

Puzzle, World, Trust: Interactive Fiction Heuristics for Lesson Design

Heiko Spies

Nordpfalzgymnasium, Kirchheimbolanden, Germany

hkaspies@gmail.com

Abstract: Games-based learning (GBL) research has shown that well-designed games can support motivation and learning across educational contexts. Less attention, however, has been paid to the design principles that make problem spaces fair, worlds coherent, and participation trustworthy. This conceptual paper asks how core principles of interactive fiction (IF) design can inform lesson planning and instructional design. The paper develops a theoretical framework that maps central IF design principles—puzzle fairness, world-model consistency, narrative framing, graduated hinting, and player trust—onto constructs from didactic theory and learning psychology, including scaffolding, flow, situated learning, self-determination, and cognitively activating tasks. On this basis, it identifies recurring structural convergences between good IF design and good teaching. These convergences include difficulty calibration, inferability, contextual coherence, learner autonomy, and the design of problem spaces that make insight possible. A central claim of the paper is that the educational value of IF design lies not primarily in turning lessons into teacher-independent artefacts, but in making the anticipated learner pathway through a task visible. From this perspective, IF-inspired playtesting offers a productive model for instructional planning. It helps reveal where learners are likely to hesitate, misread a situation, pursue unproductive interpretations, or stall, and where prior-knowledge reactivation, sub-goals, hints, or contextual cues must therefore be designed in advance. The paper also addresses a key asymmetry between the two domains. Teachers can respond adaptively to learners in real time, whereas IF authors must anticipate breakdowns in advance and compensate through iterative testing. Rather than weakening the analogy, this difference sharpens it by making the anticipatory design work embedded in lesson planning more explicit. The paper contributes a design-oriented heuristic framework for lesson and task design, a playtesting-informed account of the learner pathway as an object of instructional planning, and a principled critique of superficial gamification approaches that add reward mechanics without corresponding design rigour. It concludes by outlining implications for teacher professionalisation and future empirical research.

Keywords: Games-based learning, Interactive fiction, Lesson design, Learner pathways, Playtesting

1. Introduction

Recent review work suggests that interactive fiction can support a wide range of learning activities across educational contexts, including writing, reading, history, and technology-related learning (Wright and Weible, 2024). Dickey (2006), more specifically, shows how adventure-game narrative devices can inform the design of interactive learning environments. Yet such work has mainly examined games as classroom artefacts. A complementary question is what game design practice can teach educators about the design of learning itself.

This paper explores that question through the lens of interactive fiction (IF), spanning parser-based text adventures and choice-based narrative systems. Since Gilbert's (1989) influential critique of adventure-game design, IF designers have developed a precise vocabulary for what makes problem environments fair, engaging, and intrinsically rewarding. Nelson (2001), Short (2016), Montfort (2003), and contributors to the IF Theory Reader (Jackson-Mead and Wheeler, 2011) have expanded this tradition into a substantial set of design principles. More specifically, the two traditions converge around a shared structural insight: deep engagement, self-directed problem solving, and intrinsic motivation can be supported by environments designed to be fair, coherent, and trustworthy.

Building on Dickey's (2006) study of adventure-game narrative devices and Wright and Weible's (2024) review of IF in education, this paper shifts attention from IF as a classroom medium to IF as a heuristic resource for lesson and task design. It develops a five-part framework, reframes playtesting as anticipatory analysis of learner pathways, and distinguishes substantive instructional design from superficial gamification.

Methodologically, the paper develops a design-theoretical heuristic through a conceptual comparison of didactic theory and IF design principles, rather than proposing an empirically validated model of instructional quality.

2. Theoretical Background

To establish the comparison developed in this paper, the following section first outlines relevant didactic frameworks and then introduces key design principles from interactive fiction.

2.1 Didactic Frameworks

Contemporary lesson design can be understood as a balance between learner construction and instructional guidance. Helmke (2017) argues that school learning depends on learners' active, constructive engagement, but also on orientation, support, and structured learning arrangements that make understanding possible.

Vygotsky's (1978) zone of proximal development (ZPD) specifies this problem in developmental terms. Effective learning occurs in the space between what a learner can already do independently and what becomes possible with appropriate support. A closely related account of such temporary support was later articulated as scaffolding: assistance that extends learners' action while preserving the need for their own cognitive work (Wood, Bruner and Ross, 1976).

Csikszentmihalyi's (1990) flow theory adds a motivational dimension by emphasizing the importance of challenge-skill balance. Optimal engagement is most likely when tasks exceed routine competence but remain manageable. Flow theory thus points to a productive region of calibrated challenge that is structurally similar to, though not identical with, Vygotsky's (1978) zone of proximal development.

Self-determination theory highlights the needs for autonomy, competence, and relatedness, which are supported when learners experience tasks as meaningful and navigable. Evidence from game research likewise indicates that enjoyment, continued play, and immersion are strengthened when play environments support these same needs (Deci and Ryan, 1985; Ryan, Rigby and Przybylski, 2006).

German-speaking didactic traditions add further precision by emphasizing that lesson planning begins with didactic analysis, that is, with the question of what a content element means educationally for particular learners. In Klafki's (1964) account, a topic is educationally valuable insofar as it opens access to broader structures, problems, and possibilities through the particular case. Complementing this perspective, research on instructional quality highlights the importance of cognitively activating tasks that support deeper processing, self-regulated learning, and transfer rather than mere reproduction (Helmke, 2017).

Situated learning perspectives further stress that understanding is shaped by activity and context, and that meaning often emerges through participation in structured situations rather than through decontextualised reception alone (Brown, Collins and Duguid, 1989). At the same time, school learning still requires instructional guidance and structured task design (Helmke, 2017).

Taken together, these traditions suggest that effective lesson design depends on more than sequencing content. It involves the careful calibration of challenge, support, orientation, and meaningful context. This is closely related to the kind of design problem that interactive fiction designers have addressed in another domain.

2.2 Interactive Fiction Design Principles

Although the IF design tradition is largely extra-academic, it represents a remarkably principled body of practical design knowledge developed through decades of iteration and critical reflection. Gilbert (1989) identified core failure modes of adventure games, including opaque goals, arbitrary or poorly motivated puzzles, punitive deaths, and forms of design that restrict meaningful player action. He formulated corresponding positive principles: objectives should be clear, sub-goals visible, puzzles inferable from the game's own logic, and solutions satisfying rather than arbitrary.

What distinguishes interactive fiction from other game genres is the particularly tight coupling of narrative meaning and puzzle logic. In IF, progress depends on interpreting a linguistically structured world: the player must read, infer, and act within a rule system that is constituted through language and context rather than through visual mechanics or reflexes. This makes IF design unusually explicit about the relationship between legibility, inference, and forward motion — qualities that are especially relevant to the design of text-based instructional tasks.

Nelson's (2001) *Inform Designer's Manual* treats the world model as a central part of IF design, describing it as a complex web of standard rules governing objects, space, sense, time, and action. From this perspective, player inferability depends on the stability and coherence of that model. Short's (2016) work on plot-shaped level design develops this further by arguing that crucial story information should not merely be encountered but understood through action. Ideally, the design should make it difficult to complete the game without grasping the logic that underlies progress.

The IF Theory Reader (Jackson-Mead and Wheeler, 2011) sharpens this craft vocabulary across several essays rather than through a single design formula. Montfort (2011) emphasizes that well-designed IF depends on rules that display a consistent style rather than seeming arbitrary, and he defines puzzles as challenges requiring a non-obvious but intelligible set of commands. Ingold (2011) complements this by showing that difficult puzzles remain acceptable when the game teaches its logic gradually and, by remaining fair, earns the player's confidence. Stevens (2011), finally, argues that obstacles and puzzle structures are most satisfying when they are integrated into the fictional world and motivated by character, context, and situation rather than appearing as detachable set pieces. Taken together, these essays point to a cluster of recurring design principles: non-arbitrariness, inferability, consistency, gradual onboarding, and a trust relation between designer and player.

Dickey's (2006) work forms an important bridge between game design and educational design. Analysing adventure-game narrative devices, she argues that narrative not only motivates but also scaffolds problem solving by providing a cognitive framework that helps players identify plausible actions, interpret cues, and connect information across the environment. She also translates these observations into design heuristics for interactive learning environments.

This focus on design principles also clarifies how the present argument relates to gamification. Deterding et al. (2011) define gamification as the use of game design elements in non-game contexts and conceive such elements on multiple levels of abstraction, including not only mechanics and interface patterns but also design principles, heuristics, and methods. The present paper is therefore not primarily concerned with importing isolated game elements into education, but with drawing on interactive fiction as a source of design principles for analysing the fairness, inferability, support structure, and trustworthiness of instructional tasks.

The following section develops five structural convergences from four recurring IF concepts: inferable, non-arbitrary puzzles and clear sub-goals (Gilbert, 1989); coherent world models (Nelson, 2001); plot-shaped level design (Short, 2016); and contextually motivated, intelligible obstacles (Giner-Sorolla, 2011; Montfort, 2011).

3. A Convergent Framework

The argument that follows is not that interactive fiction and teaching are identical practices. Rather, the comparison suggests that both confront a closely related design problem: how to construct environments in which participants can orient themselves, make valid inferences, sustain engagement, and arrive at insight without being blocked by arbitrary or opaque obstacles. The convergences developed below are therefore not presented as direct equivalences, but as elements of a design-theoretical heuristic for instructional planning.

Table 1: Structural convergences between interactive fiction design and lesson design

Dimension	IF design principle	Didactic counterpart	Shared design question
Challenge, fit, and fairness	Inferable puzzles; visible sub-goals	ZPD; flow; prior-knowledge activation	Is challenge demanding but non-arbitrary?
Discovery, insight, and inferability	Progress through inference and understanding	Productive failure; cognitive activation	Can insight be inferred from available cues?
Scaffolding and graduated support	Hints; alternative routes; intermediate goals	Scaffolding; graduated assistance	Does support preserve cognitive work?
World models, context, and trust	Stable rules; coherent consequences; earned trust	Expert blind spot; situated learning	Are rules and expectations legible?
Narrative framing and meaningful context	Narrative context guides plausible action	Situated learning; contextual scaffolding	Does context make cues and actions meaningful?

These five interrelated dimensions are developed below.

3.1 Challenge, fit, and Fairness

In IF design, a structurally related problem appears in more concrete design terms: how to make challenge demanding without making it arbitrary. In educational theory, this appears in the ZPD (Vygotsky, 1978) and in flow theory (Csikszentmihalyi, 1990): both point to a productive region in which tasks go beyond routine performance while remaining attainable with the learner's available or supported capacities. Later work brought both together in the concept of "Zones of Proximal Flow" (Basawapatna et al., 2013).

But calibration is not only a matter of challenge level; it is also a matter of challenge quality. In IF design, this becomes visible in Gilbert's (1989) insistence that sub-goals should be obvious and puzzles should not be arbitrary, and in Nelson's (2001) emphasis on a coherent world model from which players can infer what will work. Fairness, in this sense, means that difficulty arises from reasoning within a legible system rather than from hidden rules or missing information.

A corresponding principle applies to educational tasks. A well-designed task should stretch learners without exceeding what has been legitimately established or can be explicitly reactivated. Because classroom teaching unfolds within a spiral curriculum rather than a closed system, fairness in education includes the active reactivation of relevant prior knowledge.

This mapping is structural rather than empirical: IF puzzle fairness, ZPD, and flow are not equivalent constructs, but address the shared design problem of calibrating challenge without making difficulty arbitrary.

3.2 Discovery, Insight, and Inferability

IF design gives this issue an unusually sharp formulation. In Short's (2016) account of plot-shaped level design, the player should "encounter, and ideally make use of" each critical piece of information, and the game should be hard to finish without understanding the story. Progress depends on understanding rather than mechanical matching. Research on insight suggests that Aha-moments are affectively marked, often involving feelings of ease and certainty, and may recruit reward-related neural processes (Tik et al., 2018).

This logic has a close analogue in instructional research on productive failure. Kapur's (2014) findings suggest that learners who attempt complex problems before explicit instruction can later outperform directly instructed learners in conceptual understanding and transfer, even when both groups attain similarly high levels of procedural knowledge. In both fields, designers are therefore cautioned against smoothing the path so completely that challenge collapses into procedure.

Taken together, these parallels suggest inferability as a shared quality criterion. In IF, a puzzle is well designed when its solution is thinkable from within the logic established by the world model and narrative frame, rather than dependent on guessing or hidden rules (Nelson, 2001; Dickey, 2006). In education, well-designed tasks should likewise require learners to reason with available information and prior knowledge in ways that support conceptual understanding and transfer, rather than merely reproduce a previously given solution (Kapur, 2014; Helmke, 2017).

3.3 Scaffolding and Graduated Support

Neither IF nor effective teaching leaves participants without support. In educational theory, scaffolding denotes temporary, calibrated assistance that enables learners to operate productively within the zone of proximal development and is reduced as independent performance becomes possible. The central requirement is that support helps learners continue working on the task without pre-empting the cognitive work the task is meant to elicit (Vygotsky, 1978; Wood, Bruner and Ross, 1976).

IF has evolved specific anti-blockage devices for this problem. Gilbert (1989) argues that designers should "give the player options": if one line of action stalls, another should remain available. Hint systems and intermediate goals serve the same function by preserving forward motion without solving the problem for the player. Here, openness serves to prevent unproductive standstill (Smith, 2011).

These strategies have clear didactic analogues. Graduated hints, sub-goals, and open task formats in lesson design allow learners to progress without reducing problem-solving to answer retrieval. Multiple task strands offer alternative points of entry and mitigate the risk of complete standstill when one approach fails, while maintaining the overall cognitive demand. In both domains, support is intended to make insight reachable, not redundant. A distinctive difference remains: where scaffolding in classrooms can be responsive to individual learners in real time, scaffolding in IF is embedded into the artefact and must be designed in advance.

3.4 World Models, Context, and Trust

Nelson's (2001) account of the world model refers to the rule-governed structure of objects, actions, and consequences that allows players to form expectations about how the game world works. Gilbert's (1989) critique of arbitrary puzzles highlights the negative case: once outcomes no longer make sense within that structure, difficulty feels arbitrary rather than earned.

First, learners, like players, need a problem space whose logic is sufficiently explicit for them to orient themselves. Nathan and Petrosino's (2003) work on the expert blind spot suggests that teachers may overestimate what learners can infer for themselves, because steps that are transparent from an expert perspective may remain implicit from the learner's point of view.

Second, situated learning theory emphasizes that activity and context are not ancillary to learning but integral to it. Brown, Collins, and Duguid (1989) argue that knowledge is situated, being in part a product of the activity, context, and culture in which it is developed and used. Just as an IF puzzle must make sense within the logic of its world, a learning task must be embedded in a context that provides the structure needed for interpretation and action.

Taken together, these insights suggest what may be described as an implicit trust contract between designer and participant. In IF, players expect that sustained engagement with the game's affordances and clues can, in principle, lead to progress. In education, learners likewise need to be able to assume that serious engagement with a task makes learning progress possible. Hidden rules, unstated expectations, or inaccessible prior knowledge undermine this trust by turning difficulty from a productive challenge into an arbitrary obstacle.

This mapping is likewise design-theoretical rather than empirical: player trust and learner trust are not treated as the same psychological construct; the analogy concerns coherence and justified expectations within a designed problem space.

3.5 Narrative Framing and Meaningful Context

Narrative in IF does more than provide flavour. It structures the player's understanding of what information matters and can be tied to actions required for progress. Short's (2016) concept of plot-shaped level design makes this explicit: critical information should not simply appear in the story but should be encountered and, ideally, used through action, so that finishing the game without understanding its underlying logic becomes difficult. In this sense, narrative framing helps establish which interpretations and solution strategies are plausible within the game world.

Dickey's (2006) analysis of adventure-game narrative devices suggests that such structures can inform educational design. She argues that narrative can both motivate learners and scaffold problem solving by providing a cognitive framework that helps learners identify plausible actions, interpret cues, and connect information across the environment. In this sense, the story frame does not merely engage learners; it also helps structure what counts as a sensible next step.

Narrative framing is therefore part of task design rather than a mere motivational embellishment. In both IF and education, it helps make relevant cues, intended inferences, and plausible solution pathways more salient.

Taken together, the five convergences outlined above suggest a coherent design logic rather than a set of independent observations. A task is more likely to be engaging and productive when challenge is fair and calibrated, the solution pathway is inferable rather than arbitrary, support preserves rather than pre-empts cognitive work, the problem space is legible and trustworthy, and the context makes intended inferences plausible. These dimensions are analytically distinct but practically interdependent. The IF-derived heuristic is therefore better understood not as a checklist, but as an integrated lens for analysing the navigability of a problem space from a learner's perspective.

4. The key Asymmetry: Adaptive Teaching and Anticipatory Design

A fundamental difference between interactive fiction and classroom teaching is that teachers can respond to learners in real time by noticing confusion, probing understanding, reformulating explanations, adjusting pacing, and providing targeted support. This adaptive capacity distinguishes teaching from the delivery of a fixed artefact.

For IF authors, by contrast, such real-time adaptation is generally not possible once the work has been released. Instead, the design must anticipate where players are likely to hesitate, misread the situation, overlook relevant information, pursue unproductive interpretations, or stall altogether. Playtesting is therefore not merely a quality-control step, but a structural response to the author's inability to intervene in the moment.

This point becomes clearer in light of research on the expert blind spot. Nathan and Petrosino (2003) show that inferential steps transparent to experts are often invisible to novices. During planning, teachers therefore

face a problem structurally similar to that faced by IF authors: they must anticipate where another person is likely to misread a situation, miss a cue, or fail to see a possible next move.

From this perspective, the educational value of playtesting lies not in the ideal of a teacher-independent learning unit, but in making the anticipated learner pathway through a task explicit enough to be examined before classroom enactment. The relevant question is whether the sequence of demands, inferences, obstacles, and supports has been designed so that meaningful progress is possible from the learner's perspective.

Understood in this way, playtesting becomes a reflective planning practice that examines not only formal correctness but also the navigability of a task's intended pathway. A mathematics task may be formally valid yet still contain an inferential jump learners cannot make; playtesting aims to surface such breakdowns before enactment.

The asymmetry between IF authorship and teaching therefore sharpens rather than weakens the analogy. Teachers are like game designers not because teaching should become fixed and self-sufficient, but because both practices involve the anticipatory construction of problem spaces through which others must be able to move meaningfully.

5. Implications

The framework has implications for lesson planning, teacher professionalisation, and future research.

5.1 IF Design as a Heuristic Lens for Lesson Planning

For lesson and task design, the framework offers three guiding questions: Are prerequisite structures fair? Is the learner pathway navigable from the learner's perspective? Does the designed problem space support orientation, agency, and trust?

In practice, these questions are not tied to a specific subject or format. They apply wherever learners must infer possible next moves from a structured problem space rather than merely follow a prescribed procedure.

First, tasks should be fair and solvable: can they be solved using only knowledge that has been legitimately established or explicitly reactivated, and is the path from problem to solution inferable from the information available to learners? Second, planners should examine the learner pathway itself: where are learners likely to hesitate, misread the situation, or stall, and where are sub-goals, hints, or support structures needed? Third, planners should consider orientation, agency, and trust: does the task provide genuine room for action, coherent context, and sufficiently transparent expectations?

In this sense, IF-inspired playtesting becomes a planning method for examining whether a task's intended pathway is navigable from a learner's point of view.

5.2 Teacher Professionalisation in GBL Contexts

For teacher education and GBL-related professional development, the framework suggests an underused reflective resource: interactive fiction design as a vocabulary for analysing lesson and task design. This connects directly to Klafki's (1964) conception of didactic analysis: before planning a lesson, the teacher must ask what a content element makes accessible for particular learners — much as the IF designer asks what the world model makes inferable for the player.

Terms such as fairness, inferability, graduated hinting, and trust provide an IF-derived vocabulary for reflecting on established concerns of instructional quality and teacher professionalism (Helmke, 2017), making lesson planning more explicit and open to revision.

It also sharpens the paper's critique of superficial gamification. The framework shifts attention away from surface features such as points, badges, and leaderboards toward the deeper design logic of the problem space itself.

5.3 Future Research Directions

As a conceptual framework, the paper is intended to prepare empirical work rather than replace it. Future research can test whether IF-inspired heuristics improve planning practice, learner experience, and pre-enactment task analysis, and can examine how fairness, inferability, and trust relate to established constructs of instructional quality.

6. Limitations

The analogy between interactive fiction and classroom teaching has clear limits. Its value lies in illuminating a shared design problem, not in collapsing two distinct practices into one another. The framework is therefore best understood as a partial, design-oriented lens rather than as a comprehensive theory of teaching.

A first limit concerns the social and open character of classroom learning. Interactive fiction is typically experienced by an individual player within a comparatively bounded system, whereas teaching is shaped by peer interaction, collaborative knowledge construction, classroom discourse, and broader curricular, institutional, cultural, and political conditions. The framework is therefore better suited to analysing task structure, learner orientation, and the anticipatory design of problem spaces than to capturing the full interpersonal and institutional complexity of classroom life.

A second limit is methodological. The present paper develops a conceptual and heuristic framework, not an empirically validated model. Whether it improves lesson planning, learner experience, or instructional quality remains a question for empirical investigation.

A third limit concerns scope. The framework is most persuasive where teaching involves relatively structured learner pathways through tasks, and less so where educational value lies primarily in open-ended social or discursive processes.

These limits clarify the framework's domain of usefulness: it offers a partial lens for analysing and revising task structures and learner pathways in terms of fairness, inferability, support, and trustworthiness.

7. Conclusion

This paper has argued that interactive fiction design and contemporary lesson design converge on a shared structural problem: how to construct problem spaces that are fair, coherent, appropriately challenging, scaffolded, and navigable from the participant's perspective. The paper develops a heuristic framework for lesson and task design, reframes playtesting as anticipatory analysis of learner pathways, and critiques superficial gamification by shifting attention to the quality of the underlying problem space. The educational value of IF design lies not in surface imitation, but in making key design questions explicit, including whether a task is fair, inferable, and adequately supported. In this sense, IF offers a compact vocabulary for analysing task quality before classroom enactment.

Ethics Declaration: This is a conceptual/theoretical paper. No primary data collection involving human participants was conducted. Ethical clearance was not required.

AI Declaration: AI language model tools were used for research support and language editing. All substantive intellectual contributions, including the argument, theoretical framework, interpretation, and conclusions, were developed and critically reviewed by the author.

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