is not simply that it is enjoyable, but that it embodies a number of conditions that are highly conducive to human development. It creates environments in which experimentation is legitimate, feedback is immediate, and repetition does not necessarily become sterile because it remains tied to action and consequence. It allows complexity to be encountered in manageable forms. It can transform abstract content into lived experience, not by simplifying reality, but by making it inhabitable.

When learning is structured around play-based principles intrinsic motivation, iterative experimentation, meaningful challenge, immediate feedback, and an environment in which failure carries no irreversible penalty the quality of engagement changes. What is retained is often not only more durable, but more usable. Knowledge acquired under these conditions is less likely to remain inert, because it has already been exercised within a system of action. The learner has not merely heard or repeated; the learner has tried, adjusted, failed, retried, and therefore appropriated.

For this reason, the central question is not merely why so many students fail to engage with institutional learning, but how learning environments might be redesigned so that they resonate more closely with the natural architecture of human curiosity, experimentation, and development. Play matters because it reveals that learning deepens when individuals are not only exposed to content, but invited into meaningful systems of action.

5.4 Beyond Motivation: Optimising Developmental Potential

The conventional framing of educational difficulty tends to place motivation at the centre. Students are described as disengaged, passive, distracted, or resistant, and the task of educators becomes that of reactivating interest. There is truth in this diagnosis, but only partial truth. It risks construing the learner as deficient, as if the fundamental problem were an absence of will that must be corrected through more stimulating pedagogy or stronger incentives.

A more useful perspective begins elsewhere. Rather than asking why learners do not want to learn, it asks what conditions would allow them to learn optimally. This is not a minor shift in emphasis; it is a change in educational anthropology. It means ceasing to view the learner primarily as a problem to be fixed and beginning instead from the assumption that human beings possess developmental potential that may remain dormant, blocked, misdirected, or undernourished when environments are poorly structured.

To speak of optimising developmental potential is to recognise that learning is never merely the transfer of information into an empty container. It is the activation of capacities already present in some form: attention, pattern recognition, imitation, interpretation, emotional regulation, imaginative projection, strategic adjustment, and the desire for mastery. These capacities do not unfold automatically. They require contexts that can support them, challenge them, and give them direction.

This also means taking seriously the specificity of each learner. Individuals differ not only in prior knowledge, but in cognitive tempo, emotional rhythms, social confidence, tolerance for ambiguity, relationship to challenge, and relationship to failure. Some need structure before they can explore; others need exploratory freedom before they can accept structure. Some are energised by competition; others shut down under its pressure and flourish in collaborative or open-ended environments. To optimise developmental potential is therefore not to lower standards, but to recognise that standards become meaningful only when environments are capable of eliciting the best from different kinds of minds.

In this respect, learning is best understood not as a linear transmission but as a dynamic negotiation between person and environment. The learner brings dispositions, histories, resistances, expectations, and capacities; the environment offers constraints, affordances, signals, rewards, and pathways. Educational intelligence lies in the quality of the fit between the two. A good system does not simply demand more effort from the learner; it also asks how the environment itself might become more responsive, more legible, more challenging in the right way, and more capable of unlocking dormant possibility.

Play is especially relevant here because it offers a language for this negotiation. It reminds us that development is often optimised not under conditions of maximum control, but under conditions of structured freedom: enough guidance to create direction, enough openness to allow personal investment, enough challenge to make effort meaningful, and enough safety to make failure informative rather than humiliating.

6 Evaluation, Assessment, and Learning Quality

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6.1 The Tension Between Personal Preferences and Institutional Requirements

This chapter addresses the evaluation of simulation-based learning, emphasising humane assessment, educational quality, and the integration of experiential, reflective, and situated perspectives.

One of the deepest tensions in any educational system lies in the distance between what learners would naturally gravitate toward and what institutions require them to know, practice, and demonstrate. This tension cannot be eliminated, because both poles have legitimacy. Personal preferences are not trivial. They are often deeply tied to identity, prior success, intrinsic curiosity, and felt competence. What a learner is drawn toward may reveal

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where energy is already available, where meaning is more easily constructed, and where effort is likely to become self-sustaining.

At the same time, institutional requirements are not merely arbitrary impositions. A society cannot function if each individual learns only what immediately interests them. There are bodies of knowledge and competence literacy, numeracy, scientific reasoning, historical understanding, ethical judgment, communicative clarity that serve as enabling frameworks. They do not simply constrain future action; they expand it. They make certain forms of agency possible.

The problem arises when these requirements are experienced exclusively as external burdens. In such cases, students may comply without understanding, reproduce without appropriating, and perform without integrating. Superficial compliance is often mistaken for learning because institutions are structurally rewarded for visible order and measurable completion. Yet real education requires something more difficult: not only exposing students to core knowledge, but presenting that knowledge in forms that can be recognised as meaningful extensions of their own capacity to act in the world.

The challenge, then, is not to choose between personal pathways and common curricula, but to hold them in productive tension. An educational environment worthy of the name would neither surrender entirely to preference nor ignore it. It would treat preference as diagnostically important without mistaking it for an absolute criterion. It would ask: how can the learner's existing motivations become bridges rather than barriers? How can mandated knowledge be presented not merely as something to be endured, but as something that enlarges the horizon of possible thought and action?

This is an extraordinarily difficult balance to achieve. It is difficult because institutions tend toward standardisation, while persons are singular. It is difficult because educational systems are often organised around efficiency, while meaningful learning is slow, relational, and uneven. And yet this balance is precisely what the best educators, whether consciously or intuitively, spend their lives trying to negotiate. They do not merely transmit content; they interpret the learner's relation to content. They do not abandon standards; they humanise their pathways.

Play, once again, becomes relevant here not as a distraction from institutional learning, but as a medium through which personal investment and formal requirement may be brought into closer alignment. A well-designed game does not simply give the learner what they already want. Rather, it creates conditions in which effort toward a larger objective becomes desirable. It binds curiosity to structure, initiative to rule, and personal pathway to shared framework. In that sense, it offers a model never perfect, but highly suggestive for how education might honor individual difference without abandoning common intellectual formation.

6.2 Rethinking the Purpose of Evaluation

The existence of assessments is so taken for granted within modern education that their purpose is rarely subjected to sustained scrutiny. Yet the question of why assessments exist at all is fundamental, because every answer implies a different understanding of what education is for.

One common justification is motivational. Assessments create stakes, and stakes can generate effort. The presence of a test, an exam, or a performance review introduces pressure, and pressure may focus attention. In some cases, this can indeed be productive. A clearly defined challenge may help learners organise time, prioritise effort, and mobilise abilities that might otherwise remain dormant. There is, moreover, a valuable distinction to be made between competition against others and competition against oneself. The healthiest form of assessment may not be the one that sorts students into winners and losers, but the one that allows individuals to see whether they have surpassed their own earlier limits.

A second justification is systemic. Institutions need to know whether what they are doing is working. Assessment, in this view, functions as a form of quality control. It provides information about what learners can do, where teaching has succeeded, where it has failed, and which interventions need revision. Here assessment is not primarily about the student as an isolated individual; it is about the institution's capacity to observe its own effects. This function is legitimate and necessary, but it is often compromised when assessments are poorly designed, too narrow, or treated as ends in themselves rather than as feedback mechanisms.

A third function is social signalling. This is often under-theorised, yet in practice it may be the most powerful. Grades, diplomas, certificates, and credentials do not merely describe what someone knows; they communicate that knowledge or the presumption of it to others. They regulate access to further education, employment, recognition, and status. In this sense, assessment belongs not only to pedagogy but to the broader social organisation of opportunity. It is one of the ways society translates educational experience into visible markers of legitimacy.

This signalling function, however, raises difficult questions. The fact that a credential is socially powerful does not guarantee that it accurately reflects meaningful learning. Institutions may end up protecting the value of the signal even when the substance of learning is thin. Students, in turn, may optimise for the signal rather than for understanding. A profound ambiguity then emerges: assessment may be indispensable for coordination within complex societies, yet also distort the very processes it is meant to represent.

For these reasons, any serious educational theory must ask not only whether assessment is necessary, but what kind of assessment corresponds to what kind of educational vision. If education is understood primarily as sorting, then assessment will tend toward ranking. If education is understood as growth, then assessment must become diagnostic, developmental, and responsive. The issue is not whether to evaluate, but what evaluation is meant to reveal, encourage, and protect.

6.3 The Evaluator Measured by Their Own Instrument

One of the most important and least acknowledged truths about assessment is that every evaluative instrument reveals something about the evaluator who created it. This is not simply a philosophical curiosity. It is a structural fact. Every test, rubric, exam, or review process contains an implicit theory of knowledge, competence, and evidence. It encodes assumptions about what matters, what counts as success, what can be ignored, and what kind of learner is imagined as the norm.

The teacher who values memorisation will design assessments that reward retention and retrieval. The teacher who values synthesis and originality will ask for interpretation, connection, and transformation. The institution that prioritises standardisation will privilege tasks that can be measured uniformly; the one that values complexity may tolerate ambiguity and multiple valid responses. In all cases, evaluation is never neutral. It is always shaped by values, conceptual commitments, and blind spots.

This has important practical implications. When students systematically perform poorly on a given assessment, the first question should not automatically be what is wrong with the students. It should also be: what is this instrument actually measuring? Does it measure what it claims to measure? Does it privilege one style of cognition over another? Does it confuse compliance with understanding? Does it reward surface performance rather than deep learning? Does it systematically exclude forms of intelligence that do not fit the dominant evaluative frame?

To ask such questions is not to excuse poor learning. It is to recognise that educational failure may emerge from a misfit between learner and instrument, not only from an absence of effort or ability. A badly designed assessment may reveal less about what students know than about what the evaluator happens to value. In this sense, assessment always turns reflexively back upon the system that produces it. It measures, but it is also measured.

This reflexivity is especially important if one takes seriously the possibility that learning is plural in form. If learners differ in how they engage complexity, demonstrate understanding, and convert knowledge into action, then assessments that privilege only one narrow mode of performance will inevitably produce distortions. They may appear objective precisely because they are consistent, while in fact being consistently partial.

Play-based and experience-based learning sharpen this issue further. Once learning is understood not merely as the retention of content but as participation in systems of action, adaptation, collaboration, and exploration, assessment can no longer be restricted to what is easily testable in decontextualised form. The more educational theory acknowledges the complexity of learning, the more carefully it must examine the instruments by which learning is made visible.

6.4 Toward a More Effective Model of Assessment

None of this leads to the conclusion that assessment should be abandoned. On the contrary, evaluation is indispensable if learning is to be made visible, shared, and supported. What follows, however, is that assessment must be radically rethought. It must become more intelligent, more humane, and more aligned with the actual dynamics of development.

The most valuable forms of evaluation are continuous rather than episodic, formative rather than merely summative, and oriented toward growth rather than ranking. They do not wait until the end of a process to deliver a verdict. They accompany the process, illuminating where the learner is, what has become possible, where misunderstanding persists, and what kinds of support or challenge are now needed. Such assessments are less theatrical but more educational. They do not merely certify the past; they help shape the future.

In this model, failure is no longer treated as a terminal judgment. It becomes diagnostic information. A poor result does not simply indicate that the learner has fallen short; it signals that something in the learning ecology requires adjustment. That adjustment may concern the learner's strategy, the teacher's design, the pacing of the curriculum, the clarity of the task, or the alignment between objectives and methods. Failure thus becomes not a stain, but a source of information.

This is where the connection with play becomes especially illuminating. In well-designed play, failure rarely functions as final condemnation. It is part of the feedback loop. It tells the player something about the system, about their current level of mastery, about the need for a different strategy, better timing, or more careful attention. The player is not expelled from learning by failure; the player is returned to it. Educational assessment, at its best, should work in a similar way. It should preserve challenge while reducing humiliation, maintain standards while making error useful, and support effort not through fear alone but through legibility and meaningful progression.

Ultimately, the deepest purpose of assessment, when it functions well, is not to sort, rank, or certify, even if in practice it may sometimes serve those functions. Its deeper purpose is to make learning visible: visible to the learner, who gains a clearer sense of their own development; visible to the teacher, who can adjust guidance and design; and visible to the institution, which can better understand the effects and limits of its own practices.

To make learning visible in this way is, at its best, an act of respect. It means recognising that human development is complex, nonlinear, and irreducibly situated. It means refusing to reduce persons to performances while also refusing the false kindness of not asking anything of them. It means building evaluative systems that challenge without degrading, inform without flattening, and guide without foreclosing possibility.

If education is to become more responsive to human potential, then it must learn from play not only how to motivate, but how to structure environments in which action, feedback, difficulty, and growth are held together coherently. The real lesson of play is not simply that people enjoy learning more when it is engaging. It is that development flourishes when individuals are placed in worlds where effort has meaning, failure remains usable, and progress becomes experientially intelligible. In that sense, the most important educational question is no longer how to make students comply, but how to design systems worthy of the capacities they already contain.

6.5 Educational Quality in Simulation-Based Learning

The educational quality of a simulation cannot be reduced to its degree of realism, its technological sophistication, or its entertainment value. A simulation may be highly immersive and still produce limited learning if its internal structure does not support interpretation, purposeful action, feedback, and reflection. For this reason, educational quality should be understood as a property of instructional design rather than as a by-product of activity alone. In the present framework, simulation-based learning is organised around three interdependent dimensions: (1) scenario, context, and settings;

(2) decision, action, and behaviour; and (3) results, performance, and consequences. The educational value of a simulation depends on how these dimensions are designed and, above all, on the extent to which they are aligned, rich, and dynamically interactive.

This section develops the theoretical basis of that claim. It argues that simulations become educationally powerful when they create a meaningful context for participation, require learners to exercise judgment through action, and produce consequences that can be interpreted and reflected upon. This claim draws on a set of complementary traditions in educational theory and social thought. Experiential learning highlights the importance of action and reflection in learning processes (Kolb 1984). Pragmatist views of education emphasise experience as the foundation of inquiry and growth (Dewey 1938). Reflective practice shows that professional competence depends on the capacity to think in and on action (Schön 1983). Sociocultural theory stresses the mediated and situated nature of learning (Vygotsky 1978). Situated learning further demonstrates that knowledge develops within communities of practice and meaningful contexts of participation (Lave, Wenger 1991). Systems theory, finally, provides the conceptual vocabulary needed to understand feedback, interdependence, and non-linear consequences within complex simulation environments (Meadows 2008; von Bertalanffy 1968).

Taken together, these traditions support a view of simulations not as static representations of reality, but as designed systems of situated action and consequential feedback. The central argument of this section is that the educational quality of a simulation emerges when the three dimensions of the framework are coherently aligned with learning objectives, enriched by meaningful complexity, and linked through recursive cycles of action and feedback.

6.6 Defining Educational Quality in Simulation-Based Learning

Educational quality in simulation-based learning refers to the capacity of a simulation to generate meaningful, durable, and transferable learning. A cautionary note from the management literature is relevant here: Ridgway's (1956) classic analysis of performance measurement warns that what gets measured shapes what gets done, often at the cost of unmeasured but equally important outcomes. Applied to simulation-based assessment, this means that evaluation frameworks which focus exclusively on quantifiable performance metrics risk crowding out the richer learning, adaptive judgment, ethical reasoning, cultural sensitivity, that good simulations are uniquely positioned to develop. Imlig-Iten and Petko (2018) provide useful empirical grounding here: their comparative study found that serious games and educational simulations produce distinct patterns of learning outcomes. A related comparison is offered by Dedeaux and Hartsell (2018), who examined two structurally different types of educational computer games and found that format interacted with content domain in determining learning gains, reinforcing the view that no single game type is uniformly superior and that matching game structure to learning objective is the critical design decision., with games generating higher levels of enjoyment and interest, and simulations producing deeper cognitive processing, a result that underscores the importance of matching the instructional format to the intended learning outcomes rather than treating the two as interchangeable. This definition implies more than participant engagement or task completion. A simulation of high educational quality enables learners to interpret a situation, identify relevant variables, make decisions under conditions of uncertainty, act within a structured environment, observe the consequences of their conduct, and reflect on the relationship between action and outcome. In this sense, educational quality concerns both process and outcome: it concerns how learning unfolds within the simulation and what forms of competence that process makes possible.

Such an understanding is consistent with Dewey's view that not all experiences are equally educative. Sousa and Rocha (2019) provide relevant evidence from management education: their study of leadership development through game-based learning found that participants developed specific leadership styles and interpersonal skills, particularly related to communication, decision-making under uncertainty, and collaborative problem-solving, that traditional training methods had not produced, supporting the view that simulation-based experiences can generate managerial competencies resistant to conventional instruction. In management and health professions education, this principle has been operationalised through the integration of serious games into case-based learning: Addy et al. (2018) demonstrated that a simulation game embedded within a case-based curriculum produced measurable improvements in clinical reasoning and professional judgement, precisely because the game's consequence structure made the logic of professional decision-making visible and actionable rather than merely described. A parallel case is documented by del Blanco et al. (2017), who conducted a randomised controlled trial using a videogame to prepare nursing and medical students for their first visit to an operating theatre: the intervention significantly reduced anxiety and improved preparedness, illustrating how simulation-based games can address affective as well as cognitive dimensions of professional training. In preparatory rather than primary instruction, Makransky, Thisgaard, and Gadegaard (2016) found in a randomised controlled study that virtual simulations used as preparation for actual laboratory exercises significantly improved the acquisition of key laboratory skills and enhanced non-cognitive outcomes including confidence and motivation, suggesting that simulation-based learning is most effective when it is designed as part of an integrated instructional sequence rather than as a standalone replacement for hands-on practice. For Dewey, the educational value of experience depends on how it is organised and on whether it opens possibilities for growth and further inquiry (Dewey 1938). This is particularly relevant to simulation-based learning. Simply placing learners in a realistic or active environment does not guarantee educational value. The experience must be structured in such a way that participants can make sense of it, act meaningfully within it, and derive insight from its consequences. Similarly, Kolb's experiential learning model suggests that learning emerges from a cycle linking concrete experience, reflective observation, abstract conceptualisation, and active experimentation (Kolb 1984). A simulation of high educational quality does not merely provide concrete experience; it must also support reflection, abstraction, and renewed experimentation.

From this perspective, educational quality can be described through several interrelated features. First, the simulation must promote situational understanding. Participants should be able to grasp the logic of the environment in which they are operating, identify salient cues, and recognise the relevance of contextual variables. Second, it must support purposeful agency. Learners should not remain passive observers; they must be required to decide and act. Third, it must include a meaningful consequence structure. Participants should encounter results that are linked to their actions and that reveal something significant about the domain being learned. Fourth, it must promote reflection and transfer. Learners should be able to reconstruct the logic of what occurred and connect that understanding to professional or organisational practice beyond the simulation itself.

Educational quality, then, is not an isolated variable. It is an emergent property of the design architecture of the simulation. It arises when the simulation functions as a coherent learning system rather than as a mere exercise or performance event.

6.7 The Three-Dimensional Framework of Simulation Quality

The framework conceptualises simulations as learning systems organised around three dimensions. The first dimension, scenario, context, and settings, concerns the conditions within which participants operate. The second, decision, action, and behaviour, concerns the forms of agency exercised by participants. The third, results, performance, and consequences, concerns the outputs and effects generated within the simulated environment. These dimensions correspond, respectively, to three pedagogical questions: What is the situation? What should be done? What happened and why?

The first dimension establishes the interpretive field of the simulation. This emphasis on active sense-making aligns with Mayer's (1996) SOI (Selecting, Organizing and Integrating information) model of learning from expository text, in which selecting, organising, and integrating information constitute the three cognitive processes through which understanding is constructed from experience, processes that simulation environments activate simultaneously rather than sequentially. Scenario refers to the problem space or narrative condition that frames participation. Context includes the social, organisational, institutional, cultural, and temporal conditions that give meaning to the scenario. Settings refer to the specific operational parameters of the simulation, including roles, rules, resources, communication channels, information availability, and time constraints. This dimension is educationally important because learners do not act in the abstract. They act in relation to perceived conditions. The scenario/context/settings dimension therefore shapes what participants notice, how they define the problem, and what forms of action appear relevant or possible.

The second dimension concerns participant agency. Decision refers to the selection of a course of action among alternatives. Action refers to the enactment of that choice within the simulation. Behaviour refers to broader patterns of conduct, including cooperation, negotiation, leadership, avoidance, risk-taking, adaptability, and ethical positioning. This dimension is central because it is the point at which understanding becomes operative. Learners reveal what they know not only through what they say, but through how they choose, act, and relate to others. Schön's notion of professional artistry is especially relevant here, since it emphasises that competent practice depends on reflection-in-action, improvisation, and the ability to respond intelligently to indeterminate situations (Schön 1983).

The last dimension concerns what emerges from participant conduct. Results refer to immediate outputs. Performance refers to the quality of action relative to goals or standards. Consequences refer to broader, often delayed or systemic effects of decisions and behaviours. This dimension is critical because learning in simulations occurs largely through the experience of feedback. Systems theory is especially useful here because it highlights that effects are often non-linear, delayed, and distributed across interdependent elements (Meadows 2008; von Bertalanffy 1968). What matters educationally is not only whether an action 'worked', but what chain of consequences it produced, for whom, and under what conditions.

These three dimensions should not be understood as linear stages. They are analytically distinct but functionally interdependent. Context shapes action, action produces consequences, consequences reshape interpretation, and revised interpretation informs new action. This recursive structure is what gives simulations their developmental potential.

The first major condition of educational quality is alignment. Alignment refers to the degree of coherence among the three dimensions of the simulation and between those dimensions and the intended learning objectives. A simulation is aligned when the scenario requires the target competence, the actions available to participants express that competence, and the consequences generated by the simulation reveal the significance of those actions in ways that are meaningful for learning.

The importance of alignment may be clarified by considering the relation between context and action. If a simulation is intended to develop intercultural competence, then the context must make intercultural judgment consequential. It is not enough to situate participants in an international setting if the actual decisions required of them can be solved through generic reasoning that ignores cultural difference. In a well-aligned simulation, the participant cannot succeed without taking the relevant context seriously. The scenario therefore functions not as decorative background, but as a substantive condition of learning.

A similar requirement applies to the relation between action and consequence. Participants must be able to see that what happens in the simulation is related, in an intelligible way, to what they did. The point is not to create simplistic or deterministic responses. Indeed, in many professional fields the consequences of action are delayed, partial, or distributed. Yet the simulation must still render consequence structures interpretable. Otherwise, learners are left with activity without causal understanding. Kolb's model is helpful here because it makes clear that experience alone is insufficient; learning requires the transformation of experience through reflection and conceptualisation (Kolb 1984). If the consequence structure is opaque or arbitrary, that transformation becomes difficult.

Alignment also has an evaluative dimension. The outcomes and performance indicators built into the simulation must reflect the values and causal logics of the target domain. A simulation on international human resource management, for example, should not evaluate success solely in terms of procedural efficiency if the domain itself includes concerns such as legitimacy, fairness, adaptation, morale, and retention. Likewise, a cross-cultural marketing simulation should not reduce success to sales volume alone if symbolic resonance, trust, and local legitimacy are central to marketing effectiveness. Misalignment at the level of evaluation risks teaching learners distorted professional priorities.

Dewey's insistence on the continuity between means and ends in education is relevant here. The educative value of an activity depends on the way its internal organisation directs learners toward meaningful growth (Dewey 1938). Alignment is thus not merely a technical requirement but a pedagogical principle. It ensures that the simulation is about the right thing in the right way.

While alignment provides coherence, richness provides depth. Richness refers to the degree of meaningful complexity present within the three dimensions of the simulation. It concerns the density of variables, the plurality of perspectives, the presence of ambiguity and trade-offs, and the extent to which the simulation requires diagnosis rather than mere execution. Richness is essential because professional competence is rarely exercised in simplified conditions. Many real-world problems are characterised by incomplete information, competing objectives, stakeholder diversity, and uncertain consequences. A simulation of low richness may be easy to manage, but it often fails to prepare learners for the interpretive and adaptive demands of actual practice.

Richness in the first dimension means that the scenario and context contain relevant complexity. This may include multiple stakeholders, conflicting expectations, institutional constraints, cultural variability, resource limitations, and temporal pressures. Such richness supports what may be called interpretive learning. Learners must decide what matters, what is uncertain, and what the problem actually is. This resonates with sociocultural approaches to learning, which emphasise that knowledge is constructed through participation in meaningful situations rather than transmitted as decontextualised content (Vygotsky 1978). It also resonates with situated learning theory, according to which learning is inseparable from the social and material contexts in which practice occurs (Lave, Wenger 1991).

Richness in the second dimension means that the simulation offers participants meaningful scope for judgment and conduct. Learners should face alternatives that involve trade-offs rather than obvious answers. They should be able to negotiate, revise, improvise, and respond to others. The educational value of such richness lies in the development of agency under constraint. Participants are not simply executing procedures; they are learning how to prioritise, justify, and adapt. This is particularly important in management education, where competence includes not only technical knowledge but also leadership, communication, ethical awareness, and strategic flexibility.

Richness in the third dimension means that outcomes are not limited to immediate and single-dimensional scores. Educationally rich simulations often include multiple performance indicators, delayed consequences, second-order effects, and tensions between short-term gains and long-term sustainability. Systems theory is especially useful in making sense of this dimension because it underscores that interventions within complex systems often generate unintended effects and feedback loops (Meadows 2008; von Bertalanffy 1968). A richly designed consequence structure helps learners appreciate that success in professional settings is often partial, relational, and temporally extended.

At the same time, richness must be calibrated. Too little richness produces oversimplification; too much richness may produce overload. Vygotsky's concept of the zone of proximal development is suggestive in this respect. Learning is most effective when challenges exceed current competence but remain within a range that can be supported through mediation and guidance (Vygotsky 1978). In simulation design, richness should therefore be sufficient to challenge learners, but not so excessive that it prevents interpretation and purposeful response.

The third condition of educational quality is dynamic interaction. This refers to the recursive way in which the three dimensions influence one another over time. A simulation of high educational quality does not present context, action, and consequence as isolated blocks. It creates a loop in which participants interpret the situation, act within it, observe the results, reflect on what occurred, and re-enter the situation with revised understanding. This cyclical pattern is fundamental to experiential learning and reflective practice.

Kolb's experiential learning cycle offers a clear foundation for this view. Learning begins with experience, but it becomes developmental only when experience is followed by reflection, abstraction, and renewed experimentation (Kolb 1984). Schön deepens this argument by showing that professionals learn not only after action, but during it, through reflection-in-action (Schön 1983). Simulations are particularly suited to such learning because they allow participants to act, observe emerging conditions, and adjust their conduct in real time. Educational quality increases when the design of the simulation makes such adjustment possible and meaningful.

Dynamic interaction is also central to Dewey's understanding of inquiry. For Dewey, learning arises through transactions between actor and environment, especially when habitual responses are disrupted and inquiry becomes necessary (Dewey 1938). A simulation that supports dynamic interaction creates precisely such conditions. Participants confront uncertainty, test possible responses, observe consequences, and reorganise their understanding. In this sense, the simulation becomes not just a representation of a problem but a medium for inquiry.

From a systems perspective, dynamic interaction matters because consequences reshape the very field in which subsequent actions occur. A decision affects not only a score but also the informational, relational, and structural conditions of future participation. For example, a poorly managed negotiation may reduce trust, which then changes the meaning of later options. An insensitive marketing message may damage legitimacy, which in turn constrains future strategic choices. These recursive effects are educationally important because they help learners recognise that professional action unfolds within evolving systems rather than static situations.

Dynamic interaction is therefore the dimension through which simulations become developmental rather than merely demonstrative. This claim is consistent with Fiorella and Mayer's (2015) framework of learning as a generative activity: the most durable understanding arises not from exposure to well-organised information, but from the learner's active effort to select, organise, and integrate that information in response to meaningful challenges, which is precisely what recursive simulation design makes possible. It supports adaptation, strategic revision, and the gradual refinement of judgment. Without it, even a rich and aligned simulation may remain educationally limited, functioning more like a complex case study than an experiential learning system.

6.8 The Integration of Experiential, Reflective and Situated Perspectives

The value of the present framework lies partly in its capacity to integrate multiple theoretical traditions into a single design logic. Experiential learning theory explains why simulations must move beyond exposition toward action and reflection (Kolb 1984). Dewey's philosophy of education clarifies why experience becomes educational only when it is organised to support inquiry and growth (Dewey 1938). Schön's account of reflective practice explains why professional learning depends on the capacity to interpret and revise action in the midst of uncertainty (Schön 1983). Vygotskian theory emphasises the mediated and socially structured character of learning, reminding us that competence develops through interaction, tools, language, and support (Vygotsky 1978). Lave and Wenger show that learning is inseparable from participation in meaningful practices and communities, which supports the claim that context is not external to cognition but constitutive of it (Lave, Wenger 1991). Systems theory, finally, explains why consequences in simulations must be treated not as isolated outputs but as components of a feedback-governed whole (Meadows 2008; von Bertalanffy 1968).

These traditions converge around several principles. First, learning is active rather than passive. Second, learning is situated rather than context-free. Third, learning is reflective rather than automatic. Fourth, learning unfolds in relation to feedback and consequence.

Fifth, meaningful competence includes not only knowledge possession but also interpretive judgment and adaptive conduct. The Context–Action–Consequence framework can therefore be seen as an applied synthesis of these principles. It translates them into a practical model for analysing and designing educational simulations.

An important implication of the framework is that not all simulations distribute emphasis equally across the three dimensions. Different configurations produce different forms of educational quality. A simulation with high alignment but limited richness may be well suited for novice learners or introductory instruction. It offers clarity and coherence, but may not sufficiently develop adaptive expertise. A simulation with high richness but poor alignment may feel realistic and engaging, yet produce diffuse or misdirected learning. A simulation with high richness and alignment but weak dynamic interaction may support analysis and discussion, but offer fewer opportunities for iterative behavioural learning.

The most educationally powerful configuration is one in which all three conditions are strong. In such cases, learners encounter a meaningful and complex context, are required to act within it through non-trivial judgment, and receive layered, interpretable consequences that support reflection and adaptation. This configuration is especially appropriate for fields characterised by complexity, ambiguity, and relational interdependence, such as cross-cultural marketing and international human resource management.

In cross-cultural marketing, high educational quality requires a context rich in symbolic and cultural variability, actions that require interpretation of local meaning systems, and consequences that reveal the effects of strategic choices on resonance, trust, and legitimacy. In international human resource management, high educational quality requires a scenario that captures global-local tensions, actions that involve both formal policy and relational conduct, and consequence structures that make visible the effects of decisions on morale, adaptation, fairness, and organisational integration. In both cases, the framework helps explain why superficial gamification is insufficient: the educational challenge lies not in adding competition or rewards, but in designing a consequential system of situated judgment.

6.9 Implications for Evaluation of Learning Experience

The framework also provides a basis for evaluating simulation quality. A simulation can be assessed by asking whether its scenario and context meaningfully represent the target domain, whether participant decisions and behaviours express the intended competence, whether the results and consequences make causal structures visible, and whether the overall design supports iterative reflection and adaptation.

This evaluative perspective is useful because it shifts attention away from narrow indicators such as satisfaction or completion and toward the deeper structure of learning.

For the purposes of the present book, this framework can serve as a conceptual bridge between theoretical chapters and applied chapters. It provides a vocabulary for describing why some simulation-based learning experiences are educationally robust and others are pedagogically thin. It also offers a comparative lens for analysing the two anchor cases of cross-cultural marketing and international HRM. In both cases, the key question will not simply be whether learners participated successfully, but whether the simulation achieved alignment, richness, and dynamic interaction across the three dimensions.

The educational quality of a simulation is best understood as an emergent property of design. It does not reside in realism alone, in participation alone, or in technological sophistication alone. Rather, it emerges when a simulation creates a meaningful context for interpretation, requires purposeful and competence-relevant action, and generates consequences that can be understood, reflected upon, and used to guide future conduct. In the framework proposed here, this educational quality depends on three interrelated conditions: alignment, which provides coherence; richness, which provides depth; and dynamic interaction, which provides developmental learning potential.

This perspective allows simulations to be theorised as more than instructional techniques. They become structured environments for inquiry, action, and reflection. They allow learners to encounter the complexity of professional practice in forms that are pedagogically manageable yet sufficiently consequential to generate understanding. The next sections of the chapter can build on this framework by examining how the three-dimensional framework informs the design of specific simulation formats and how it can be operationalised in the two empirical domains explored in this book.

7 Game-Based Learning Experiences
Cross-Cultural Marketing and International Human Resource Management (HRM)

7.1 The Shared Architecture of Management Learning Simulations

This chapter applies the theoretical framework to management education. Among the most practically tested applications of simulation-based learning in management development is the use of virtual reality for sales training: Upadhyay and Khandelwal (2018) report that VR-based simulations enable trainees to practise high-stakes client interactions, handle objections, and develop adaptive communication strategies in an environment that is both

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realistic and consequence-free, with self-reported improvements in confidence and skill transfer. Van Bree (2014) situates this enterprise within a broader vision of game-based organisation design. Hall and Patel (2020) contextualise these design choices within the broader organisational frame: their account of leading the learning function identifies the strategic, relational, and operational challenges facing those responsible for learning and development in complex organisations, and positions simulation-based and game-based approaches as high-leverage investments precisely because they develop the adaptive, judgment-based competencies that conventional training cannot reliably produce. Hugos (2012) develops a complementary practical argument, demonstrating how game mechanics points, levels, immediate feedback, and transparent rules can be embedded in business processes to improve organisational performance, increase employee engagement, and accelerate learning within teams. The enterprise game, in Hugos's account, is not a metaphor but a design principle: the logic that makes games engaging is the same logic that makes organisations adaptive. Hugos argues that the principles of game mechanics – meaningful choice, feedback, progressive challenge, and the management of uncertainty – translate directly into the design of organisational structures and learning interventions, making game design thinking a real resource for management practice, and not merely an instructional technique, with particular attention to cross-cultural marketing, international human resource management, learning analytics, collaboration, staffing, and talent-management decisions.

Lavine et al. (2022) offer a framework for management learning that interweaves positive and critical perspectives. At a more foundational level, Mantzavinos, North, and Shariq (2004) argue that institutions evolve through shared learning, that economic performance across societies depends on how effectively individuals and organisations build, revise, and transmit the cognitive models they use to navigate complex environments. This claim has direct implications for management simulation design: games that make economic and institutional logic visible, that reward adaptive model-revision rather than the mechanical application of received rules, are aligned with the deepest mechanisms through which institutions improve over time, affirming the value of engagement and experimentation while insisting on reflexive attention to power, culture, and the limits of any single method. This dual orientation applies with particular force to cross-cultural and international HRM simulations, where the risk of reproducing cultural stereotypes through unreflective game design is real, and where the educational value depends on the facilitator's capacity to make that risk itself an object of learning. The two educational experiences under consideration, simulation-based learning in cross-cultural marketing and game-based learning in international human resource management, may at first appear to belong to different pedagogical families. One seems to be primarily concerned with market environments, consumer meaning, communication strategy, and cultural adaptation, while the other appears to focus on organisational roles, employment policies, intercultural interaction, negotiation, and managerial decision-making. Yet, when examined more closely, both are found on the same deep educational architecture. In both cases, learning is produced through the design of a meaningful situation, the demand for situated action, and the experience of consequences that follow from that action. Both educational formats place learners inside a structured scenario, require them to interpret a particular context, compel them to make decisions and perform actions, and then confront them with outcomes that reveal something important about the logic of the field being studied.

This common structure is crucial. It means that both simulation-based learning and game-based learning are not simply alternative techniques for making management education more engaging. They are forms of consequential pedagogy. Their educational value lies in the fact that they transform abstract knowledge into lived problem situations. Rather than merely receiving information about marketing across cultures or HRM in international environments, learners are placed in situations in which knowledge must be used, tested, and revised. The central learning process no longer consists of memorising principles and later applying them in a hypothetical way; instead, it consists of entering a scenario, interpreting its constraints and opportunities, acting under conditions of uncertainty, and then understanding the effects of one's conduct. In this respect, both kinds of simulation are pedagogically powerful because they organise learning as a movement from scenario and context, to decision and action, to results, consequences, and reflective re-interpretation.

At the heart of both formats is the principle that management problems are never encountered in a vacuum. Decisions are not abstract choices detached from circumstance. They are shaped by settings, roles, timing, relationships, institutional conditions, and cultural environments. This is why the scenario and the context are not simply narrative ornaments placed around the learning activity. They are foundational elements of the educational design. The scenario introduces a problem world. It defines what is happening, what is at stake, who the relevant actors are, and why the situation requires intervention. The context deepens that world by specifying the cultural, organisational, market, relational, legal, symbolic, and temporal conditions within which the problem must be understood. Together, scenario and context generate the need for action.

Once participants are placed within such a world, they are required to decide and act. This second moment is central because learning becomes educationally meaningful only when interpretation is translated into agency. Participants must decide what matters, what should be prioritised, what alternatives are available, and how to intervene. Action is therefore not merely mechanical execution. It is the outward manifestation of interpretation and judgment. When learners choose a strategy, negotiate with others, allocate resources, revise messages, structure policies, or respond to emerging difficulties, they are not only displaying existing knowledge; they are actively constructing competence.

The third moment concerns the results and effects of those actions. A simulation becomes educational when it does not stop at action itself, but shows learners what their decisions produce. These results may concern performance, stakeholder responses, legitimacy, trust, morale, customer reception, organisational cohesion, or strategic effectiveness. Importantly, these outcomes are not merely terminal scores. They function as feedback. They reveal the causal logic of the environment and allow participants to examine the relationship between what they did and what followed. It is at this point that action becomes learning. Participants begin to understand not only whether their choices were effective, but why certain consequences emerged and what those consequences suggest about the deeper structure of the field.

This basic architecture applies to both cross-cultural marketing and international human resource management, even though each domain gives it a different emphasis. In cross-cultural marketing, the simulation is typically centred on the challenge of strategic action in culturally differentiated market environments. The learner is placed in a scenario in which an organisation must communicate, position, adapt, or redesign its presence in relation to consumers whose values, symbols, habits, expectations, and interpretive frameworks differ from those of the organisation's home environment. The educational difficulty lies in the fact that marketing strategy is not universally interpretable. The same product, slogan, visual image, or brand promise may carry different meanings in different cultural settings. What appears persuasive, elegant, humorous, respectful, or aspirational in one context may appear offensive, irrelevant, confusing, or ineffective in another. Thus the simulation teaches that marketing is not simply a matter of technical strategy, but of situated interpretation.

The scenario might concern entry into a new national market, the launch of a product across different cultural regions, the redesign of a campaign after a cultural misunderstanding, or the need to balance global brand consistency with local adaptation. This scenario becomes meaningful only through the context that surrounds it. The context may include cultural norms related to communication, values associated with status and identity, consumer attitudes toward foreign brands, symbolic meanings attached to colours or images, local competitor behaviour, institutional regulations, media environments, and temporal pressures linked to launch schedules or market crises. None of these elements is pedagogically incidental. Each contributes to the field of interpretation within which participants must work. Learners are therefore not simply told that culture matters; they are placed in a situation in which failure to understand culture leads to poor action and visible consequences.

The decisions required in such a simulation are typically strategic and interpretive. Participants may have to choose how to segment a market, whether to standardise or localise a campaign, how to adapt a brand message, what communication channels to use, how to respond to consumer backlash, or how to negotiate between headquarters' strategic priorities and local cultural intelligence. Yet these decisions are never purely analytical. They become actions when participants commit to a course of conduct, revise messages, deploy campaigns, justify their choices to others, or respond to emergent feedback from the market. Their behaviour also becomes part of the learning process. Do they listen to local expertise? Do they cling rigidly to prior assumptions? Are they willing to revise an appealing strategy when new evidence suggests that it is culturally inappropriate? These behavioural patterns reveal as much about managerial competence as the formal decision itself.

The consequences of action in cross-cultural marketing simulations are often especially revealing because they expose the relationship between symbolic choices and market effects. Some decisions may produce immediate results. A mistranslated slogan, an offensive image, or a clearly inappropriate cultural reference may trigger rapid consumer rejection or reputational damage. These are cases where the relationship between action and effect is relatively direct and visible. Other decisions, however, may produce delayed consequences. A strategy that initially appears efficient may slowly erode brand trust because it fails to resonate with local values. A campaign that achieves short-term visibility may undermine long-term legitimacy because it is perceived as culturally tone-deaf or externally imposed. Such delayed consequences are educationally important because they teach learners that effectiveness cannot always be judged at the moment of launch. Marketing action unfolds over time, and its effects are often cumulative.

This introduces a key distinction: the difference between immediate and delayed effects. In educational simulations, some actions are followed by rapid consequences that can be easily linked back to the original choice. These immediate effects are useful for making causal structures visible. They help learners see those certain types of error or sensitivity matter. Delayed effects, by contrast, are pedagogically richer because they reveal that real managerial environments are temporally layered. Not all decisions show their full significance at once. Some alter relationships, expectations, and perceptions in ways that become visible only later. A good simulation teaches both kinds of temporality.

A second important distinction concerns determinism and probability. Some outcomes in simulation design are relatively deterministic. That is, a certain type of action predictably generates a certain type of result. For example, if a campaign violates a widely known cultural taboo, rejection may be highly likely. Deterministic effects are useful in pedagogical terms because they clarify principles and provide strong feedback. However, many outcomes in professional life are not strictly deterministic. They are probabilistic. A well-adapted message may improve the likelihood of success without guaranteeing it. A carefully localised campaign may still fail because of competitor reactions, timing problems, distribution weaknesses, or internal incoherence. A simulation that includes probabilistic consequences offers a more realistic representation of managerial complexity. It teaches learners that good decisions improve the odds of success but do not abolish uncertainty. This insight is particularly important in management education because it counters the simplistic belief that correct reasoning automatically produces desired outcomes.

The distinction between linear and recursive designs is equally significant. In a more linear simulation, the educational sequence is relatively straightforward. Participants receive a scenario, analyse the context, make a decision, observe the result, and discuss the lesson. This format is useful, especially for introductory teaching, because it clarifies causal logic and reduces complexity. It allows educators to isolate variables and highlight fundamental principles. In cross-cultural marketing, a linear structure might involve presenting several campaign options for a given market and then showing which option is best aligned with cultural expectations. The learning is focused, clear, and tightly organised.

Yet many richer simulations are recursive rather than linear. In a recursive design, action changes the context, and the altered context requires new interpretation and new action. This structure more closely resembles actual management practice. A firm launches a campaign, receives ambiguous or unexpected feedback, revises its messaging, encounters new stakeholder responses, and must then re-evaluate its assumptions. What began as a single decision becomes an evolving process. The educational strength of recursion lies in the fact that learners are not merely tested once; they are drawn into a cycle of interpretation, intervention, consequence, and re-interpretation. They come to see that action is not a final step but a moment in an ongoing system.

Game-based learning in international human resource management is organised by the same overall architecture, but the educational emphasis shifts. Here the scenario typically concerns the internal life of multinational organisations rather than the external logic of markets. Learners may be asked to manage expatriate assignments, design internationally appropriate compensation systems, resolve conflict in multicultural teams, respond to grievances across subsidiaries, negotiate between global HR policies and local institutional expectations, or balance efficiency with fairness in staffing decisions. The context is therefore less centred on consumer interpretation and more centred on organisational relationships, formal structures, norms of legitimacy, and the human effects of management policy.

This field is particularly well suited to game-based learning because HRM decisions in international settings are rarely neutral or purely technical. They are deeply relational. They affect identity, belonging, authority, trust, motivation, and perceptions of fairness. A policy choice may be formally coherent and still generate resistance if it is experienced as culturally insensitive or politically imposed. An apparently efficient staffing decision may damage local legitimacy if it ignores local expertise or reinforces asymmetries between headquarters and subsidiaries. A game-based format makes these tensions visible by assigning roles, structuring interactions, and requiring participants to confront one another as stakeholders with different interests, expectations, and degrees of power.

For example, in international HRM, the scenario often revolves around organisational dilemmas. The use of computerised top management simulations has a long research tradition within management education: Nair (2003) found, in an early study of a business simulation, that middle managers systematically underperformed relative to senior managers and students, not because of inferior domain knowledge, but because of defensive decision-making patterns that the simulation made visible. This diagnostic capacity, the ability of a management simulation to reveal behavioural tendencies that formal assessment cannot detect, is one of its most distinctive and practically significant educational contributions.: whether to appoint a local manager or an expatriate, how to design rewards across countries with different expectations, how to evaluate performance across cultural contexts, how to address conflict between units, or how to negotiate a policy that can be accepted by both central and local actors. The context here includes labour laws, organisational hierarchies, cultural norms regarding authority and communication, corporate strategy, local institutional realities, and historical patterns of trust or mistrust. As in marketing simulations, this context is not merely descriptive. It creates the conditions under which participants must interpret what counts as a reasonable, legitimate, or effective decision.

The actions required in international HRM simulations are often more overtly interpersonal than those in cross-cultural marketing. Participants must choose policies, but they must also communicate them, justify them, negotiate them, defend them, revise them, and bear responsibility for their effects on others. Thus, behaviour becomes especially central. The educational issue is not only whether the participant makes a technically plausible choice, but whether that choice is enacted with sensitivity, legitimacy, and strategic awareness. Does the participant listen to local concerns? Do they impose headquarters logic without consultation? Are they able to mediate between stakeholders? Can they recognise that a formally correct decision may still produce organisational damage if it is poorly communicated or normatively misaligned? In this domain, the simulation becomes an arena for observing not only decision quality but managerial comportment.

The results and consequences in international HRM are often less immediately measurable than in marketing, but no less significant. Outcomes may include changes in employee morale, trust in leadership, willingness to cooperate, retention risk, conflict intensity, legitimacy of HR policy, adaptation of expatriates, or cohesion across organisational units. Some of these consequences can appear quickly. A dismissive managerial response may trigger immediate resistance. An obviously inequitable policy may create direct conflict. But many important HRM effects are delayed. A staffing decision may seem efficient in the short run, only to produce dissatisfaction, hidden disengagement, or turnover months later. A policy that appears standardised and fair at headquarters may accumulate resentment in subsidiaries over time. These delayed effects are especially valuable pedagogically because they reveal that organisational decisions are socially and temporally layered.

As in the marketing case, consequences may be deterministic or probabilistic. A direct violation of a legal norm or an overtly discriminatory action may predictably produce formal or relational breakdown. Yet much of international HRM unfolds in probabilistic space. An inclusive policy may increase commitment without guaranteeing it. A well-intentioned expatriate assignment may still fail because of family adjustment problems, local resistance, or broader strategic instability. Probabilistic consequence structures teach learners that management is not an arena of certainty but of conditional influence. Decisions modify the landscape of possibility rather than mechanically producing outcomes.

The contrast between linear and recursive approaches is also highly relevant here. A linear HRM simulation may present a staffing problem, require participants to choose among policy alternatives, and then provide structured feedback on likely consequences. This is useful for introducing students to fundamental categories of decision. But the recursive format is often more faithful to organisational reality. In a recursive game, a decision about staffing changes employee expectations; those expectations alter trust; changed trust affects the viability of later interventions; those interventions then reshape the organisational environment again. In this structure, every action is both a response to context and a producer of new context. Learners do not merely solve a problem; they inhabit a process.

When the two educational experiences are compared directly, their shared logic becomes evident. Both are based on the principle that learning emerges from acting within a meaningful situation and confronting the effects of that action. Both require the design of scenarios that are not generic, but domain-specific and contextually grounded. Both position context as an active force rather than passive background. Both require decisions that matter within the internal logic of the scenario. Both link those decisions to outcomes that teach participants something about performance, causality, judgment, and adaptation. In both, learning is grounded in the transformation of abstract concepts into situated problems.

At the same time, the comparison reveals significant differences of emphasis. Cross-cultural marketing simulations are more strongly oriented toward the interpretation of external environments, symbolic systems, and market responses. Their primary challenge is often strategic adaptation to culturally mediated consumer contexts. International HRM games, by contrast, are more strongly oriented toward the management of internal organisational relationships, policies, power structures, and interpersonal dynamics across borders. Their primary challenge is often the negotiation of legitimacy, coordination, and human consequences within multinational systems.

This distinction matters because it shows that different scenarios produce different contexts, and different contexts produce different forms of action. The type of world designed by the simulation determines what kind of competence is required. A market-entry scenario invites strategic interpretation, message adaptation, and reading of consumer response. An international staffing scenario invites relational judgment, policy negotiation, and sensitivity to institutional and organisational effects. Thus, the scenario is never neutral. It selects and organises the form of managerial reality to which learners must respond.

Yet both cases confirm the same general theoretical point: educational simulations in management are built on a causal and interpretive chain in which context generates meaningful choices, choices become actions, actions produce results, and results reshape future understanding. Sometimes this chain is presented in a linear form for clarity and instructional focus. Sometimes it is organised recursively to reflect the evolving nature of real systems. Sometimes effects appear immediately, making causal relations easy to see. Sometimes they emerge only later, teaching learners about cumulative, indirect, and delayed consequences. Sometimes outcomes are deterministic, clarifying clear rules or boundaries. Sometimes they are probabilistic, reflecting uncertainty, multi-causality, and the fact that managerial action operates through influence rather than certainty.

These distinctions are not secondary technical details. They are central to the pedagogy of simulation. A linear design is useful when the aim is to make foundational relationships visible and cognitively manageable. A recursive design is useful when the aim is to cultivate systems thinking, adaptation, and strategic responsiveness. Immediate effects are useful because they provide strong, memorable feedback. Delayed effects are useful because they reveal temporal complexity. Deterministic consequences are useful because they clarify norms, principles, and predictable errors. Probabilistic consequences are useful because they prepare learners for the uncertainty and ambiguity of real managerial life.

Seen in this way, simulation-based learning in cross-cultural marketing and game-based learning in international human resource management should not be treated as isolated pedagogical methods. They are better understood as two variants of a broader educational logic: a logic in which learning is generated by the design of consequential environments. These environments compel learners to interpret situations, choose among alternatives, act under constraints, and examine the effects of what they have done. Their value lies not simply in activity, nor in realism, nor in playfulness, but in the fact that they turn knowledge into situated judgment and judgment into experience.

A final synthesis may therefore be stated as follows. Both simulation-based learning in cross-cultural marketing and game-based learning in international human resource management are grounded in the design of scenarios and contexts that make decision and action necessary. These decisions and actions affect results, and those results generate effects that may be immediate or delayed, deterministic or probabilistic. Depending on the educational purpose and design sophistication, the learning process may unfold linearly or recursively. In all cases, however, the central pedagogical principle remains the same: learners develop competence by acting within meaningful situations and by understanding the consequences of their actions within systems that are culturally, organisationally, and strategically structured.

7.2 Cross-Cultural Marketing Simulation: *Sprinting a Brand* (by Tiziano Vescovi)

The *Sprinting a Brand* game is an educational case study in decision-making simulation within the field of strategic and operational marketing, as it coherently integrates theoretical concepts, realistic constraints, and organisational dynamics typical of new brand launch projects. The game's structure can be organised around three dimensions: educational validity, consistency with theoretical marketing models, and the ability to develop decision-making skills. The game draws inspiration from the theme of new brand development, drawing on information from various authors, including De Chernatony (2008), Aaker (2012), Kapferer (1994; 2012), Steenkamp (2017), and Keller, Busacca, and Ostillio (2021).

The key elements of the game concern the player's role, the description of the client and its objectives, and a series of constraints that constantly influence the evaluation of the player's choices and are synthesised into a final assessment. The player is a brand strategist working at a consulting firm called Luma Strategy. The client is the company Vortika Sports S.p.A., which intends to launch a new brand dedicated to running and cross-training products that it has decided to call ARX. The company's goal is to launch the new brand within 16 weeks of the start-up, testing it in three pilot cities it considers key to understanding the brand's potential success (Milan, Turin, Bologna), in time for the half-marathon season, which would allow for the collection of important information on the proposed product offering. The constraints are therefore a budget of €750,000.00, a small internal support team, a defined time frame, and highly fragmented available market data. The company defines 3 KPIs (Key Performance Indicators) to be achieved within 90 days of launch:

1. 20% aided awareness in the pilot cities
2. 10,000 online pre-orders
3. 3 active partnerships with retailers

The basic mechanics are therefore simple and measurable (Beverland 2021). First, the resources the player must manage to succeed in the marketing consulting role. These relate to time (weeks), budget (available €), client trust (measured on a scale of 0-100), and the team's satisfaction and trust levels (measured on a scale of 0-100). At each turn, the player has three choices, each of which affects the resources differently and unlocks or locks options in subsequent levels. The final score is determined by the weighted sum of KPIs + Trust + Remaining Budget. The marketing consultancy fails if trust falls below 30, the budget goes into the negative, or the time delay exceeds 2 weeks.

The logic of the *Sprinting a Brand* game is to directly involve the player in a simulated real-world scenario, through various stages useful for developing a marketing consultation, applicable to internal company responsibilities, adaptable to various cultural contexts (with a few tested variations, it can be applied to culturally distant markets), relating to the market launch of a new sports brand, simulating not only the sequence of marketing actions to be carried out, providing alternative choices that lead to different consequences and outcomes, but also unforeseen situations and the dynamics of relationships among the actors involved, that is, the various stakeholders involved in the process of launching new products/brands, each with a specific role and distinct interests that influence the decision-making process. Specifically, these are:

1. Main Player (player)
2. Customer
3. Internal stakeholders (NPCs – Non-Playable Characters)
4. External actors (implicit in the game)

The main player, the central decision-maker, is the player, that is, the Brand Strategist, a consultant at Luma Strategy. Their role is to define the strategy to follow for the brand launch, the competitive positioning it must adopt, and the launch plan to be implemented. They must also manage the various resources at their disposal, namely the budget, time, the client company's trust, and the various documents they can obtain or request (e.g., market research, interviews with distributors, etc.). They must then mediate among the client company's internal stakeholders, who have different priorities, different opinions, and different ways of interacting. All of this must be implemented while ensuring the successful achievement of the specified KPIs.

The second key player is obviously Vortika Sports S.p.A., the client company, which is the project sponsor, eager to launch the ARX brand, and which defines the objectives to be achieved, sets the constraints, and determines the available budget.

Closely linked to this key player are, of course, the internal stakeholders, who are assigned various roles. The CEO (Chief Executive Officer), or general manager, defines the company's strategic direction and vision. His or her objectives are to achieve an ambitious and distinctive positioning, that is, a premium positioning. From a Behavioural perspective, he rewards bold and well-reasoned choices, while penalising excessive analysis of problems that slows down or prevents decision-making, bearing ultimate responsibility for the company's development, which he manages with an entrepreneurial vision.

The CMO (Chief Marketing Officer), that is, the head of marketing, sales, and communications, focuses on the intrinsic consistency of the brand's characteristics and its relationship with the company's other brands. They are concerned with the effectiveness of promotional and sales campaigns and the performance of KPIs; furthermore, they strive to ensure that a price deemed too high by potential customers does not limit the target market they aim to reach. Their approach tends to prioritise decisions based on data and market testing, seeking an appropriate segmentation strategy and a consistent, innovative communication campaign.

The CFO (Chief Financial Officer) is responsible for the financial oversight of the operation; therefore, their objectives are to seek adequate margins relative to the established investment, a minimum ROI (Return on Investment) of 20%, and the mitigation of financial risks that may arise from the marketing activities undertaken from time to time. His management approach focuses on financial scenarios and financial sensitivity analysis and, naturally, he opposes decisions that he deems economically unsustainable.

The Head of Operations is responsible for operational management and production activities. Their goal is to make production more efficient and less complex, constantly seeking to simplify the product range, reduce variations that hinder operations, and promote decisions that ensure a higher degree of production and logistics feasibility. He therefore prefers and rewards simple, scalable solutions and criticises any activity that could increase the complexity of his operations, such as generating too many SKUs (Stock Keeping Units) in his warehouses.

These corporate stakeholders are joined by a number of external stakeholders implicit in the process. First and foremost are retailers and commercial partners, that is, the physical sales channels through which products will be distributed. The objectives of these stakeholders are to select, from Vortika Sport's overall product offering, the brands and products with the highest likelihood and speed of sale, to maximise their revenue and margins while reducing inventory costs. That is, products capable of attracting customers, driving traffic to other parts of their offering, and thereby boosting overall sales. Their role in the game is to provide insights through interviews they participate in and to contribute to achieving established KPIs, which include securing at least three strong partnerships with retailers.

The target consumers, that is, the end users of the new brand's products, are profiled as 'urban athletes' between the ages of 18 and 35, who are active in sports and dedicated to staying in shape. Their goal is to use high-performance products that align with their lifestyle, without necessarily opting for products designed for professional athletes. Their role in the strategy is to determine brand awareness levels, drive product pre-orders based on available information and performance expectations, and shape the brand's perception, and thus its actual market positioning relative to competitors.

Influencers/creators, whose relationship with the new brand's offerings should drive the amplification of communication across various media, thereby enhancing its reputation. Obviously, influencers tend to collaborate with brands that align with their image, reputation, and standing, demonstrating a certain degree of independent judgment. The company has no control over their communications, so their impact can be positive or negative, and is not entirely predictable in terms of how and when it will occur.

Competitors can also be considered external actors, as market rivals whose Behaviour directly influences the position and perception of Vortika Sport's offering. Their goal is obviously to defend or increase their market share. Their impact in the game influences Vortika Sport's positioning, pricing, and communication strategies. Their actions can trigger unforeseen market events, such as product leaks, that is, the unauthorised disclosure of confidential information, images, or technical specifications of a new product prior to its official announcement.

The game highlights how marketing is a multi-stakeholder process, emphasising the various interests at play, a negotiation where internal alignment among the different stakeholders is necessary, and constrained by available budgets, defined time frames, and limited data. Success depends not only on strategic choices but also on the player's ability to balance conflicting perspectives within the client company, build consensus among internal stakeholders regarding decisions to be made, and develop and maintain a high level of trust with stakeholders.

These three aspects, multi-stakeholder, negotiation-based, and constrained, actually represent the theoretical core of the simulation, because they transform marketing from a 'decision-making' discipline into a complex organisational process. Let's explore them in a structured way.

Marketing as a multi-stakeholder process highlights how decision-making regarding the market is not an individual process carried out by the CMO, but rather the balancing of a system of interests. In the game, the player does not make decisions in a technical vacuum, but within a network of actors with divergent objectives: the CEO is oriented toward choices that prioritise growth, the corporate vision, and differentiation from the competition; essentially, he is guided by a longer-term logic. The CMO, for their part, is focused on achieving sales performance, interested in the effect the new brand has on the overall consistency of the product offering's image, and on collecting clear data that allows for the measurement of various aspects of market actions. The CFO is obviously focused on the margins and ROI generated by the new brand and on financial risk control, while the head of operations demands simplicity and production feasibility.

These perspectives often conflict regarding the importance and urgency to be assigned to the various decisions the consultant-player calls upon them to make. This negotiation is influenced by market factors beyond the company's control, which consequently contribute to altering the balance of power among the actors, such as trends in actual demand rather than projected demand, and changes in competitors' strategic Behaviour.

As an educational implication of this condition, the marketing process becomes an example of applied stakeholder theory: value is not maximised for a single actor, but is built through the balance among multiple decision-making centres. In line with stakeholder theory (Freeman 1984; Donaldson, Preston 1995), the marketing process can be interpreted as a system of distributed value creation, in which multiple actors, internal and external, participate in the definition and implementation of decisions. In this sense, value is not maximised for a single stakeholder but emerges from the dynamic balance between often divergent interests, shifting marketing activities from customer-centric to human-centric/stakeholder-centric (Kotler, Kartajaya, Setiawan 2017). Consequently, in this dynamic, no choice is ever entirely right or wrong but may increase one actor's trust while simultaneously reducing another's. This introduces the concept of the distributional effects of decisions (Harrison, Bosse, Phillips 2010). Marketing activities as a negotiation process imply that the value of a market offering does not stem from a top-down decision but is constructed through conflict and mediation.

In the game, the initial briefing is deliberately contradictory, uncertain between a premium proposal and an accessible one. This simulates a typical reality: marketing does not always start from a clear strategy but navigates a conflict of visions (Mintzberg, Waters 1985). Being negotiative means that the player must continually mediate between seemingly incompatible objectives, build compromises acceptable to the conflicting parties, and translate different languages (finance, marketing, operations).

The cognitive mechanism activated by the game is geared toward developing sensemaking skills, that is, making sense of information that is inherently inconsistent. Sensemaking is the social and continuous process through which individuals and organisations construct meaning from their experiences, transforming chaos or ambiguity into structured realities (Weick 1995).

Furthermore, strategic framing skills are activated (clearly defining the problem before the solution). Strategic framing refers to the process through which organisational decision-makers interpret and define strategic situations, influencing possible courses of action (Kaplan 2008; Gavetti 2012). In line with the sensemaking perspective, such frames are not objective but socially constructed and often subject to competition among actors with differing perspectives. Finally, internal persuasion activities are stimulated (selling the strategy to stakeholders), based on the premise that a strategy's effectiveness does not depend solely on its analytical quality, but also on its ability to be 'sold' and legitimised within the organisation (Whittington 2006).

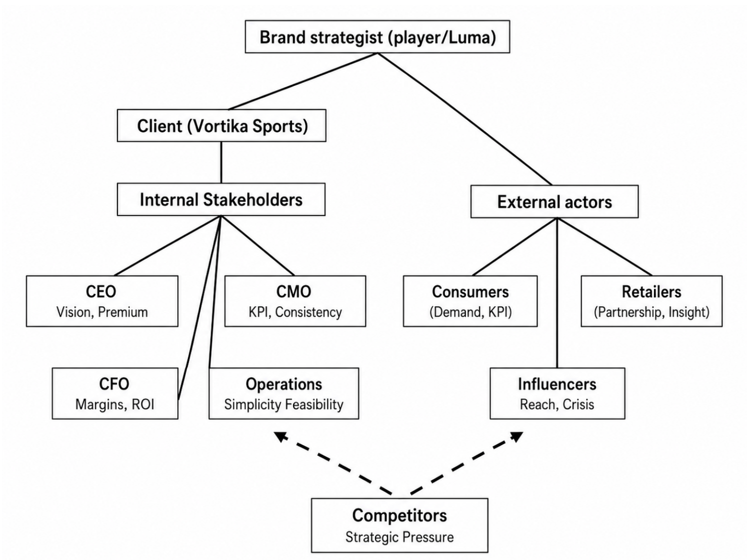


Figure 1 Concept map of the stakeholders involved

Taking a concrete example from the game: the CEO wants a premium offering, high margins, and strong branding; the CFO demands a high ROI and reduced financial risk; while the CMO aims for scalability of the offering and reaching a broad target audience. The player cannot satisfy everyone, so they must choose a coherent strategic narrative, justifying the exclusions and maintaining a minimum consensus that allows them to move forward smoothly with the proposal.

The formation of marketing decisions as a constrained process highlights how decisions occur under real constraints. The game introduces three fundamental constraints: a) time, 16 weeks for the entire launch and the typical pressure of 'time-to-market'; b) budget, €750,000 total, with trade-offs between activities (media, product, retail); incomplete information, fragmented market data, and the need to work with assumptions. These three aspects (multi-stakeholder, negotiation-based, and constrained) reflect the concept of bounded rationality (Simon 2000).

The player cannot perfectly optimise their game decisions but can only meet minimum criteria for sound decision-making and choose among imperfect alternatives. As a learning outcome, the player learns that more information does not eliminate uncertainty, that every decision has an opportunity cost to consider, and that global optimisation is impossible. Together, these three elements define marketing as a complex adaptive system, where decisions, constraints, and interests interact continuously.

In summary, the game's core dynamics include a) input data involving stakeholders with different objectives, limited resources, and incomplete information; b) a complex decision-making process (internal negotiation, consensus-building, strategic choice under constraints); c) a final output (market KPIs, trust level, project sustainability); and feedback activities, i.e., crisis events, adjustments, and strategic review.

In addition to explicit KPIs, the game assesses three implicit competencies related to strategic coherence, meaning that it is not enough to choose strong options; the chosen options must be consistent with one another. The player's ability to align, as their success depends on their skill in reducing internal conflicts and building trust. The management of uncertainty, since complete information does not exist and the process involves various hypotheses where quality matters.

The educational value of the simulation lies in the fact that it overturns the traditional view of marketing: it is not merely analysis and rational decision-making, but rather a social (multi-actor), political (negotiation), and constrained (limited resources) process. Success does not stem from the 'perfect strategy', but from the ability to balance divergent interests, build internal consensus, and maintain trust over time (Elliott, Percy, Pervan 2015).

7.3 The Game

The game consists of a total of seven main phases, played out over nine rounds, excluding unforeseen events that occur at various points, requiring the player to adjust their strategic path.

Round 1. Kick-off: In the initial round, the player must align stakeholder objectives by gathering information from the initial brief, which contains the client's requirements.

Round 2. Research: This round involves collecting both desk and field research data and analysing insights regarding potential customer targets and perceptions of the pricing for the products being launched.

Move 3. Analysis: This move gathers the information needed to choose among the usual three alternatives by analysing the TAM/SAM/SOM data, which are fundamental metrics for assessing a business's market size and potential. These refer respectively to: the Total Addressable Market (TAM), the Served Available Market (SAM), and the Serviceable and Obtainable Market (SOM); this phase also involves formulating a market segmentation proposal.

Move 4. Positioning: In this move, three positioning options are presented: the premium option with prices above the competitors' average; the accessible and essential "Sport for everyone, without frills" option; and the Barbell strategy, which combines extremely safe investments (85-90% of capital) with high-risk, high-return investments (10-15%), avoiding intermediate solutions.

Step 5. Brand Identity: In this step, the characteristics of the brand name and visual identity are defined, and legal constraints regarding the brand definition, specifically potential similarities with competing brands, are verified.

Step 6. Portfolio & Pricing: In this step, inventory risk related to the size of the product range is assessed, along with the identification of potential 'hero' products, their accessories, and the margins achievable from each solution.

Step 7. Go-to-Market: It is time to decide how to reach the market, whether digitally via e-commerce platforms, through traditional retail (perhaps by developing a shop-in-shop solution to increase visibility of the new offering), or through sponsorship of a sporting event linked to the product's performance.

Move 8. Test: In this phase, you must define the testing methodology for the brand launch, aiming to validate the accuracy of the market message and the target positioning on a limited scale to decide whether to proceed with the launch, modify certain elements, or halt the process.

Move 9. Launch: In this phase, you assess how to respond to a potential reputational crisis and proceed to monitor the various KPIs.

The educational value of the simulation is implicit in the game's structure, which clearly reflects the principles of experiential learning defined by Kolb (2015) in his four-phase pedagogical model, which describes learning as a continuous process in which knowledge is created through the transformation of experience: the participant acts (decisions), observes the effects (changes in Trust, Budget, KPIs), reflects (debrief), and reformulates strategies.

The most significant element is the presence of explicit trade-offs such as time versus quality, for example, holding an initial workshop versus starting immediately, the depth and accuracy of data versus the speed of decision-making, for example, desk research versus direct field research, and strategic consistency versus tactical opportunities that arise.

This allows for the development of critical and systemic thinking, because every choice has cascading effects (David 1985), a concept whereby past decisions, events, or preferences significantly limit and determine current and future options, simulating real-world consulting contexts.

The game reflects consistency with theoretical marketing models. The problem definition and alignment process reflect the concepts of problem framing and stakeholder management. As previously noted, the presence of a conflicting brief (CEO vs. CMO) is consistent with stakeholder alignment theory (Cleland, Ireland 2006). From an educational perspective, this is crucial because it highlights that the marketing problem is not given but constructed.

By delving deeper into the learning aspects of marketing, we can identify how the game influences learning across various core areas of the discipline. First, the skills that can be acquired in the field of marketing research, specifically, the fundamentals, are reflected in the choices between secondary data, qualitative data, and quantitative data, as well as in the trade-off between internal and external validity. The integration of qualitative and quantitative insights is then evaluated. The challenge posed by incomplete data simulates a real-world context of bounded rationality. Market segmentation and sizing are achieved using TAM/SAM/SOM in line with market sizing models (Ashdown, Loker 2010). Of particular interest is the introduction of different scenarios, specifically a conservative-prudent scenario, a medium-risk scenario, and an aggressive scenario. This draws on decision theory under uncertainty and the need for sensitivity to parameters, as explicitly requested by the CFO. Positioning policies and brand strategy involve three strategic options representing classic archetypes: "smart performance", attributable to differentiation strategies (Porter 1980); "Accessible & Essential", linked to cost/volume leadership strategies; and the "Barbell strategy", a hybrid solution with managerial complexity.

The conflict between distinctiveness and accessibility is central to branding decisions; in fact, an effective brand must balance salience (awareness) and meaning (brand meaning). In building brand identity and defining naming, constraints related to trademarks, digital availability, specifically the ability to secure a web domain consistent with the brand name, and competitive visual consistency come into play. From an educational perspective, this is useful because it links abstract strategy to legal and operational feasibility.

Regarding the product portfolio and pricing, the choices the player must make include focusing on a hero product that can drive sales of other complementary products, defining the breadth of the product range with the risks and benefits associated with expanding the product range, and the alternative of abandoning the project due to competitive weakness. These are aspects that reflect decisions regarding product strategy and assortment planning. The margin constraint (>55%) introduces a unit economics framework. Regarding Go-to-Market, the launch alternatives (digital-first, retail-led, event-centric) represent different models of channel strategy and customer acquisition, while the use of KPIs such as CAC (Customer Acquisition Cost), ROAS (Return On Advertising Spend), and CTR (Click-Through Rate) makes the link between marketing and financial performance explicit. Finally, market testing and brand launch reflect evidence-based marketing approaches. Random events (crises, delays, negative reviews) introduce dimensions of uncertainty management, crisis management, and the need for organisational agility.

The organisational and political dimensions of marketing activities are considered particularly realistic due to the presence of stakeholders with differing objectives: the CEO is driven by the company's medium-term vision and the ambition to achieve significant results; the CMO is guided by the need for consistency in marketing decisions relative to the company's positioning and by concerns regarding KPI evaluation; the CFO focuses on the size of achievable contribution margins and potential financial risk; while operations teams are concerned about the complexity that may arise from the preceding decisions. This simulates marketing as an intra-organisational and negotiation-based process, not a purely analytical one. The "Customer Trust" parameter is particularly interesting because it serves as a proxy for consulting credibility, highlighting that defining a good strategy is not enough, it must be accepted by stakeholders.

The scoring system combines market KPIs, the remaining resources available for each chosen activity, the customer trust rate, and adherence to defined timelines. This reflects a multi-criteria objective function, typical of real-world managerial decisions. The failure conditions (Trust < 30, Budget < 0, delay) introduce 'hard' constraints, consistent with the theory of operational constraints. The game's scoring system translates a typical problem of real-world management into a simplified form: deciding under conditions of bounded rationality with multiple objectives and rigid constraints.

This reflects a multi-criteria decision-making (MCDM) model (Zopounidis, Doumpos 2016), typical of real-world managerial contexts where there is not a single utility function, but multiple simultaneous and partially conflicting objectives. An example can be described as follows: maximising KPIs may require a larger budget, saving on the budget may reduce KPIs, and speeding up timelines may reduce strategic quality. The problem is not to optimise, but to balance the trade-offs.

The condition of bounded rationality stems from the fact that there is no absolute optimal solution. The system is built according to Simon's (2000) concept of bounded rationality. In the game, this aspect is reflected in certain constraints that the player must accept. First, the player does not have all the information they would like; they cannot foresee all the consequences of their decisions; they cannot simultaneously optimise all variables. Therefore, they do not obtain a 'perfect' solution, but a sufficiently satisfactory, coherent, and defensible solution vis-à-vis stakeholders. An important educational implication is that the game shifts the focus from 'what is the optimal choice?' to 'which choice is sustainable within the system of constraints?'

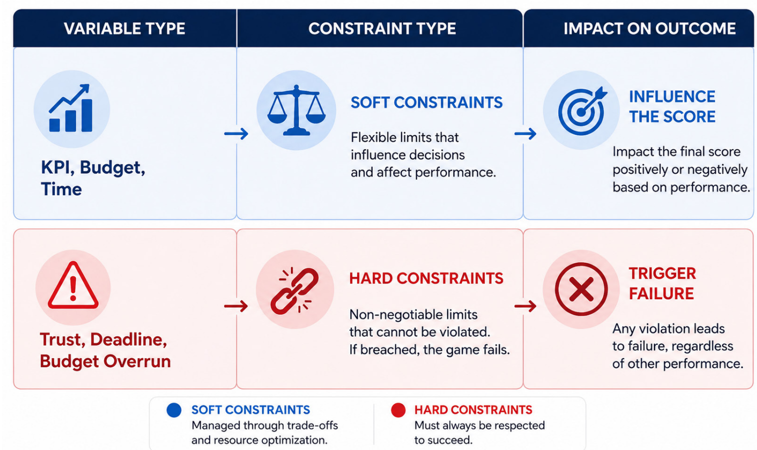


Figure 2 Types of constraints

The implicit scoring structure leads to the achievement of a dynamic equilibrium where the scoring system functions as a dynamic balance across four dimensions: market KPIs, trust from corporate stakeholders, available time, and remaining budget; these dimensions constantly vary due to the decisions the player makes. The key effect is that every decision shifts the system's equilibrium: greater investment leads to an increase in KPIs but a reduction in the available budget; faster decisions result in lower strategic quality; and an increase in the pursuit of stakeholder satisfaction and trust corresponds to a greater amount of time spent. The goal is therefore to find a balance among various competing forces.

Some constraints can be defined as 'hard', others as 'soft'. The former represent failure thresholds that must not be exceeded and correspond precisely to Trust < 30, Budget < 0, and Delay > 2 weeks. These are non-negotiable constraints. A system does not fail due to average performance, but due to the occurrence of critical bottlenecks (Goldratt 2004).

Figure 3 Dynamic equilibrium of decisions

The role of 'trust' as a strategic relational variable is perhaps the most interesting from an educational standpoint. In fact, it does not measure technical performance but refers to the credibility of the strategy proposed to the client, the resulting consistency among marketing decisions, as perceived by company stakeholders, and the management of stakeholder relationships itself. Trust functions as a metric of relational capital that encompasses reputation, organisational legitimacy, and trust in the consultant.

Thus, a project may achieve good or excellent KPIs but fail due to an insufficient level of trust, or it may achieve only average results but be barely accepted by stakeholders. This introduces the fundamental aspect that managerial success is not only about performance but also about legitimacy.

The scoring system integrates three fundamental theoretical levels:

1. Multi-objective optimisation (Chen 2024): there is not a single utility function, but multiple simultaneous objectives;
2. Bounded rationality (Simon 2000): decisions made with incomplete information and limited cognitive abilities;
3. Constraint theory (Cox, Schleier 2010): the presence of rigid constraints that determine the project's viability.

The scoring system transforms the game into a realistic simulation because it does not reward the 'optimal' solution so much as it rewards the systemic consistency of decisions and penalises the violation of critical constraints. In managerial terms, the winner is not the one who maximises a single variable, but the one who manages to keep the system in equilibrium under pressure. The presence of decision-making realism (constraints, conflicts, incomplete data), combined with the end-to-end integration of the marketing process, the development of cross-functional skills, and simple yet significant game mechanics, characterises the educational value of the game.

In particular, decision-making realism does not merely simulate 'what to do', but how to make decisions under imperfect conditions, which is the true managerial skill. In this way, students learn to make decisions without complete information (avoiding the 'perfect analysis' scenario), to manage ambiguity and contradictions, to define explicit trade-offs between the conflicting desires of the CEO, CFO, and CMO in a real conflict of interest, to evaluate the validity and usefulness of qualitative data versus quantitative data, and to manage the decision-making pressure imposed by time and budget constraints, thereby enabling the construction of a 'defensible decision'. The end-to-end integration of the marketing process, which avoids teaching isolated phases of the process (marketing research, branding, sales, distribution, etc.), is instead integrated into a single decision-making cycle that students must navigate. The game's design provides a comprehensive view of the problem at hand by presenting an ambiguous brief, incomplete marketing research data, the challenging choice between strategic alternatives, brand positioning, operational constraints on defining and managing the product portfolio, plan execution, and potential crises at the time of the new brand's launch. This fosters the development of systemic thinking, where one choice impacts others, and the ability to connect different decisions. For example, the strategic choice to position the brand in a premium segment impacts pricing decisions, target audience selection, and distribution channel choices. Students come to understand that marketing is not about 'running specific campaigns', but rather about making interconnected decisions. The development of cross-functional skills is a significant part of the game. It requires analytical skills, that is, the ability to interpret incomplete and contradictory data by distinguishing perceptions from facts and seeking the truth amidst differing opinions. For example, retailers may demand an innovative design deemed essential, while the panel highlights the importance of price. It develops synthesis skills, that is, the ability to reduce complexity into clear decisions that follow a strategic line of thinking derived from the analysis process and go beyond it. It also requires a willingness to negotiate among the various positions of corporate leadership, between the desire for growth, concerns about risk, and the demand for consistency, to find a credible compromise, in accordance with stakeholder management, which remains fundamental in real-world work. It requires an aptitude for risk management, that is, the ability to evaluate not only the opportunities arising from the available options but also the potential drawbacks, defining not what is best but what is sustainable given the context in which the player operates, and proposing decision-making under uncertainty.

The simple game mechanics work because they are easy to understand but difficult to optimise; this is exactly what is needed in education. Key resources (budget, time, client trust, and team morale) teach that every decision has a cost and that there are no free choices. The student learns that optimising one variable (e.g., KPI) can worsen another (e.g., trust or time). The concept of constraint is introduced as a strategic driver, not as a limit, but as part of the decision.

In summary, the game works because it combines realism, that is, it simulates real-world chaos, with structure; it guides the player through the game phase by phase, step by step; it imposes a continuous trade-off, introducing the concept that every choice has both positive and negative consequences. Its scope goes beyond a marketing game; it also serves as a managerial decision-making simulator. In fact, it presents the player with certain logical questions that transform the process from a simple, engaging experience into a more comprehensive and assessable educational tool:

1. What would you do differently?
2. Where did you take too much or too little risk?
3. The evaluation criteria are summarised in Figure 4, which lists the rating levels, a description of the rationale for each rating, and observable performance indicators. At the end, examples of final overall scores are provided, along with the option to evaluate quantitative KPIs.

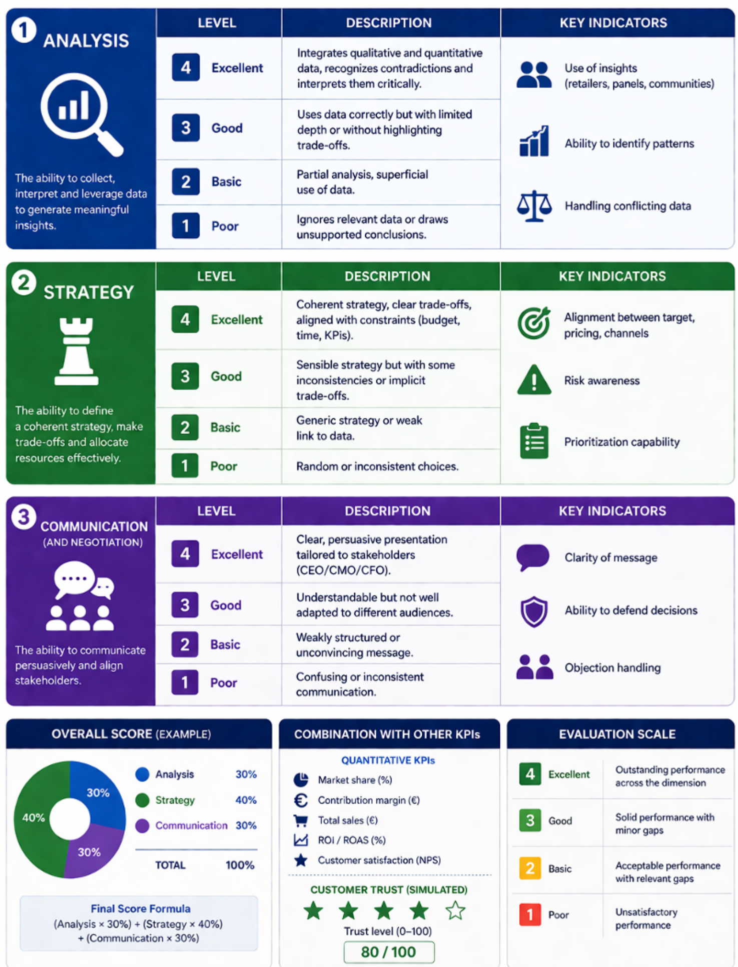


Figure 4 Evaluation rubrics

Structured debriefing sessions can also be incorporated, as they play a key role in transforming the game into deep learning. These debriefs should be scheduled after Step 3.2 (strategic decision-making), after Step 6 (GTM), and after Step 7.2 (brand launch and market crises), with a final debrief added at the end.

The structure of the debrief should remain simple yet meaningful, incorporating five key points. The first concerns the question “What would you do differently?” with the aim of fostering metacognition, that is, reflection on one’s own decisions, by posing guiding questions such as “Which decision would you make differently?”, “With the current information, would you change your strategy?", and "Did you underestimate any data?". The expected outcome of this process is to generate awareness of mistakes and the resulting ability to learn from experience.

The second concerns the question "Where did you take too much/too little risk?" and aims to develop risk management skills, suggesting guiding questions such as "Did you make overly conservative decisions?", "Where did you take excessive risks?", "Did you balance short-term vs. long-term well?".

The third concerns the question "What did you overlook?", with the goal of bringing to light decision-making biases the player encountered during the various phases. In this case, the guiding questions might be "What data did you not consider?", "Did you give more weight to qualitative or quantitative factors?", "Were you influenced by an opinion (e.g., CEO or CMO)?".

The fourth point involves the question "How did you manage stakeholders?", with the goal of developing interpersonal soft skills; the player should be asked "Did you favor anyone (CEO/CMO/CFO)?", "Were you able to mediate between the different positions?", "Did you lose someone's trust?".

The final point poses the question "What would you do in the next step?", with the goal of linking learning to action, by asking: "What is your next move?", "What would you change in the go-to-market strategy?", "How would you improve the KPIs achieved?".

In terms of how the debrief is conducted, several classroom options can also be considered:

- Option 1. A quick debrief (approx. 10-15 min) focused on two key questions: "What would you do differently?" and "Where did you take too much/too little risk?".
- Option 2. A more structured debrief (approx. 30 min), involving group discussions and a final report from each group presented to the whole class.
- Option 3. A written debrief of no more than two pages describing the main mistake the player believes they made during the game, the best choice made under conditions of incomplete information, what they would change about their approach, and why.

As we have seen, the game is designed to develop both hard skills, through data analysis and the development of a marketing strategy, and soft skills, which involve communication skills, the ability to negotiate between parties, and the need for decision-making. It also promotes the understanding and learning of meta-skills that are of considerable importance, such as the ability to learn from one's mistakes and to reason under conditions of uncertainty. Without rubrics, the game is more engaging, but without debriefing, the game becomes more superficial. With both, it can become a true simulator of managerial skills.

7.4 Limitations and Potential Improvements to the Simulation

From a scientific and educational perspective, several critical issues within the game can be identified. For example, the competitive complexity is greatly simplified; the market is, in fact, represented in a rather simplified manner, and the competitive response dynamics are missing. There is also a lack of long-term iterative learning, as KPIs are limited to 90 days and brand equity is not considered in the medium term. Consumer Behaviour is also simplified, since the model does not fully integrate the psychological variables implicit in the type of purchase, that is, motivations, deep-seated perceptions, and the psychological reasons behind responses to questions regarding purchasing Behaviour. There is also a risk of 'gamification bias', as players may seek to optimise their score rather than the strategic consistency of the decisions made.

The reduction of competitive complexity is a theoretical limitation, as the model represents the market in a partially exogenous and simplified form: competitors are present, but they do not fully play the role of strategic agents. In terms of economic and strategic theory, this means that the system is not a true dynamic oligopoly, but a simplified reactive environment. Consequently, it lacks competitors' response strategies, the condition of strategic interdependence among firms, and competitive response dynamics, such as a potential price war or strategic repositioning due to competitors' actions, as well as any actions to anticipate the predictable competitive response Behaviour of the competitors themselves.

The risk is that of an incomplete understanding of game theory as applied to marketing, both regarding the perception of competition as an iterative and adaptive process and the nature of markets' continuous evolutionary transformation. The player thus risks developing a one-sided view of market conditions, according to which the player's decisions determine the market, but the market does not think strategically and does not react competitively.

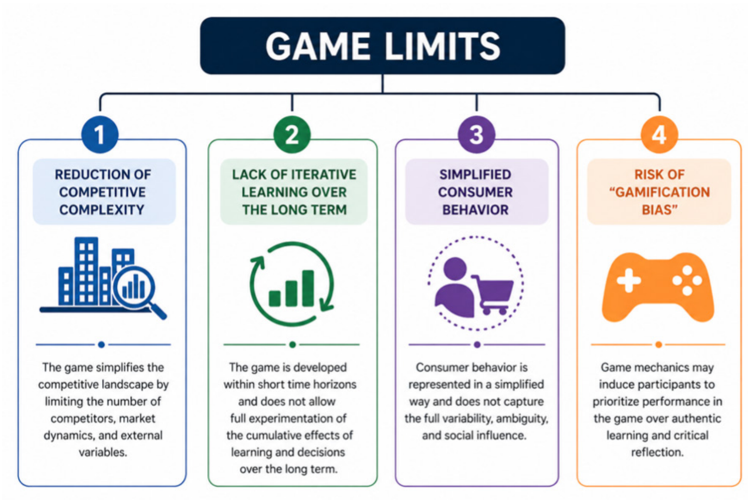


Figure 5 Main limitations of the game

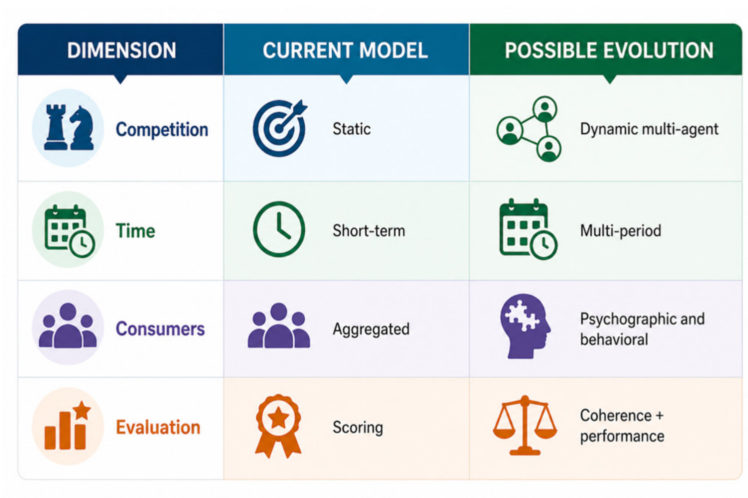
To increase realism, elements of market response and environmental dynamics could be introduced. For example, one might consider reactions from competitors using adaptive strategies that leverage the possibilities offered by artificial intelligence, response functions such as a reaction to a price change decided by the player, the dynamic evolution of market shares in response to different strategic decisions, and the entry or exit of competitors. In this way, the game model could incorporate dynamics that would make the game very realistic.

Long-term iterative learning is absent, since the system is focused, as mentioned, on a short time horizon, with KPIs primarily oriented toward immediate performance. Consequently, the fundamental dimension represented by the intertemporal dynamics of brand value, and thus brand equity, is missing. The structure of the gameplay highlights and incentivises the pursuit of short-term optimisation, places the focus on converting interest into purchases and immediate awareness, and ends up underestimating cumulative effects, thereby losing sight of the effects of brand reputation accumulation and the growth, or lack thereof, of customer loyalty.

In real-world marketing decisions and activities, many variables have delayed effects relative to the moment of decision, since the processes at work in the market and among consumers require learning curves and decision-making that takes time. These effects are cumulative in nature because they build up over time, producing results that are sometimes unexpected; they depend on the historical trajectory of decisions and competitive responses. The game, on the other hand, implicitly assumes a quasi-static relationship between action and outcome.

In a future iteration of the game, a dynamic brand equity index could be introduced, based on market responses, along with variable reputational effects driven by competitive Behaviours. This would provide the building blocks for a dynamic brand value model.

Consumer Behaviour is obviously simplified, modelled primarily as reactive to price and communication, and aggregated into quantitative KPIs. Therefore, there is a lack of representation of the cognitive, emotional, and symbolic dimensions of consumption. This limits the understanding of the intrinsic and extrinsic motivations of potential buyers, the effect of non-rational decision-making processes, and the effects of identity construction through brands. The consumer is implicitly treated as a fully rational agent with predictable Behaviour.



DIMENSION	CURRENT MODEL	POSSIBLE EVOLUTION
Competition	Static	Dynamic multi-agent
Time	Short-term	Multi-period
Consumers	Aggregated	Psychographic and behavioral
Evaluation	Scoring	Coherence + performance

Figure 6 Possible evolution of the game

In reality, consumer Behaviour is influenced by values and emotional reactions, by the social identity they wish to build or achieve through products and brands, and by the cultural context in which they are embedded (a game is planned that will propose variations in cultural contexts, simulating Vietnamese and Chinese contexts). Framing effects are present, whereby people react to the same information in different ways depending on how it is presented. Emphasising the positive aspects (benefits) rather than the negative ones (obstacles) influences decisions, even if the substance remains the same. The current model simplifies everything into a direct and simplified relationship between marketing inputs and a linear Behavioural output.

In a future edition, more advanced psychographic market segments (status-driven, community-driven, performance-driven), non-linear Behavioural models, and social effects in communication and purchasing Behaviour (virality, network effects) could be introduced.

As for the risk of 'gamification bias', the scoring system may encourage behaviour aimed at maximising the score rather than following an actual strategy, as Goodhart (2015) states: "When a measure becomes a target, it ceases to be a good measure". The risk is that the player will be inclined to choose options that 'optimise' the score, resulting in a failure to follow an acceptable strategic consistency, developing a 'game the system' mentality, thereby reducing the depth of marketing analysis, transforming the pursuit of logical managerial decisions into opportunistic decisions focused on the score rather than on market conditions that are gradually taking shape, and significantly distorting the objective of acquiring managerial competencies. The scoring system may also become too predictable, easily optimised, and insufficiently responsive to the pursuit of overall strategic quality.

To mitigate this issue, qualitative assessments based on stakeholder judgment can be introduced, along with qualitative KPIs that are partially hidden or made less obvious, emerging during the game, and penalties for strategically inconsistent decisions. This shifts the game toward an evaluation of strategic coherence rather than relying solely on a numerical score.

In conclusion, the simulation is effective as an introductory teaching tool because it simplifies the complexity of the real market, which would otherwise be excessive for the players' skill level, makes the strategic decisions required by the proposed marketing problem clear and emphasises the decision-making process and its progression as required. However, its ideal future development should move toward a more systemic, behavioural, and dynamic simulation, in which the market, consumers, and competitors evolve over time.

7.5 Learning by Playing

An analysis of the game *Sprinting to Brand* reveals it to be an educational tool for simulating marketing decision-making processes under conditions of organisational complexity, information uncertainty, and time constraints. The value of the simulation lies not only in its attempt to reproduce, in simplified form, the stages of launching a new brand, but also in its ability to translate into a learning experience some of the key tensions that characterise the contemporary marketing process: the multiplicity of stakeholders involved, the negotiation of divergent interests, and the need to make coherent decisions under constraints of time, budget, and internal legitimacy.

From this perspective, *Sprinting a Brand* aligns with a conception of marketing understood not as an isolated or merely technical-analytical function, but as a complex, cross-functional, and relational organisational process. The simulation highlights, in fact, that marketing decisions cannot be understood or evaluated exclusively in terms of instrumental effectiveness but must be situated within a system of interdependencies among internal and external stakeholders, each with different rationales, expectations, and evaluation criteria. In this sense, the game provides a stakeholder-oriented view of the decision-making process, in which strategic value emerges not from the maximisation of a single actor's interests, but from the construction of dynamic balances between objectives that are often partially conflicting.

Another key element is the portrayal of marketing activities as negotiation activities. The presence of ambiguous briefings, misaligned preferences, and structural trade-offs makes it clear that strategy formulation is not simply the outcome of a linear analytical process, but the product of practices of interpretation, framing, and mediation. The game, therefore, is not exclusively geared toward testing prior disciplinary knowledge, but rather encourages the development of cognitive and organisational skills, such as sensemaking, defining the strategic problem, the ability to argue a case, and building internal consensus. From this perspective, it helps shift the educational focus from seeking the 'optimal' choice to constructing sustainable, coherent, and justifiable decisions, that is, the 'possible' choice.

The centrality assigned to constraints also appears significant. Limited time, a defined budget, the incompleteness of available data, and the presence of critical failure thresholds create a decision-making environment compatible with the notion of bounded rationality. The player does not operate under conditions of full information, nor can they pursue a logic of absolute optimisation; on the contrary, they are called upon to identify satisfactory solutions within a system of multiple and interdependent constraints. The simulation thus succeeds in representing one of the most realistic dimensions of management: the need to decide under imperfect conditions, assuming opportunity costs, accepting margins of uncertainty, and preserving the overall balance of the decision-making system.

The game serves as a tool well-suited for the simultaneous development of hard skills, soft skills, and meta-skills. In terms of subject-specific skills, it allows participants to apply classic models of market research, market sizing, segmentation, positioning, brand strategy, channel strategy, and performance measurement.

In terms of transferable skills, it trains participants in synthesis, negotiation, stakeholder management, risk assessment, and strategic communication. Finally, it fosters self-reflection, learning from mistakes, and the ability to reason in highly ambiguous contexts. It is precisely this multi-level nature of learning that makes the simulation a particularly valuable tool not only for teaching marketing but for managerial training in a broader sense.

Within this framework, debriefing plays a decisive role. Simulation, in fact, fosters deep learning only to the extent that the experience is subsequently subjected to a process of critical reflection, verbalisation, and re-elaboration. Questions regarding what the participant would do differently, the risks taken, the data overlooked, stakeholder management, and subsequent moves are not merely a complement to the game but an essential component of its pedagogical framework. For this reason, the integration of the game, evaluation rubrics, and structured moments of reflection is a central condition for the full scientific and educational value of the tool.

In conclusion, Sprinting a Brand seeks to combine conceptual rigor, educational applicability, and managerial relevance. Its intent is to bring to the fore not so much the total complexity of reality as its most formative underlying tensions: ambiguity, constraints, interdependence, conflict of interest, the partial irreversibility of choices, and the need for internal legitimacy.

It can therefore be concluded that the simulation's main contribution lies in its attempt to promote a form of learning that integrates theory, action, and critical reflection. In this way, Sprinting a Brand does not merely support the understanding of marketing tools and models, but seeks to contribute to the development of managerial judgment, preparing participants to operate in real-world contexts characterised by complexity, decision-making pressure, and a plurality of success criteria.

7.6 A Game-Based Simulation of International Human Resource Management

This game-based simulation is designed to support learning in International Human Resource Management (IHRM) through an interactive and experiential approach. Participants are immersed in realistic international HR scenarios that require analysis, decision-making, and reflection on outcomes.

The simulation is organised into five modules, whose development corresponds to progressively increasing levels of complexity. Each module addresses a specific theme in international personnel management and is designed to build on the knowledge and skills acquired in previous stages. All modules are developed in HTML format and are downloadable, allowing participants to access the materials offline and review them at their own pace.

In several exercises, participants are asked to make decisions based on a reference model that is provided and made available for download. In other cases, they are confronted with an open-ended problem, requiring them to identify, compare, and justify alternative solutions. The decisions taken by players are evaluated in terms of their correctness and consistency with international HRM principles.

Each decision generates a score, which contributes to an overall performance assessment and supports the certification of learning outcomes. Scores are collected and processed anonymously and are used not only for individual feedback, but also to construct an aggregated learning scenario that reflects patterns, strengths, and areas for improvement across the entire population of players.

Through its modular structure, increasing complexity, and data-driven feedback system, the simulation promotes active learning, self-assessment, and a deeper understanding of International Human Resource Management in a global context.

The game-based simulation integrates a structured learning analytics framework that aims to monitor, evaluate, and interpret the learning processes and results of participants in International Human Resource Management (IHRM).

At the individual level, learning analytics are based on the decisions made by participants during the simulation. Each exercise requires players to select or propose solutions to HR-related problems. These decisions are mapped to predefined evaluation criteria derived from established IHRM models and best practices. The resulting assessments generate quantitative scores that reflect the degree of alignment between participants' choices and theoretically or empirically grounded solutions.

At the system level, all performance data are collected, stored, and processed in anonymised form. No personally identifiable information is used in the analytical process. This ensures compliance with ethical standards and data protection regulations, while allowing the aggregation of results across the full population of players.

Aggregated data are used to construct a population-level learning scenario, which enables the analysis of learning patterns across modules and levels of complexity. In particular, the analytics framework supports:

- the identification of common decision paths and recurring errors;
- the assessment of learning progression across modules with increasing complexity;
- the comparison of performance across different types of exercises (model-based vs. problem-based);

- the evaluation of the overall effectiveness of specific modules and learning designs.

The learning analytics outputs serve both formative and summative purposes. Formatively, they provide feedback for the iterative improvement of the simulation design, module content, and difficulty calibration; They support the certification of learning outcomes, ensuring that performance scores are grounded in transparent and replicable evaluation criteria. Overall, the learning analytics component transforms gameplay data into actionable insights, enhancing the pedagogical value of the simulation and supporting evidence-based evaluation of learning in International HRM Collaborative Learning and Group-Based Simulation In addition to individual gameplay, the simulation includes a dedicated component that supports collaborative learning in small groups. Participants are given the opportunity to compare perspectives, discuss decision options, and collectively reflect on the implications of alternative HR strategies in an international context. To facilitate group-based activities, an ad hoc version of the simulation is made available for use in teamwork settings. This version is specifically designed to support collective decision-making, enabling groups to engage with the same scenarios while negotiating and justifying shared solutions. The structure of the group version allows instructors to integrate the simulation into classroom-based workshops, seminars, or project work where collaboration is a core learning objective. From a methodological perspective, group interaction is treated as a complementary learning dimension rather than a substitute for individual assessment. Group-level decisions can be analysed to identify patterns of collective reasoning, convergence or divergence of viewpoints, and the impact of discussion on decision quality. When learning analytics are applied to group activities, data are processed in aggregated and anonymised form, ensuring consistency with ethical and data protection standards. The inclusion of a group-based simulation mode enhances the pedagogical value of the tool by promoting peer learning, critical discussion, and shared sense-making, which are particularly relevant for International Human Resource Management, where decisions often emerge from collective processes and cross-functional collaboration.

7.7 Collaborative and Collective Learning

The group-based version of the simulation is grounded in established theories of collaborative and collective learning, which emphasise learning as a socially situated and co-constructed process. According to social constructivist perspectives, knowledge emerges through interaction, dialogue, and the negotiation of meaning among learners rather than through individual cognition alone. This theoretical orientation is particularly relevant in the field of International Human Resource Management, where decision-making typically involves multiple stakeholders and diverse cultural viewpoints.

Within the simulation, collaborative learning is operationalised through small-group interaction, where participants jointly analyse scenarios, exchange interpretations, and deliberate on alternative courses of action. These interactions support the development of higher-order cognitive skills, such as critical thinking, perspective-taking, and integrative problem-solving. The requirement to articulate and justify decisions within the group further reinforces reflective learning and conceptual understanding.

The simulation also incorporates elements of collective learning, understood as the capacity of a group to develop shared knowledge structures that go beyond the sum of individual contributions. Through repeated engagement with complex scenarios and feedback mechanisms, groups progressively align their interpretations and decision criteria, leading to more coherent and informed collective outcomes. This process mirrors real-world organisational learning dynamics in international contexts.

From an instructional design perspective, the availability of an ad hoc group version of the simulation enables educators to intentionally scaffold collaborative processes. By structuring tasks, roles, and decision points, instructors can foster productive interaction and guide groups toward effective knowledge co-construction. Learning analytics applied to group-level performance further support this approach by making visible patterns of collective reasoning and learning progression.

Overall, the integration of collaborative and collective learning theory provides a robust conceptual foundation for the group-based simulation. It reinforces the alignment between the pedagogical design of the tool and the social, interactive nature of international human resource management practice.

7.7.1 The Strategic Relevance of Staffing and Candidate Evaluation in International Organisations

Personnel selection and staffing represent a core process in Human Resource Management, as they directly shape the alignment between individual characteristics and organisational needs. Effective staffing requires the systematic evaluation of candidates' skills, competencies, values, and behavioural tendencies in relation to the strategic objectives, structure, and culture of the organisation. The quality of this matching process has long-term implications for individual performance, organisational effectiveness, and workforce stability.

In international organisations, the relevance of staffing processes is further amplified. Firms operating across national borders face higher levels of complexity due to cultural diversity, institutional differences, and geographically dispersed operations. As a result, selecting the right candidates, particularly for international assignments or globally integrated roles, becomes a high-impact decision with significant economic consequences. Poor staffing decisions can generate substantial direct costs (e.g., recruitment, relocation, training, and turnover) as well as indirect costs related to underperformance, coordination failures, and reputational damage.

Beyond economic considerations, staffing and candidate evaluation play a critical role in shaping employee motivation and work-related behaviour. When individuals perceive a strong fit between their personal characteristics and job requirements, they are more likely to demonstrate engagement, commitment, and adaptive behaviour. Conversely, misalignment can lead to stress, reduced motivation, and dysfunctional behaviours, particularly in international contexts where ambiguity and adjustment demands are high.

For these reasons, staffing in international companies is not merely an administrative activity, but a strategic and behavioural process. It influences how employees interpret organisational expectations, respond to cross-cultural challenges, and contribute to collective goals. By integrating staffing and candidate evaluation into the simulation, participants are encouraged to appreciate the multifaceted nature of selection decisions and to understand their economic, motivational, and behavioural implications in global organisations.

7.7.2 People Strategy and Its Relationship with Staffing and Talent Management

People strategy can be defined as the coherent set of principles, priorities, and choices through which an organisation aligns the management of its human resources with its overall business strategy. It expresses how an organisation intends to attract, develop, motivate, and retain people in order to achieve sustainable competitive advantage. Unlike isolated HR practices, people strategy provides a long-term, integrative perspective, linking individual-level processes to organisational goals and values.

Within this strategic framework, staffing and talent management represent two closely interconnected and mutually reinforcing processes. Staffing concerns the acquisition of human resources through recruitment, selection, and placement decisions, while talent management focuses on the identification, development, deployment, and retention of individuals with critical skills and high potential. Both processes are central mechanisms through which people strategy is translated into operational reality.

From a strategic perspective, staffing decisions are not neutral or purely technical. Choices about whom to hire, for which roles, and at which career stage directly reflect underlying assumptions about the type of workforce the organisation seeks to build. For example, a people strategy oriented toward innovation and adaptability will prioritise candidates with learning agility, openness to change, and cross-functional skills. Conversely, a strategy emphasising efficiency and standardisation may focus more strongly on role-specific competencies and procedural reliability. In this sense, staffing acts as a gatekeeping function, shaping the human capital available to the organisation over time.

Talent management builds upon these initial staffing decisions by determining how selected individuals are nurtured and leveraged within the organisation. A coherent people strategy ensures consistency between who is hired and how talent is subsequently developed and rewarded. Misalignment between staffing and talent management, for instance, hiring for creativity but promoting conformity, can undermine employee motivation, weaken performance, and erode trust in organisational systems.

The relationship between people strategy, staffing, and talent management becomes even more critical in international organisations. Global firms must reconcile the need for strategic coherence with sensitivity to local labour markets, cultural expectations, and institutional constraints. Decisions about staffing expatriates, developing global leaders, or building local talent pipelines reflect broader people strategy choices regarding standardisation versus differentiation, centralisation versus decentralisation, and short-term performance versus long-term capability building.

From an economic standpoint, people strategy provides a framework for managing the cost–value trade-off inherent in staffing and talent decisions. Investments in recruitment, assessment, training, and development are justified not only by immediate performance outcomes but also by their contribution to long-term organisational learning and resilience. Poorly articulated or inconsistently implemented people strategies increase the risk of costly mismatches, high turnover, and underutilisation of talent, risks that are magnified in international contexts due to higher coordination and adjustment costs.

Equally important are the motivational and behavioural implications of the alignment between people strategy, staffing, and talent management. Employees interpret staffing and promotion decisions as signals of what the organisation truly values. When these signals are consistent with the declared people strategy, they foster perceptions of fairness, clarity, and psychological contract fulfilment. When inconsistencies arise, they may generate cynicism, disengagement, and counterproductive behaviours.

In this light, staffing and talent management should be understood not merely as functional HR processes, but as strategic levers that shape organisational culture, behaviour, and identity. A well-defined people strategy provides the guiding logic that connects individual characteristics and aspirations with organisational needs and long-term objectives. By making these connections explicit, organisations, and learners engaging with the simulation, can better understand how human resource decisions contribute to both performance and sustainability.

Within the simulation context, this strategic perspective encourages participants to move beyond short-term, isolated decision-making. Instead, they are invited to reflect on how staffing and talent management choices accumulate over time, reinforcing or undermining the intended people strategy and, ultimately, the effectiveness of the organisation in a complex international environment.

People strategy can be defined as the coherent set of principles, priorities, and managerial choices through which an organisation aligns the management of its human resources with its overall business strategy. Within the field of Strategic Human Resource Management (SHRM), people strategy represents the mechanism through which HR practices are vertically aligned with organisational objectives and horizontally integrated with one another. Rather than viewing HR activities as isolated functions, SHRM emphasises their systemic and long-term impact on organisational performance.

From the perspective of the Resource-Based View (RBV) of the firm, human resources constitute a critical source of sustainable competitive advantage when they are valuable, rare, difficult to imitate, and effectively organised. People strategy plays a central role in shaping these conditions by determining how human capital is acquired, developed, and deployed. Staffing and talent management are therefore not operational decisions alone, but strategic investments that influence the quality and uniqueness of the organisation's human resource base.

Within this framework, staffing functions as a strategic entry point. Recruitment and selection decisions determine which forms of human capital enter the organisation and set the boundaries of future capability development. A people strategy oriented toward innovation, international growth, or knowledge integration will emphasise selection criteria such as learning agility, cultural intelligence, and collaborative orientation. Conversely, strategies focused on efficiency or reliability may prioritise standardisation, technical specialisation, and procedural compliance. In RBV terms, staffing decisions shape the initial endowment of human capital on which competitive advantage is built.

Talent management extends this strategic logic over time. Drawing on Human Capital Theory, talent management can be understood as a process of enhancing the productive value of individuals through targeted investments in training, development, and career opportunities. A coherent people strategy ensures that these investments are aligned with both individual potential and organisational priorities, thereby maximising returns on human capital investments. Inconsistent or fragmented approaches, by contrast, risk underutilising talent and eroding the value created through staffing.

The strategic interdependence between staffing and talent management becomes particularly salient in international organisations. Global firms operate in environments characterised by institutional diversity, cultural complexity, and heightened uncertainty. From a SHRM perspective, people strategy provides the guiding framework for managing these tensions, balancing global integration with local responsiveness. Staffing choices related to expatriation, global leadership pipelines, or local talent development reflect deeper strategic assumptions about control, knowledge transfer, and long-term capability building.

Economic considerations further reinforce the strategic nature of these processes. In line with Human Capital Theory, investments in selection and development generate costs in the short term but create value through improved performance, reduced turnover, and enhanced adaptability. In international contexts, the financial consequences of poor staffing or weak talent management are magnified due to relocation costs, adjustment failures, and coordination inefficiencies. A clearly articulated people strategy helps organisations manage these risks by providing consistency and strategic direction.

Equally important are the behavioural and motivational implications emphasised in SHRM research. Employees interpret staffing, promotion, and development decisions as signals of organisational values and priorities. When these signals are aligned with the stated people strategy, they foster perceptions of fairness, commitment, and psychological contract fulfilment. When misaligned, they may generate disengagement, reduced motivation, and counterproductive behaviours, outcomes that undermine the very human capital advantages the organisation seeks to build.

Taken together, Strategic HRM, the Resource-Based View, and Human Capital Theory provide a robust conceptual foundation for understanding the relationship between people strategy, staffing, and talent management. These perspectives highlight how HR decisions accumulate over time to shape organisational capabilities, employee behaviour, and competitive advantage. Within the simulation, this theoretical integration encourages participants to approach staffing and talent management not as isolated choices, but as interconnected strategic levers with long-term organisational consequences in a complex international environment.

7.7.3 People Strategy, Staffing, and Talent Management in International HRM

People Strategy People strategy refers to the set of long-term choices through which an organisation aligns the management of its workforce with its business strategy. In Strategic Human Resource Management (SHRM), people strategy ensures: Vertical alignment: HR practices support organisational goals; Horizontal alignment: HR practices (staffing, development, rewards) are mutually consistent.

Staffing as a Strategic Lever From the Resource-Based View (RBV), human resources can create sustainable competitive advantage when they are valuable, rare, difficult to imitate, and well organised. Staffing decisions determine who enters the organisation.

Key Question for Players: Selection criteria shape the organisation's future capabilities (e.g., innovation, adaptability, global coordination). Key Question for Players: Does your staffing decision contribute to building a distinctive and valuable human capital base?

Talent Management and Human Capital According to Human Capital Theory, employees' skills and competencies are assets that generate value when organisations invest in their development.

Talent management includes identification, development, deployment, and retention of high-potential employees. Coherence between staffing and development increases the return on human capital investments.

Key Question for Players: Are development and career decisions consistent with the characteristics of the people you selected?

Higher economic impact (recruitment, training, relocation, turnover costs): Stronger behavioural consequences (motivation, engagement, adjustment); Strategic relevance for global integration and local responsiveness.

Key Question for Players: How do cultural, institutional, and organisational factors influence the effectiveness of your HR decisions?

7.7.4 Learning Analytics and Scoring Logic in the Game-Based Simulation

The game-based simulation is designed to transform players' decisions into meaningful evidence of learning through a structured learning analytics and scoring system. Rather than evaluating isolated answers, the system captures how participants reason, adapt, and integrate decisions over time, particularly in complex areas such as the management of international teams.

At the core of the simulation, each decision made by a player (or group) is mapped against a set of reference criteria derived from international HRM theory and best practices. Decisions are evaluated along multiple dimensions, reflecting not only correctness, but also strategic coherence and behavioural awareness. Each decision generates a partial score, and the aggregation of these scores over time forms the basis of both feedback and certification of learning outcomes.

A first layer of scoring focuses on decision quality. When players are presented with a scenario, such as managing conflict in an international team or designing coordination mechanisms across countries, their chosen action is compared with a benchmark solution.

Decisions that are fully consistent with the underlying model or best practice receive the maximum score (e.g., 3 points). Partially appropriate decisions receive an intermediate score (e.g., 1-2 points), reflecting awareness of the problem but incomplete alignment. Inappropriate or counterproductive decisions receive zero or negative points, particularly when they increase conflict, undermine trust, or ignore contextual constraints. Beyond single decisions, the simulation evaluates strategic consistency over time. Players are rewarded not only for making good choices, but for making choices that fit together coherently. For example, a staffing decision that emphasises diversity and collaboration should be followed by leadership and coordination practices that support integration.

Consistent decision patterns across scenarios generate bonus points for strategic alignment, while contradictory decisions, for example, selecting for autonomy but managing through rigid control, reduce the cumulative score, even when individual decisions are acceptable in isolation. In the international team management module, particular attention is given to conflict management. The scoring system distinguishes between task conflict and relationship conflict and evaluates how players intervene. Preventive and proportionate interventions that preserve collaboration while encouraging constructive debate are scored highly. Escalation of relationship conflict, avoidance of critical issues, or culturally insensitive responses lead to penalties, reflecting their negative impact on team performance. Another key dimension concerns integration and coordination in global teams. Players receive higher scores when their decisions balance global consistency with local responsiveness, clarify roles, and support communication across time zones and cultures. Over-standardisation or excessive decentralisation, when misaligned with the scenario, results in lower scores, signalling coordination inefficiencies. The scoring system also captures learning progression: early mistakes are not automatically penalised if players demonstrate improvement over time. Evidence of adaptation, such as changing strategies after feedback or avoiding repeated errors, generates progression points that reward learning rather than perfection, while repeated ineffective choices lead to declining marginal scores. In the group-based version of the simulation, scores can be generated at both individual and collective levels. Groups that converge toward well-reasoned shared solutions receive higher collective scores, while persistent disagreement without resolution, or dominance by a single perspective, reduces the group score. When reflective explanations are required, metacognitive scoring is applied: players who clearly justify their decisions and link them to strategic objectives receive additional points. Overall, the scoring system is designed to reflect the strategic, behavioural, and organisational complexity of International Human Resource Management, ensuring that high performance corresponds to deep, transferable understanding rather than short-term optimisation.

7.7.5 Fun and Difficulty Level

One of the central challenges in video game design is to sustain player enjoyment without allowing the experience to become either excessively easy or unnecessarily difficult. Engagement depends on a dynamic relationship among fantasy, curiosity, control, and challenge. When these elements are well balanced, players are more likely to remain immersed, motivated, and emotionally involved in the game experience. When this balance is disrupted, however, enjoyment may decline rapidly. Challenge is especially difficult to regulate because the appropriate level of difficulty is never fixed. It changes as players learn the mechanics of the game, improve their skills, encounter failure, revise their strategies, and become more familiar with the logic of the environment. Traditional difficulty settings are limited in this respect, even when they offer multiple levels. A fixed difficulty curve may frustrate players who progress more slowly than expected, while leaving more skilled or faster-learning players insufficiently challenged. Similarly, requiring players to adjust the difficulty manually may interrupt immersion and make the experience feel artificial. Dynamic Difficulty Adjustment (DDA), responds to these limitations by enabling games to adapt difficulty continuously and more subtly during play.

DDA can be understood as an AI-supported design approach through which a game modifies its parameters, systems, or agent behaviours in real time on the basis of the player's observed performance. Instead of treating difficulty as a fixed choice made before gameplay begins, DDA treats it as a variable that can be recalibrated throughout the experience. The system evaluates the player's performance in relation to an expected or desired baseline and then adjusts the game in order to keep the player within an appropriate zone of challenge. This principle is closely connected to Csíkszentmihályi's concept of flow, according to which task difficulty and individual ability must remain sufficiently balanced to support concentration, confidence, and motivation. For DDA to be effective, however, the system must be able to estimate the player's current skill level, detect changes in that skill over time, and adjust difficulty in a way that does not appear intrusive, arbitrary, or manipulative.

A central component of DDA is the meaningful measurement of player performance. One possible approach is to compare the player's current number of successful actions with an ideal reference value over a defined period of time. This comparison allows the system to produce a normalised estimate of difficulty, which may also be paired with an inverse measure of ease. If the resulting value remains within a desired range, the game can interpret the current level of difficulty as appropriate. If it falls outside that range, the system may intervene by increasing or decreasing the level of challenge. A broader proficiency score can also be constructed by combining several performance indicators, either through simple averaging or through weighted aggregation, depending on the relative importance assigned to each indicator.

A second approach evaluates performance by comparing the player's actions with an expected value at a specific point in the game. This makes it possible to determine whether the player is performing above expectations, below expectations, or in line with them. On the basis of this comparison, the game may modify variables such as enemy strength, resource availability, pacing, or the behaviour of non-player characters. In more advanced systems, this process can be supported by adaptive agents that learn from player behaviour and modify their strategies accordingly. Such agents must be efficient enough to learn from a limited number of encounters, rather than requiring extensive training time. They must also be interpretable, since developers need to understand why the system generates particular behaviours. Variety is equally important, because adaptive agents should not become repetitive or predictable. At the same time, they must remain consistent across different players and scalable enough to respond to a wide range of skill levels.

Fully adaptive AI, however, can create design problems if its only objective is to improve its own performance. If the AI becomes too effective, it may defeat the player too consistently and therefore undermine the very purpose of DDA. The goal of DDA is not to maximise AI success, but to preserve an engaging and balanced level of challenge. For this reason, developers may introduce specific constraints on adaptation. Weight clipping, for example, limits the maximum value assigned to a rule, preventing any single strategy from becoming excessively dominant. Top culling operates in a similar manner by allowing weights to increase while excluding rules that exceed a specified threshold from being selected. These techniques help prevent the AI from becoming overwhelmingly efficient and preserve the player's possibility of success.

Another possible adjustment is the introduction of an 'adrenaline rush' mechanism, which takes into account the fact that players often improve rapidly at the beginning of a session and more gradually later on. To reflect this learning pattern, the system can limit how aggressively it updates rule weights. If the player's improvement falls below a certain threshold, the AI's adaptation rate can be reduced so that it does not outpace the player too quickly. The fitness function can also be redesigned. Rather than rewarding the AI for maximising its own performance, the system can reward behaviours that reduce the gap between the AI and the player. In this way, adaptation is directed toward balanced competition rather than toward the simple increase of AI victory.

Dynamic Difficulty Adjustment can therefore be understood as a design strategy aimed at sustaining player engagement through continuous and individualised adaptation. Its implementation normally involves two closely connected stages: measuring the player's proficiency through gameplay data and adjusting game parameters or agent behaviours in response to that measurement. Both stages require careful data collection, mathematical modelling, and design judgement. When implemented effectively, DDA can maintain motivation by keeping challenge within a rewarding range. When implemented poorly, it can produce abrupt changes in difficulty, reduce player trust, or impose unnecessary computational demands on the game engine. For this reason, DDA requires not only technical sophistication, but also careful planning, testing, and sensitivity to the player's experience (Sepulveda, Caro, Fernández 2019).

8 AI-Enhanced Gaming and Learning
Future Directions in International Education

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8.1 Game-Based Learning and the Motivational Architecture of Experience

The preceding chapters have traced the conceptual foundations of game-based learning (Chapter 1), the internal architecture of play as a learning system (Chapter 2), the role of digital games and artificial intelligence in contemporary educational environments (Chapter 3), the relationship between prior knowledge and game design (Chapter 4), the dynamics of cooperation and competition (Chapter 5), the principles of evaluation and educational quality (Chapter 6), and the application of simulation to management education in cross-cultural contexts (Chapter 7). This concluding chapter brings these threads together and projects them forward, situating the gaming and learning paradigm within the wider transformation created by generative AI and the demands of international and global education.

Game-based learning adds to simulation a distinctive formal and motivational architecture. Games organise experience through rules, goals, constraints, uncertainty, feedback, challenge, and meaningful choice (Salen, Zimmerman 2004). In educational settings, these features can support learning when they are aligned with the knowledge, competences, and forms of judgement that the activity is intended to cultivate. The influential model proposed by Garris, Ahlers, and Driskell (2002) remains useful because it describes learning games as recursive cycles in which user judgements shape behaviour, behaviour produces system feedback, and feedback sustains engagement, adaptation, and learning.

The educational challenge is not to decorate content with points, badges, levels, or competitive rankings. Such devices may generate short-term activation, but they do not necessarily produce conceptual depth or transferable competence. A game becomes educationally meaningful when its mechanics embody the epistemic structure of the domain. In other words, the rules of the game should require learners to reason in the manner demanded by the target practice. Game design is therefore not ornamental but epistemic: it organises what counts as information, which actions are possible, how consequences become visible, and what forms of strategy, cooperation, interpretation, or judgement are rewarded.

The motivational force of game-based learning can be clarified through established theories of motivation and engagement. Csíkszentmihályi's concept of flow emphasises the need to balance challenge and perceived competence so that learners remain engaged without becoming either bored or overwhelmed (Csíkszentmihályi 1990). Self-determination theory identifies autonomy, competence, and relatedness as core conditions for intrinsic motivation (Ryan, Deci 2000). Effective educational games translate these principles into design: they provide learners with agency, intelligible progress, informative feedback, opportunities for mastery, and social or narrative contexts that make effort meaningful.

8.2 The Learning Paradigm: Experiential, Algorithmic, Adaptive, and Reflective

The contemporary development of simulation and game-based learning is inseparable from technological innovation. Earlier simulations were often static, manually facilitated, and constrained by the designer's ability to anticipate scenarios. Digital technologies expanded their interactivity, scalability, distribution, visualisation, and capacity for data capture. Algorithmic systems subsequently made possible rule-based adaptation, procedural generation, scoring models, automated feedback, trace analytics, and increasingly sophisticated representations of learner activity. Artificial intelligence extends these capacities by enabling simulations and games to become more responsive, personalised, conversational, and partially generative.

Adaptive algorithms can modify the experience in response to learner behaviour. Dynamic difficulty adjustment can keep the learner within a productive zone between boredom and anxiety; learner modelling can identify strengths, weaknesses, misconceptions, and decision patterns; learning analytics can trace not only final performance but also process indicators such as hesitation, exploration, repeated errors, strategy shifts, collaboration patterns, and response to feedback. Intelligent agents can function as competitors, collaborators, tutors, customers, patients, managers, employees, institutional actors, or stakeholders within a simulation. Generative AI can support scenario variation, dialogue generation, narrative branching, feedback explanation, and contextual elaboration (Chiotaki, Poulopoulos, Karpouzis 2023; Moon et al. 2025; Tan et al. 2025).

Recent reviews of adaptive game-based learning and AI-enabled educational systems indicate that personalisation, intelligent feedback, learning analytics, and adaptive pathways are becoming central features of the field (Chiotaki, Poulopoulos, Karpouzis 2023; Tan et al. 2025). Generative AI is particularly significant because it can make educational simulations less static and more variable, conversational, and responsive to learner choices (Moon et al. 2025). These affordances, however, also introduce risks: opacity, bias, hallucination, excessive automation, privacy exposure, and the possible substitution of automated output for learners' cognitive effort. AI should therefore be treated as an amplifier of pedagogical design, not as a replacement for it (UNESCO 2023).

The resulting paradigm may be described as experiential, algorithmic, adaptive, and reflective. It is experiential because learning occurs through action within a meaningful environment. It is algorithmic because the environment is governed by formal rules, computational models, data structures, and decision logics that generate consequences. It is adaptive because the experience can be modified in response to learner behaviour. It is reflective because the educational value of action depends on learners' ability to interpret what happened and connect it with conceptual understanding. This paradigm does not reject theory, explanation, or content; rather, it changes their role. Theory is activated, content is situated, and explanation is integrated into cycles of experience and reflection.

A further distinctive feature of this paradigm is its treatment of error. In conventional assessment, error is often framed as a deficit to be corrected. In simulation-based learning, error becomes evidence: it reveals assumptions, partial understandings, cognitive shortcuts, coordination failures, and misreadings of the environment. Because the simulated setting is protected, error can be examined without the full consequences of real-world failure. For this reason, simulation is especially valuable for cultivating judgement, not merely performance.

8.3 The Role of AI in Designing Dynamic Learning Experiences

Artificial intelligence enables a deeper evolution of simulation-based learning by transforming the environment from a fixed scenario into a dynamic partner in inquiry. AI can generate multiple versions of a case, adapt the behaviour of non-player characters, provide personalised explanations, detect recurring misconceptions, and support structured debriefing. It can also enable the simulation to respond to learners' interaction styles, levels of preparation, and patterns of decision-making.

The most promising use of AI is not to provide answers, but to enrich the conditions under which learners search for answers. An AI-supported simulation can confront learners with more nuanced consequences, more realistic social interactions, and more individualised feedback. It can vary scenarios while preserving their structural logic, thereby increasing transfer and reducing the likelihood that learners simply memorise a single solution path. It can make the environment adaptive without abandoning a stable pedagogical core.

This potential creates a fundamental design responsibility. If adaptation occurs invisibly, learners may not understand what has been adapted or why. If feedback is generated automatically, it may appear authoritative even when it is partial, biased, or inaccurate. If

AI agents simulate human roles, they may reproduce stereotypes or oversimplify social complexity. A human-centred approach to AI in education therefore requires transparency, accountability, privacy protection, and the preservation of human judgement (UNESCO 2023). AI should support reflection rather than replace it; extend agency rather than diminish it; and make complexity learnable rather than conceal it behind automation.

An effective simulation-based learning experience may be described as an architecture composed of context, roles, rules, decision space, feedback, reflection, and transfer. The context defines the artificial world and establishes its credibility. Roles place learners within that world by assigning perspectives, responsibilities, interests, and stakes. Rules define what can be done and which constraints govern action. The decision space creates meaningful choices under uncertainty. Feedback makes consequences visible. Reflection transforms consequences into learning. Transfer connects the simulated experience to real domains of practice.

Each element is necessary, but none is sufficient in isolation. A credible context without meaningful decisions becomes a case description. Rules without play become procedure. Feedback without reflection becomes information without understanding. Reflection without action becomes discussion detached from experience. Transfer without structural fidelity becomes analogy without rigor. The design challenge is to integrate these elements so that learners move through a coherent arc: entry, exploration, decision, consequence, interpretation, revision, and application.

AI-supported environments add further layers to this architecture. Learner data can inform adaptation; algorithms can regulate complexity; intelligent agents can introduce social and strategic interaction; generative systems can produce scenario variation; dashboards can support metacognition. Yet these layers must remain subordinate to the learning design. The relevant question is never simply what technology can do, but what form of learning the technology is intended to make possible.

8.4 Simulation as an Environment for Organisational and Managerial Learning

Simulation and game-based learning are especially relevant in organisational and managerial education because organisations are complex, adaptive, and ambiguous systems. Many organisational problems cannot be treated as simple puzzles with predetermined solutions. They appear as mysteries: situations characterised by incomplete information, multiple interpretations, contested values, and evolving consequences. Learners must therefore develop both analytical and interpretive capacities. They must learn to transform ambiguous situations into actionable problems without pretending that ambiguity has disappeared (Weick 1995; Rittel, Webber 1973; Snowden, Boone 2007).

Simulation is uniquely suited to this purpose because it can stage organisational complexity in a controlled yet credible form. It can reproduce tensions between individual and collective goals, local and global optimisation, short-term and long-term performance, exploration and exploitation, formal structure and informal behaviour (March 1991). It can show how incentives produce unintended consequences, how communication failures spread, how leadership decisions alter motivation, and how strategic choices interact with institutional constraints.

For managers and organisations, the value of simulation is not limited to training. It is also a mode of inquiry. It allows participants to test assumptions, explore alternative futures, and experience consequences before they become real. In this sense, simulation becomes a laboratory of judgement. It does not promise deterministic prediction; rather, it offers a structured exploration of possibility and a disciplined way to reason about uncertainty.

8.5 Simulation, Knowledge Acquisition, and the Transformation of Understanding

Simulation supports knowledge acquisition in at least three interrelated ways. First, it helps learners acquire conceptual knowledge by making abstract relations concrete. Concepts such as feedback, equilibrium, opportunity cost, organisational culture, stakeholder conflict, path dependency, or institutional constraint become more intelligible when learners observe them operating as consequences of decisions within a system. Second, simulation supports procedural knowledge by enabling learners to practise how to diagnose, negotiate, allocate, prioritise, communicate, intervene, and adapt. Third, it develops conditional knowledge: the capacity to know when a concept or procedure is appropriate and under which conditions it may fail.

Conditional knowledge is particularly important for professional and organisational learning. Learners may be able to reproduce theories without knowing how, when, or whether to use them. Simulation bridges this gap by placing knowledge under pressure. Learners must decide with incomplete information, under constraints, in relation to other actors, and with uncertain consequences. This pressure does not merely test knowledge; it reorganises it. What was previously held as an abstract proposition becomes a practical resource.

The learning process can be described as a cycle of situated cognition. Learners enter the simulation with prior knowledge, assumptions, expectations, and motivations. They encounter a designed situation that requires action. They act according to their current mental model. The system responds. The learner interprets the response, often with the support of peers, facilitators, dashboards, or AI-generated feedback. The learner then revises the mental model and acts again. Across successive cycles, knowledge becomes more connected, operational, and transferable (Kolb 1984; Schön 1983).

8.6 From Game to Play: Making the Experience Motivationally Effective

A central design problem is how to make the game become play. The distinction is subtle but decisive. A game is a structured system of rules, goals, and constraints; play is the lived experience of freedom, curiosity, experimentation, and voluntary engagement within or around that structure (Huizinga 1955; Caillois 1961; Salen, Zimmerman 2004). An educational game may be formally coherent and still fail if learners experience it as a mechanical exercise. Conversely, a simulation becomes powerful when its game structure opens a play experience: when learners feel that they are not merely following instructions but exploring possibilities.

To make the game become play, design must preserve agency. Learners must experience their decisions as meaningful, compare alternative strategies, and recognise the relation between choice and consequence. The simulation must also preserve uncertainty. If every step is obvious, the experience becomes procedural rather than exploratory; if everything is opaque, the experience becomes frustrating. Effective design therefore creates interpretable uncertainty: enough ambiguity to require thought and enough structure to support action.

The movement from game to play also requires emotional and cognitive safety. Learners must be allowed to experiment without humiliation, and failure must be framed as part of inquiry rather than as evidence of incompetence. This does not mean removing difficulty. Difficulty is essential, but it must be experienced as challenge rather than threat. The motivational quality of simulation is therefore produced by the relation among agency, challenge, credibility, feedback, safety, and meaning.

8.6.1 The Technological Inflection Point: Generative AI and the Future of Learning Environments

The future of the gaming and learning paradigm in international and global education cannot be separated from the broader technological inflection point created by generative AI. Large language models and other AI systems are changing the relationship between humans, computers, knowledge, language, and decision-making in ways that were previously associated mainly with science fiction. These developments carry both utopian and dystopian implications. On one side, they open possibilities for more adaptive, personalised, multilingual, and immersive learning environments. On the other side, they raise serious concerns about bias, surveillance, dependency, inequality, authorship, manipulation, and the automation of judgment.

For game-based learning, this technological shift is especially consequential. As argued in Chapter 3, games and simulations have always depended on the construction of artificial environments in which learners can act, decide, fail, reflect, and try again. The framework developed there identified AI as a system capable of making these environments more dynamic, responsive, and adaptive. Generative AI now extends this possibility into new territory: instead of fixed scenarios, fixed characters, and predetermined feedback, future learning games may incorporate AI-generated dialogue, adaptive cultural contexts, real-time role-play, multilingual interaction, and personalised debriefing. The game will no longer be only a designed object. It may become a responsive learning system that changes according to the learner's decisions, language, cultural assumptions, and level of understanding.

This means that the new paradigm of gaming and learning should be understood as part of a wider transformation in educational technology. Just as the Internet became a substrate of organisational and educational life, rather than merely a specialised topic, AI is likely to become a substrate of future learning environments. Not every educator or researcher needs to become an AI specialist, but every educator working with international learning, simulations, intercultural training, or game-based pedagogy will need to understand how AI changes the design, delivery, assessment, and ethics of learning.

8.6.2 From Fixed Simulations to Adaptive Global Learning Environments

Traditional educational games and simulations are often built around predesigned scenarios. The designer creates a fictional company, a set of roles, a cultural dilemma, decision options, scoring criteria, and feedback. This model remains valuable because it gives structure to the learning experience, as the cross-cultural marketing and international HRM simulations described in Chapter 7 illustrate. However, it also has limitations: real international contexts are fluid, ambiguous, multilingual, and socially complex, while many simulations remain relatively static.

Generative AI can change this by making learning games more adaptive. In an international HR simulation, for example, AI could generate different employee responses depending on the learner's communication style. In a cross-cultural marketing game, it could simulate how different audiences interpret a slogan, image, or brand message. In a global negotiation exercise, it could play the role of multiple stakeholders with different priorities, cultural expectations, and institutional constraints.

This creates the possibility of adaptive global learning environments. Learners would no longer only choose between fixed options. They could formulate their own messages, strategies, and arguments, and the system could respond in ways that reveal cultural, linguistic, and organisational consequences. This would make learning more dialogic and more realistic, because the learner would have to deal with ambiguity rather than simply select a correct answer, a development that resonates directly with the emphasis on uncertainty, incomplete information, and real decision-making developed in Chapter 2.

8.6.3 From Games as Tools to AI-Enhanced Environments for Global Understanding: Open to the future

The argument of this book has moved from foundations to applications, from philosophy to design, from the individual learner to the global context. It began with the anthropological claim that play is a fundamental mode of human sense-making, not a leisure activity annexed to serious life, but a primary form through which human beings explore, test, and construct meaning. It has arrived, in this final chapter, at the possibility of AI-enhanced environments capable of sustaining that same exploratory logic at international scale and with a degree of responsiveness and cultural complexity previously unavailable to designers and educators.

The future of the paradigm can be summarised as a movement from games as tools for engagement to games as AI-enhanced environments for global understanding. In this new paradigm, generative AI does not simply make games more entertaining. It can make them more responsive, dialogic, culturally complex, and transfer-oriented.

The educational promise is significant. AI-supported games can help learners experience cultural distance, test decisions safely, practice adaptation, receive contextual feedback, and develop deeper understanding of international complexity. They can support diffusion by allowing global knowledge to travel, acquisition by allowing learners to act and receive feedback, and development by helping learners reflect on ambiguity and consequence.

Yet the risks are equally significant. Without critical design, these systems may reinforce stereotypes, automate shallow assessment, or turn culture into simulation without responsibility. The future of gaming and learning will therefore depend not only on technical innovation, but on educational imagination, ethical design, and active scholarly engagement.

The rise of generative AI strengthens the argument for a new gaming and learning paradigm in international education. It allows us to imagine learning environments that are more adaptive, interactive, multilingual, and culturally responsive. But it also forces us to rethink what learning, transfer, assessment, and cultural understanding mean in practice. The key challenge is not simply to use AI in games. The deeper challenge is to design AI-enhanced game-based experiences that help learners develop the capacity for reflective, ethical, and adaptive action in a complex global world.

This is ultimately a design challenge, but it is also a human one. Games have always worked because they give human beings structured space in which to act freely, fail safely, and learn meaningfully. Artificial intelligence, at its best, can extend that space, making it more responsive, more culturally aware, more individualised, and more honest about the complexity of the world. The Homo Ludens who inhabits these new environments will not be diminished by that complexity. With the right design, the right ethics, and the right educational imagination, they may be enlarged by it.

In concluding this book, it is worth revealing a small secret. Readers, each according to their own sensitivity and expertise, may have already reached a similar conclusion: the game-based learning experience is built around four poles, or dimensions: play, game, puzzle, and mystery.

These poles may appear, and, to some extent, truly are opposite, distinctive, and even alternative ways of shaping the learning experience. Yet, in simulations designed for learning, they tend to converge. This convergence is not merely a matter of partial overlap. Rather, it is the result of a deliberate design effort: the construction of an experience in which these dimensions are dynamically combined and recomposed over time.

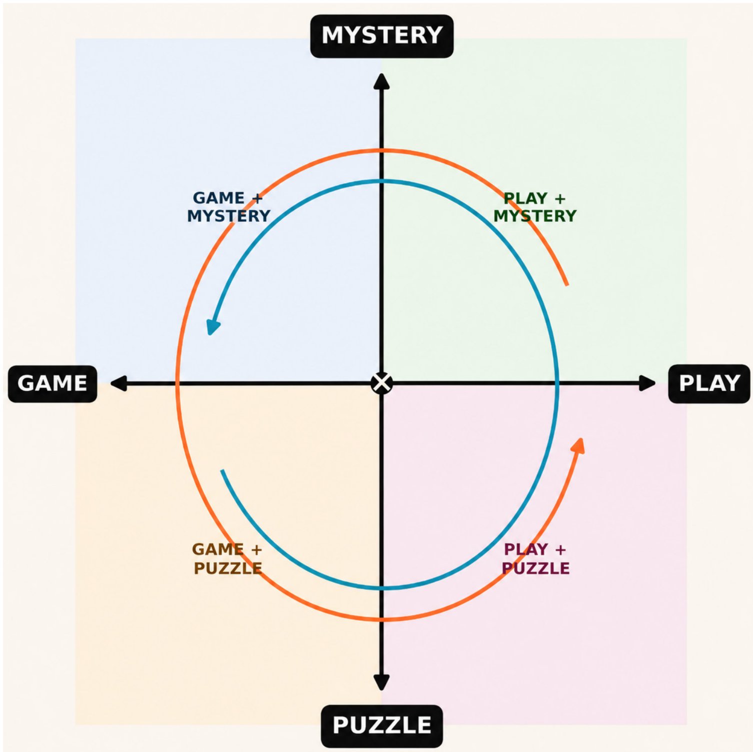

Figure 7 Final framework

Much has already been written about game and play. Two further dimensions, however, still need to be addressed: puzzle and mystery.

A puzzle refers to the structured dimension of the learning experience. It presents the learner with a problem, a constraint, an obstacle, or a configuration that must be understood and solved. The puzzle invites analysis, comparison, hypothesis, strategy, and verification. It is the dimension in which the learner is asked to make sense of a situation by identifying relations, testing solutions, and gradually reducing uncertainty. In this sense, the puzzle gives form to cognitive effort: it transforms complexity into a challenge that can be explored, manipulated, and eventually resolved.

Mystery, by contrast, refers to the open, uncertain, and generative dimension of the experience. It does not simply ask the learner to solve a predefined problem; it invites them to investigate what is not yet clear, to follow traces, to interpret weak signals, and to remain engaged with ambiguity. Mystery sustains curiosity. It keeps the experience open by suggesting that there is something more to discover, something not immediately visible, something that cannot be reduced too quickly to a single correct answer.

Puzzle and mystery are therefore different. The puzzle tends toward resolution; mystery tends toward exploration. The puzzle organises uncertainty into a solvable structure; mystery preserves uncertainty as a source of curiosity and meaning. The puzzle asks, “How can this be solved?” Mystery asks, “What is really happening here?” or “What remains to be discovered?”

Yet these two dimensions can and must coexist within the same learning experience. An effective simulation does not simply alternate between free play and rule-based game mechanics. It also creates moments in which learners are confronted with specific problems to solve, and moments in which they are drawn into a broader field of inquiry. The puzzle gives direction to action; mystery gives depth to attention. The puzzle supports reasoning; mystery sustains motivation. The puzzle makes learning operational; mystery makes it meaningful.

The essence of an effective, motivating, and learning-oriented simulation lies precisely in the rhythm and alternation among these four dimensions. Play opens a space of exploration and possibility. *Game* introduces rules, goals, roles, and feedback. Puzzle focuses attention on problems, constraints, and solutions. Mystery keeps curiosity alive by preserving ambiguity, discovery, and narrative tension.

What matters, then, is not the isolated presence of each dimension, but their dynamic composition throughout the simulation. At different moments, one dimension may become dominant while the others remain in the background. The learner may begin in a playful mode, enter a game structure, encounter a puzzle, and then be drawn into a mystery that reopens the meaning of the entire experience. This rhythm, this alternation and recompositing of play, game, puzzle, and mystery, is the core of a powerful learning design. It is what transforms simulation from a simple activity into an engaging, motivating, and purposeful process of learning.

8.7 Why Mystery and Puzzle Have Organisational Meaning

Mystery and puzzle should not be treated merely as literary, ludic, or cognitive categories. They have a precise organisational meaning because organisations operate in environments where problems differ in kind, not only in degree. Some situations can be specified, measured, decomposed, assigned to roles, governed by procedures, and solved according to explicit criteria. Others resist such treatment because they appear as ambiguity, institutional pressure, cultural difference, technological disruption, identity conflict, ethical tension, or strategic drift. The managerial question is therefore not simply how to solve a problem, but how to diagnose what kind of situation has been encountered.

A puzzle belongs to the domain of structured or structurable problems. Its relevant elements can be identified with sufficient agreement; relations among those elements can be analysed; and proposed solutions can be judged against reasonably explicit standards. Budget allocation, scheduling, capacity planning, inventory control, pricing under stated assumptions, and many operational decisions are puzzle-like. Their difficulty may be considerable, but it remains internal to a recognisable frame.

A mystery belongs to the domain of ambiguous, equivocal, or wicked situations. It does not present stable boundaries in advance. Organisational members may disagree about what the problem is, which data are relevant, whose interpretation is legitimate, what temporal horizon should be adopted, and what would count as success. Strategic renewal, culture change, innovation under uncertainty, ethical dilemmas, post-merger integration, legitimacy crises, and international coordination are mystery-like. They are not solved once and for all; rather, they are interpreted, enacted, negotiated, and temporarily stabilised (Weick 1979, 1995; March, Olsen 1976).

This distinction is consistent with a major tradition in organisation theory. Simon shows that decision-making occurs under bounded rationality rather than perfect knowledge; Cyert and March describe organisations as coalitions that engage in problemistic search under shifting goals and constraints; Weick emphasises sensemaking and enactment; Argyris and Schön (1978) distinguish between correcting errors within existing assumptions and questioning the assumptions themselves; and March contrasts exploitation of known possibilities with exploration of uncertain alternatives.[1] Taken together, these perspectives show that organisations move continually between puzzle-like and mystery-like modes of learning.

8.8 Defining Puzzle in Organisational Terms

In organisational studies, a puzzle can be defined as a problem that can be framed as a task of analysis, design, optimisation, or decision within known or sufficiently agreed constraints. A puzzle need not be simple. It may involve many variables, incomplete information, high stakes, and substantial computational or managerial difficulty. What makes it a puzzle is not ease but frame stability: the organisation knows, or can agree sufficiently, what is being asked and how the adequacy of an answer will be assessed.

1 See Simon 1947, 1955; Cyert, March 1963; Weick 1995; March 1991.

Puzzle-like situations typically exhibit five properties. First, the problem boundary is relatively identifiable. Second, relevant variables are at least partially known. Third, the rules, constraints, or decision premises can be stated. Fourth, feedback can be interpreted in relation to the decision taken. Fifth, success can be evaluated against recognisable criteria, even when those criteria are approximate or contested at the margin.

Puzzles are indispensable to organisational functioning. Standard operating procedures, key performance indicators, project-management systems, decision trees, dashboards, routines, and analytical models are mechanisms through which organisations transform complexity into puzzle-like forms. They reduce the cognitive burden of action, distribute decision premises across roles, and make coordinated performance possible (Simon 1947; March 1994).

The strength of the puzzle is also its limitation. Because every puzzle presupposes a frame, puzzle-solving can address only what the frame renders visible. When the frame is inappropriate, puzzle-solving may become a source of systematic error. The organisation may optimise the wrong variable, solve a local problem while worsening a systemic one, or treat a political, cultural, ethical, or strategic ambiguity as though it were a merely technical issue. Organisational failure often begins not with bad answers, but with premature puzzling: the conversion of a mystery into a puzzle before the mystery has been adequately interpreted.

Table 2 Puzzle-like meanings across organisational dimensions

Organisational dimension	Puzzle-like meaning
Decision-making	Choosing among alternatives inside a sufficiently stable frame.
Learning	Improving performance through feedback, repetition, correction, and optimisation.
Coordination	Aligning roles, tasks, resources, and procedures around defined objectives.
Control	Monitoring deviations and correcting them through established criteria.
Risk	Estimating probabilities, consequences, and mitigation strategies within stated assumptions.
Typical danger	Solving efficiently within a frame that should have been questioned.

A mystery is an organisational situation in which the frame itself is uncertain. The organisation is not merely missing information; it is uncertain about how to interpret the information it already possesses. A mystery may include data, signals, events, conflicts, symptoms, and stakeholder claims, but their meaning is not yet stabilised. Actors may disagree about whether the situation is a threat or an opportunity, whether its cause is technical or cultural, and whether the relevant level of analysis is individual, team, organisational, institutional, or systemic.

Mystery is therefore closely related to ambiguity, equivocality, and wickedness. Ambiguity means that several interpretations remain plausible. Equivocality means that the same event can sustain different meanings. Wickedness means that the problem cannot be separated cleanly from the process of addressing it, because each attempted solution changes the problem itself (Rittel, Webber 1973). These are not exceptional conditions at the margins of management. They are ordinary features of strategy, innovation, leadership, governance, international management, and organisational change.

In mystery-like situations, organisational actors do not begin by solving. They begin by making sense. They notice cues, construct narratives, test interpretations, negotiate meanings, and develop provisional definitions of what is happening. Weick's sensemaking perspective is central here: organisational environments are not simply external realities waiting to be decoded, but are partly enacted through the actions, categories, expectations, and narratives of organisational members (Weick 1979; 1995). The mystery is therefore not only outside the organisation; it also lies in the relation between the situation and what the organisation is able to notice.

Mystery has a distinctive learning function. It prevents premature closure, preserves the possibility of reframing, and allows weak signals, anomalies, contradictions, and minority interpretations to remain visible long enough to inform action. Where puzzle logic asks, "How do we solve this?", mystery logic asks, "What is this becoming?", "What are we failing to see?", "Who interprets this differently?", and "What would change if we named the situation otherwise?"

Table 3 Mystery-like meanings across organisational dimensions

Organisational dimension	**Mystery-like meaning**
Decision-making	Interpreting an ambiguous situation before stable alternatives exist.
Learning	Reframing assumptions, discovering hidden relations, and generating new meanings.
Coordination	Negotiating interpretations among actors with different interests, identities, and perspectives.
Control	Accepting that some forms of uncertainty cannot be eliminated before action.
Risk	Recognising unknown interdependencies, unintended consequences, and shifting criteria of success.
Typical danger	Remaining in ambiguity so long that action becomes impossible.

8.9 Mystery, Puzzle, and Major Organisational Theories

The mystery-puzzle distinction can function as a synthetic lens through which several major organisational theories become mutually intelligible. It does not replace those theories. Rather, it clarifies the form of organisational learning and judgement that each theory emphasises.

8.9.1 Bounded Rationality and Decision Premises

Simon's theory of bounded rationality shows that organisational actors do not optimise under conditions of perfect information. They satisfy by relying on limited attention, limited information, routines, and decision premises (Simon 1947; 1955). In this perspective, puzzles are organisationally necessary simplifications: they reduce environmental complexity to decision problems. Mystery appears when the simplification itself becomes doubtful, that is, when the premises used to define the decision may no longer fit the situation.

8.9.2 The Behavioural Theory of the Firm

Cyert and March's behavioural theory of the firm is strongly compatible with the distinction. Organisations search when performance falls below aspiration levels; this is puzzle-like because search is triggered by a recognised deviation and directed toward a remedy. Yet the firm is also a coalition of participants with different goals, attention patterns, and interpretations. This introduces mystery: what counts as a problem, whose aspiration level matters, and which remedy is acceptable are not purely technical questions (Cyert, March 1963).

8.9.3 Sensemaking and Equivocality

Weick's theory of sensemaking is perhaps the clearest organisational theory of mystery. Organisations confront equivocal events and construct plausible meanings through enactment, selection, and retention. The organisational world is not simply given; it becomes actionable through interpretation (Weick 1979; 1995). Puzzle-solving begins only after some degree of sense has been produced. Simulation design can use this insight by presenting participants with ambiguous cues before offering structured tasks, so that they experience the distinction between framing and solving.

8.9.4 Single-Loop and Double-Loop Learning

Argyris and Schön clarify the learning difference between puzzle and mystery. Single-loop learning corrects errors without altering governing assumptions; it is puzzle-like because action is adjusted inside an existing frame. Double-loop learning questions the frame itself by examining the values, norms, and assumptions that determine what counts as an error (Argyris 1977; Argyris, Schön 1978). A mature simulation should generate both forms of learning: participants should correct decisions within the frame and also confront moments in which the adequacy of the frame becomes questionable.

8.9.5 Exploration and Exploitation

March's distinction between exploration and exploitation maps productively onto the model. Exploitation is puzzle-oriented: refinement, efficiency, selection, implementation, and execution. Exploration is mystery-oriented: search, variation, experimentation, discovery, and the pursuit of uncertain possibilities. Organisations need both, but the two compete for attention, time, and resources (March 1991). Simulations can make this tension visible by rewarding operational efficiency and interpretive openness while also showing the risks of excessive commitment to either mode.

8.9.6 Wicked Problems and Organisational Strategy

Rittel and Webber's account of wicked problems identifies organisational mysteries in a strong form: problems without definitive formulation, stopping rules, single correct answers, or neutral tests of solution quality (Rittel, Webber 1973). Strategic change, sustainability, digital transformation, and cross-cultural integration often display this structure. Treating such conditions as puzzles creates an illusion of control; treating them only as mysteries produces paralysis. The managerial challenge is to construct provisional puzzles within a broader mystery, solve them, learn from the consequences, and reframe the larger situation.

8.9.7 Systems Thinking, Complexity, and High Reliability

Systems thinking and complexity perspectives show that organisational puzzles are frequently nested inside larger mysteries. A local optimisation can generate unintended consequences elsewhere in the system (von Bertalanffy 1968; Meadows 2008). In tightly coupled systems, Perrow argues, interactions can produce normal accidents that are not reducible to a single local error (Perrow 1984). High-reliability organising, by contrast, depends on sustained attention to weak signals, reluctance to simplify, and sensitivity to operations (Rochlin, La Porte, Roberts 1987; Weick, Sutcliffe 2007). These capabilities are mystery-oriented because they maintain interpretive openness even when routine puzzle-solving is available. Complex and chaotic domains approximate mystery conditions: causal relations are not fully knowable in advance, and action is required to discover what is happening (Snowden, Boone 2007). For simulation design, the implication is that participants should not always know which domain they occupy. Part of the learning task is diagnostic: recognising when puzzle-solving is appropriate and when it is dangerously premature.

8.10 The Organisational Matrix: Mystery and Puzzle Across Play and Game

When mystery and puzzle are combined with the Play-Game axis, the model becomes organisationally richer. Play denotes openness, experimentation, voluntary movement, imaginative variation, and the temporary suspension of rigid instrumentality. Game denotes rules, goals, constraints, roles, scoring, and accountable decision. Mystery denotes ambiguous meaning and unstable framing. Puzzle denotes structured challenge and solution-oriented reasoning. The four combinations therefore identify distinct organisational modes.

Table 4 Play-Game / Mystery-Puzzle organisational matrix

	Mystery: ambiguous frame	**Puzzle: structured problem**
Play: open exploration	Play-Mystery: organisational imagination, weak-signal exploration, cultural inquiry, strategic questioning, and identity work. The organisation explores what the situation might mean before forcing it into a solution frame.	Play-Puzzle: experimental problem solving, prototyping, design thinking, scenario tinkering, and sandbox analytics. The organisation plays with possible solutions inside a problem that is sufficiently framed but still open to variation.
Game: rule-governed action	Game-Mystery: role-based ambiguity, negotiation, crisis simulation, institutional conflict, and strategy under equivocality. Actors must decide under rules while meanings, interests, and causal relations remain contested.	Game-Puzzle: operational decision, optimisation, resource allocation, performance management, compliance, and tactical execution. Actors solve defined problems under explicit constraints and measurable outcomes.

8.10.1 Play-Mystery: Organisational Imagination and Sensemaking

Play-Mystery is the organisational space of exploratory interpretation. It is the mode in which an organisation permits itself to ask what a situation might mean before deciding what it is. Weak signals are noticed, metaphors are tested, alternative narratives are entertained, and taken-for-granted assumptions become visible. This mode is closely associated with early innovation, scenario thinking, culture work, strategic foresight, ethnographic inquiry, and identity reconstruction.

The value of Play-Mystery lies in its refusal to close meaning too early. It creates room for imagination, plurality, dissent, and reframing. Its risk is excessive openness: conversation without commitment, interpretation without decision, and creativity without consequence.

8.10.2 Play-Puzzle: Experimental Problem Solving and Prototyping

Play-Puzzle is the space of exploratory solution-building. The problem is more structured than in Play-Mystery, yet the approach remains experimental. Prototyping, simulation sandboxes, design sprints, war-gaming alternatives, hackathons, and laboratory experimentation all belong to this quadrant. Its value lies in lowering the cost of trying, enabling rapid feedback, and allowing actors to test hypotheses without bearing the full costs of irreversible implementation.

The risk of Play-Puzzle is fragmentation. Organisations may generate many clever prototypes without integrating them into strategy, governance, or disciplined adoption. Play-Puzzle therefore requires a subsequent movement toward commitment.

8.10.3 Game-Mystery: Decision Under Ambiguity

Game-Mystery is the most organisationally dramatic quadrant because it combines rule-governed action with ambiguous meaning. Actors have roles, constraints, deadlines, power relations, and consequences, but they do not fully know what the situation means or what other actors intend. Negotiation, crisis management, international management, political decision-making, post-merger integration, and strategic transformation often occupy this quadrant.

The value of Game-Mystery is that it trains judgement under ambiguity. Managers frequently cannot wait for perfect clarity before acting. They must make commitments, interpret others' behaviour, manage symbolic meaning, and revise assumptions while events unfold. The risk is defensive closure: actors may over-rely on formal rules, authority, or familiar categories to reduce discomfort, thereby missing the deeper dynamics of the mystery.

8.10.4 Game-Puzzle: Operational Execution and Accountable Performance

Game-Puzzle is the quadrant of structured performance. Goals are explicit, constraints are formalised, actions have measurable consequences, and success can be evaluated. It includes operational planning, logistics, budgeting, staffing decisions under defined criteria, compliance procedures, project execution, and many forms of managerial analytics.

The value of Game-Puzzle is reliability. It allows organisations to coordinate action, compare performance, reduce variance, and learn from repeated feedback. Its risk is mechanistic reduction: actors may mistake measurable performance for meaningful performance or confuse optimisation inside a model with wisdom about the larger organisational situation. Game-Puzzle is powerful when connected to the other quadrants; it becomes dangerous when treated as the whole of organisational life.

8.11 How Simulations Develop the Organisational Meaning of Mystery and Puzzle

Simulation is an especially appropriate medium for developing the organisational meaning of mystery and puzzle because it can stage not only a situation but also movement among different logics of action. A conventional case study often presents a problem after the frame has already been written. A simulation can make participants experience the process through which a frame emerges, breaks down, is reconstructed, and becomes actionable again.

The deepest educational value of simulation lies in this dynamic passage. Participants begin in one mode, are drawn into another, and must learn not only how to perform within each mode but how to recognise when a mode has become insufficient. A simulation should not merely contain mysteries and puzzles. It should make learners experience the transition between them as a managerial problem in its own right.

8.11.1 From Mystery to Puzzle

The first movement is from mystery to puzzle. Participants encounter an ambiguous situation: a declining market, conflict among subsidiaries, a failed project, an unexpected competitor, a cultural misunderstanding, or a reputational crisis. At first, the problem is not clearly defined. Participants must interpret cues, identify stakeholders, formulate hypotheses, and decide what they believe is happening. Only then can they transform part of the situation into a puzzle: a decision problem, allocation problem, negotiation problem, or design problem.

This movement is pedagogically powerful because it gives participants ownership of the frame. They are not simply handed the problem; they construct it. The puzzle becomes meaningful because it has been wrested from ambiguity. In organisational terms, the simulation reproduces a core managerial competence: the capacity to transform equivocal situations into actionable problems without denying their residual ambiguity.

8.11.2 From Puzzle to Mystery

The second movement is from puzzle back to mystery. Participants solve a structured problem, receive feedback, and discover that the solution has consequences they did not anticipate. A staffing decision improves short-term performance but damages legitimacy. A pricing strategy increases revenue but provokes channel conflict. A negotiated agreement stabilises one relationship while destabilising another. An operational fix works locally but worsens the system globally.

This return to mystery prevents simulation from becoming a mere exercise in technical correctness. It teaches that organisational solutions are not endpoints; they are interventions in living systems. Every solution changes the situation it was designed to solve. Designers can produce this effect through delayed feedback, second-order consequences, stakeholder reactions, emergent events, and narrative turns that reveal hidden assumptions.

8.11.3 From Play to Game

The third movement is from play to game. Participants may begin by exploring alternatives, testing interpretations, generating scenarios, or experimenting without immediate penalty. Gradually, however, the simulation introduces rules, deadlines, scarce resources, role responsibilities, and measurable consequences. What was exploratory becomes accountable.

This movement matters because organisations cannot remain permanently in open exploration. At some point, possibilities must become commitments. Play generates alternatives; game requires selection, coordination, and consequence. The motivational power of the movement lies in its tightening structure: freedom is not removed arbitrarily, but transformed into responsibility.

8.11.4 From Game to Play

The fourth movement is from game back to play. After participants have acted within rules and experienced consequences, the simulation should reopen reflective space. Debriefing, redesign rounds, alternative scenarios, role switching, and counterfactual exploration return learners to a play-like mode. They can ask what else could have been done, which rules shaped their behaviour, what assumptions were hidden, and how the system might be redesigned.

This movement is essential because organisations learn not only by executing routines but by suspending them long enough to examine them. Game creates experience; play reinterprets it. Without this return to play, simulations risk producing competent performers who do not question the systems within which they perform.

8.12 The Centre of the Schema: Organised Inquiry

The centre of the Play-Game/Mystery-Puzzle schema is not a compromise or neutral midpoint. It is the most demanding zone of organisational learning. It can be called organised inquiry: a condition in which exploration and structure, ambiguity and problem solving, imagination and accountability coexist in productive tension.

At the centre, the learner does not simply play, because action has consequences. The learner does not simply game, because rules are themselves open to interpretation and redesign. The learner does not simply inhabit mystery, because some decisions must be made. The learner does not simply solve puzzles, because each solution reopens questions of meaning, system, and purpose. The centre is therefore the space in which organisational intelligence becomes adaptive.

This centre is also where simulations become more than training tools. A simulation that remains in Game-Puzzle trains execution. A simulation that remains in Play-Mystery stimulates imagination. A simulation that moves through all quadrants and culminates in the centre trains judgement. Judgment is the capacity to know when to explore, when to decide, when to frame, when to solve, when to follow rules, when to question them, and when to hold multiple interpretations without becoming paralysed.

Table 5 Organisational capabilities and simulation design mechanisms by quadrant

Quadrant	Organisational capability developed	Simulation design mechanism
Play-Mystery	Sensemaking, imagination, strategic openness	Ambiguous scenarios, weak signals, multiple narratives, reflective prompts.
Play-Puzzle	Experimentation, prototyping, adaptive search	Sandboxes, alternative paths, low-cost trials, iterative feedback.
Game-Mystery	Judgment under ambiguity, negotiation, crisis leadership	Roles, constraints, hidden interests, time pressure, contested meanings.
Game-Puzzle	Execution, optimisation, accountable decision	Clear goals, scoring, resources, constraints, measurable consequences.
Centre	Organised inquiry and adaptive organisational intelligence	Transitions among quadrants, debriefing, reframing, second-order feedback.

8.13 Design Principles for Organisational Simulations

The model implies a set of practical design principles for simulations used in management education and organisational learning. A simulation should begin with ambiguity before offering structure, so that participants experience the discomfort and educational value of mystery before converting it into a puzzle. Framing should become an explicit learning task: participants should not only solve a problem but also justify how they have defined it. Once a frame has been constructed, puzzle phases should create accountability by requiring decisions under constraints and by making measurable consequences visible.

After the initial decision has been made, the simulation should reopen mystery by revealing unintended consequences, stakeholder interpretations, systemic effects, or new dilemmas that require reframing. It should alternate play and game rhythms, using exploratory phases to cultivate imagination and structured phases to demand commitment. Debriefing should then be designed as movement toward the centre of the schema, examining how participants moved between mystery and puzzle, play and game.

Finally, the assessment of learning should reward diagnostic intelligence. Participants should be evaluated not only on whether they solved assigned tasks, but also on whether they recognised the kind of situation they were in and the limits of the frame they adopted. A strong organisational simulation therefore preserves residual ambiguity: it should not make everything clear at the end, but should leave learners with better questions as well as better answers.

For management education, the organisational meaning of mystery and puzzle is decisive. Managers are often trained as puzzle solvers: they learn tools, frameworks, models, and methods. This training is necessary, but it is incomplete. Organisational life also requires the capacity to recognise when a tool is useful, when a situation calls for sensemaking, when a frame must be questioned, and when institutional or cultural interpretation is more important than technical optimisation. The manager must therefore become at once analyst and interpreter, designer and actor, player and rule-maker.

A simulation designed around the four quadrants can develop a more complete form of managerial intelligence. It can train analytical skill through puzzles, exploratory imagination through mystery, responsible action through game structures, and curiosity through play. Most importantly, it can train transitions among these modes. Managerial learning occurs not only in mastering one logic but in knowing when to change logic.

This approach is particularly relevant for international human resource management, cross-cultural marketing, innovation strategy, crisis leadership, and organisational change. In each field, the central challenge is rarely only technical. It is interpretive, relational, systemic, and political. Learners must read situations, negotiate meanings, make decisions, and live with consequences. The mystery-puzzle model gives language to this process and provides simulation designers with a structure for making it teachable.

Mystery and puzzle have organisational meaning because they name two different ways in which organisations encounter the world. The puzzle is the world as problem: bounded, analysable, actionable, and open to solution. The mystery is the world as ambiguous becoming: unstable, contested, systemic, and open to interpretation. Organisations require both. Without puzzles, they cannot act reliably. Without mysteries, they cannot renew their understanding.

The contribution of simulation-based learning is to hold these modes together. It makes ambiguity experiential rather than merely abstract. It makes problem solving consequential rather than merely analytical. It renders visible the transition from open exploration to structured decision and back again. In doing so, simulation creates a central space of organised inquiry in which participants learn not only to solve organisational problems but to understand how those problems are formed, framed, transformed, and reopened.

8.14 The Movement from Puzzle to Mystery and Back

The distinction between puzzle and mystery clarifies the epistemic movement of simulation-based learning. Knowledge acquisition often begins with puzzles: concepts, rules, variables, and models that provide recognisable problem structures. A puzzle has a determinate or at least stabilisable frame; it presents information to organise, relations to analyse, and answers that can be approached through disciplined reasoning.

Knowledge production, by contrast, often begins with mystery. A mystery is not yet a well-defined problem; it is an ambiguous situation that must first be interpreted. Many organisational problems begin in this form. Declining motivation, weak collaboration, cultural misunderstanding, market uncertainty, leadership failure, innovation resistance, and legitimacy crises are not immediately puzzles with clear variables. They must be framed before they can be addressed (Weick 1995; Rittel, Webber 1973).

A strong simulation alternates between puzzle and mystery. Learners may initially use acquired knowledge to solve a structured problem; the consequences of that solution then generate a new mystery, requiring interpretation, reframing, and new hypotheses. Once the mystery is provisionally framed, it becomes a new puzzle that can be addressed with analytical tools. This alternation is one of the deepest mechanisms of simulation learning because it prevents learning from becoming mechanical. It teaches that knowledge is not only the ability to solve known problems, but also the capacity to recognise, frame, and investigate unknown ones.

8.15 Game, Play, and the Discipline of Exploration

The distinction between game and play is equally important for simulation design. The game dimension gives the simulation structure: rules, roles, constraints, objectives, timing, scoring, and consequences. It creates seriousness, direction, and challenge. Without the game dimension, the simulation risks becoming vague and educationally unfocused.

The play dimension gives the simulation openness. It allows exploration, curiosity, experimentation, imagination, and voluntary engagement. It gives learners the possibility to test interpretations and actions without the fear of irreversible failure. Without the play dimension, the simulation may become rigid, performative, and excessively focused on winning or satisfying the instructor.

The most effective simulations combine both dimensions. They use game structure to create focus and play openness to generate discovery. Acquisition requires sufficient game structure to clarify what must be learned. Diffusion requires both game and play because learners must coordinate within rules while exploring different perspectives. Production requires play because new ideas emerge when learners are allowed to experiment, interpret, and reframe. The craft of simulation design consists in creating a structured environment that learners experience as a meaningful field of exploration.

8.16 A Narrative Sequence for Simulation-Based Learning

A simulation may be organised around a sequence of phases, although these phases should not be treated as rigid steps. The experience often begins with orientation, during which learners enter the context, acquire key concepts, understand the scenario, and become familiar with the rules. Orientation is followed by role appropriation, as learners begin to inhabit a perspective and interpret the simulation from within rather than from outside.

As the simulation develops, collective diffusion becomes central. Learners share information, build common interpretations, negotiate meaning, and coordinate action. Decision and action then require them to apply knowledge under constraints and uncertainty. At this point, knowledge is exposed to consequence. The simulation produces feedback, and this feedback may confirm some assumptions while disrupting others.

The final movement is knowledge production and reflection. Learners interpret what happened, formulate new insights, revise models, and connect experience back to theory. The sequence can then begin again at a higher level of complexity. Each cycle expands learners' capacity to connect conceptual understanding, social coordination, situated action, and reflective reconstruction.

8.17 The Teacher as Designer, Facilitator, Observer, and Interpreter

In this model, the teacher is not primarily a transmitter of content. The teacher becomes a designer, facilitator, observer, and interpreter. As designer, the teacher constructs the simulation environment and ensures that it contains the conditions necessary for acquisition, diffusion, and production. As facilitator, the teacher supports participation without controlling every outcome. As observer, the teacher examines how learners acquire concepts, circulate knowledge, negotiate meaning, and respond to feedback. As interpreter, the teacher helps learners connect their experience to theoretical categories and identify what they have learned.

This role is more demanding than traditional teaching because the teacher must manage both structure and emergence. The simulation must be sufficiently designed to generate meaningful learning and sufficiently open to allow surprise, uncertainty, and learner agency. The teacher must know when to provide knowledge, when to let learners struggle, when to introduce feedback, and when to pause the action for reflection. The craft of facilitation lies in balancing guidance and autonomy.

The teacher's interpretive role is especially important during debriefing. Learners may experience a simulation intensely without immediately understanding its conceptual significance. Debriefing transforms lived experience into articulated knowledge by naming patterns, connecting actions to consequences, linking events to theory, and identifying the new understandings produced by the group (Schön 1983; Argyris, Schön 1978).

8.18 Simulation as Disciplined Freedom

Simulation-based learning merges acquisition, diffusion, and production by transforming knowledge into experience. Acquisition gives learners the conceptual tools needed to enter the simulated world. Diffusion turns individual knowledge into shared, social, and operational knowledge. Production enables learners to generate new ideas, interpretations, and solutions through action, uncertainty, and reflection.

The simulation is the environment that holds these processes together. It is artificial because it is designed, credible because it preserves the structural logic of reality, motivational because it gives learners agency and consequence, and educational because it transforms action into reflection and reflection into new understanding. In this sense, simulation-based learning is not merely a method for teaching existing knowledge more effectively. It is a paradigm for creating learning experiences in which students acquire knowledge, circulate it, test it, and produce new knowledge through the disciplined freedom of play.

The phrase disciplined freedom captures the distinctive character of simulation. Learners are free to explore, but their exploration is structured by roles, rules, constraints, feedback, and reflection. They are invited to act, but action becomes meaningful because it is connected to theory. They are encouraged to experiment, but experimentation becomes learning because it is interpreted. For book publishing, the significance of this framework lies in its capacity to position simulation not as a supplementary classroom device, but as a comprehensive pedagogical architecture.

Simulation and game-based learning, intensified by technological innovation, adaptive algorithms, immersive media, and artificial intelligence, point toward a paradigm of learning as designed experience. This paradigm does not reduce education to entertainment, nor does it replace theory with play. It creates artificial but credible environments in which learners encounter complexity, act under uncertainty, receive feedback, reflect on consequences, and transform knowledge into judgement.

The promise of the paradigm lies in its capacity to make learning active, situated, adaptive, motivational, and reflective. Its risk lies in treating technology as sufficient in itself. The future of simulation and game-based learning therefore depends on a balanced conception: technologically advanced but pedagogically grounded; algorithmically adaptive but human-centred; playful but intellectually serious; artificial but credible; motivating but ethically responsible. The most effective simulations and educational games will not be those that merely impress learners with technological sophistication. They will be those that create conditions in which learners want to think, need to decide, are allowed to fail, are helped to interpret, and are able to transfer what they have discovered into the real contexts where knowledge matters.

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