



When a Game Becomes Mathematics: Teachers' Mathematical Attentions in Fortknight, a Reduced-Board Chess Game for Area Measurement

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Abstract. Mathematical topics such as ratios, perimeters, and areas can remain abstract when introduced primarily through tasks without context. This article reports on a comparative case study from the Checkmating Mathematics Difficulties (CMD) project, which examines Fortknight, an analogue chess variant inspired by Fortnite's "storm" mechanic. In Fortknight, timed "storms" gradually reduce the playable chessboard ($8 \times 8 \rightarrow 6 \times 6 \rightarrow 4 \times 4 \rightarrow 2 \times 2$), creating a concrete and visible sequence of uniform squares and changing scales. Chess provides a natural basis for mathematical engagement through its grid-based structure, but whether this mathematical potential is exploited depends on pedagogical practice. Based on classroom, field notes, and video recordings, two contrasting performances of the same game are analyzed: one in which the teacher explicitly links the reduced space to area and shape, and one in which such a link is absent, with the pupils' engagement remaining primarily strategic. The results show a difference between mathematical affordance and mathematical execution. The storm mechanism is a powerful design trigger, but it does not automatically elicit mathematical reasoning. Short, well-chosen teacher prompts and participation structures, short whole-class gatherings, pointing and counting together, enable shifts from strategic gameplay to measurement conversations. The article argues that the teacher's attention-directing measures constitute a portable pedagogical repertoire that determines which of a game's many possibilities are exploited as learning opportunities in the classroom.

Keywords: math games · playful learning · scaffolding · chess · area measurement · game-based learning

1 Introduction

Mathematical topics such as ratios, perimeters, and areas can remain abstract when introduced primarily through tasks without context (Smith et al. 2016). From a playful learning perspective, games incorporate core components that support learning: they are active, socially interactive, engaging, meaningful, joyful, and iterative (Zosh et al. 2018).

Through gameplay, children can actively construct mathematical knowledge, engage in scaffolded interactions with adults or peers, and experience repeated practice with math skills embedded in game procedures (DePascale and Ramani 2025). Game-based approaches are frequently proposed as ways to increase motivation and engagement in mathematics. Yet a persistent challenge is that a game can remain “only a game” unless mathematical attention is actively fostered (Ke 2008; Ramani et al. 2012). Contemporary research on math games emphasises that learning emerges not only from playing but also from how the game’s design features and social interactions during play shape what learners attend to and practise (DePascale and Ramani 2025; Ramani and Siegler 2008). Despite this evidence, significant gaps remain in our understanding of math games for early learning. First, most studied games focus on single mathematical domains, particularly basic numeracy and number sense. Only two studies in De-Pascale and Ramani’s (2025) review examined “sets of games” targeting multiple mathematical areas (Chao et al. 2000; de Chambrier et al. 2021), and no studies investigated games that integrate mathematical content with strategic gameplay requiring higher-order thinking. Second, while the review identifies that “parent guidance during gameplay can scaffold children’s learning in different ways” (De-Pascale and Ramani 2025, p. 17), limited research examines how teacher moves during gameplay mediate the relationship between game design and learning outcomes. The few existing studies focus primarily on general guidance categories (e.g., scaffolding, number talk) rather than analyzing specific attention-directing moves that shape children’s mathematical engagement during play. Third, research on games combining mathematical content with thematic elements familiar to children, such as popular game mechanics, remains scarce, despite their motivational potential.

This paper contributes a design-oriented classroom case from the Checkmating Mathematics Difficulties project (CMD) (Kaup 2025), a three-year design research initiative founded by the Egmont Foundation (2025–2027) involving approximately 350 pupils in grades 2–4 across three Danish schools, through the analysis of Fortknight, an analogue chess variant inspired by Fortnite’s “storm” mechanic. In Fortknight, timed “storms” progressively reduce the playable chessboard, eliminating outer ranks and files at regular intervals (Fig. 1). This transforms familiar chess gameplay into a visible sequence of reducing square arrays: $8 \times 8 \rightarrow 6 \times 6 \rightarrow 4 \times 4 \rightarrow 2 \times 2$.

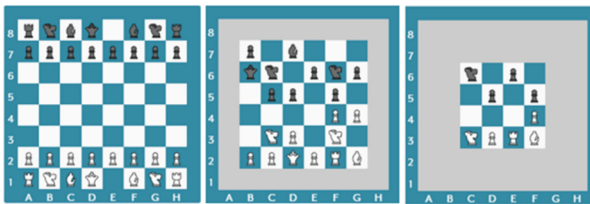


Fig. 1. Fortknight’s storm mechanic transforms a standard chessboard into a sequence of reducing square arrays ($8 \times 8 \rightarrow 6 \times 6 \rightarrow 4 \times 4 \rightarrow 2 \times 2$)

The reducing board mechanic embeds clear mathematical affordances. First, the playable region functions as a visible “unit square array,” inviting area-as-counting reasoning (e.g., “How many squares are left?”). Second, successive board sizes form a figure

sequence, inviting ratio comparisons and scaling reasoning (e.g., “The 6×6 board has 36 squares, that’s about half of 64”). Chess provides a natural foundation for mathematical reasoning. The 8×8 grid introduces coordinate systems, files and ranks establish geometric concepts of rows and columns, and piece movements follow distinct geometric patterns (Berkman 2004). Research indicates that chess involves spatial reasoning, pattern recognition, and continuous calculation cognitive processes directly applicable to mathematical problem-solving (Rosholm et al. 2017). While evidence for direct transfer from chess instruction to mathematics achievement remains mixed (Sala and Gobet 2017), the chessboard’s inherent mathematical structure, particularly its grid-based spatial organization, makes it a promising platform for embedding explicit mathematical content, the approach taken in Fortknight’s design.

To demonstrate how teacher moves mediate these design affordances, the paper presents two cases of Fortknight enacted in different classroom situations with comparable pupil groups. In Case A, the teacher explicitly couples storm transitions to mathematical language through brief prompts, whole class pauses, and shared counting routines, supporting sustained measurement talk and comparison reasoning. In Case B, the teacher facilitates engaged gameplay but does not introduce mathematical attention-directing moves, and pupil discourse remains focused on strategic survival. The contrasting design highlights teacher participation structures and attention-directing move as a plausible mediating mechanism between design affordances and mathematical engagement, the central question of this study. In this paper, *mathematical affordances* refer to the action possibilities embedded in a game’s design that are mathematically relevant, features that *could* invite counting, comparing, or measuring, but that require interactional activation to function as learning opportunities. An affordance, in this sense, is not a property that acts on learners automatically; it is a relational potential between design and participation (Gibson 1979). Whether a design feature becomes a mathematical resource depends on how teachers and pupils jointly orient to it during play. This study examines the conditions under which teacher attention-directing moves activate the mathematical affordances embedded in Fortknight’s design. The research question is: *Under what conditions do teacher attention-directing moves activate the mathematical affordances of a game-based design?*

Through video analysis of classroom gameplay sessions, it is identified and analyzed what types of attention-directing moves teachers employ and how these moves shape children’s mathematical focus during play. This contributes to the literature by providing empirical insight into the mechanisms through which teacher guidance facilitates learning in strategically complex math games, directly addressing DePascale and Ramani’s (2025) call for research examining “how different types of interactions during play relate to learning” (p. 5).

2 Theoretical Framing: Math Games, Playful Learning, and Scaffolding

This paper draws on playful learning theory to analyze Fortknight as enacted classroom practice. DePascale and Ramani’s (2025) systematic review of math games describes games as a form of playful learning, distinguished from free play by their directed goals

and formal rule structure. Following Zosh et al. (2018), playful learning opportunities can be characterized through six components: being active, engaging, meaningful, socially interactive, joyful, and iterative.

For Fortknight, the storm mechanic creates iterative opportunities to compare successive board states, pair play combined with whole-class moments enables socially interactive mathematical discussion, and the Fortnite-inspired narrative provides a meaningful and joyful frame for gameplay. However, as DePascale and Ramani (2025) emphasize, these design elements do not automatically produce mathematical learning, this requires deliberate teacher facilitation.

2.1 Directing Mathematical Attention During Gameplay

Research on teachers noticing in mathematics education emphasizes that teachers play an active role in directing pupils' attention toward mathematically significant features (Mason 2002; Sherin et al. 2011). While much of this work examines how teachers notice and respond to pupils' thinking, less attention has been given to how teachers proactively direct collective attention during game-based activities.

In math games, adult guidance is essential for learning (DePascale and Ramani 2025), but the specific practices through which teachers activate mathematical potential remain underspecified. This paper focuses on attention-directing moves: brief teacher interventions at critical moments that make mathematical features of gameplay salient. For example, when the storm arrives and the board physically reduces from 8×8 to 6×6 squares, an attention-directing move might be: "What happens when the area becomes smaller and smaller?" Such moves do not replace play with direct instruction. Rather, they orient collective attention so that pupils can pursue game goals (survival, strategic positioning) while simultaneously engaging with mathematical relationships (area reduction, scaling ratios). Analytically, this paper examines attention-directing moves at two critical transition points: (i) the introduction of the game, where mathematical concepts may be established before gameplay, and (ii) the first storm transition, where material change offers a concrete opportunity for mathematical comparison.

3 The Fortknight Design in the Checkmating Mathematics Difficulties Project

The CMD project provides participating pupils with one additional weekly lesson (45 min) focused explicitly on connecting mathematics with chess-based games. These supplementary sessions are designed to create playful learning opportunities for students experiencing mathematics difficulties, using chess mechanics as vehicles for mathematical reasoning rather than teaching chess skills per se. Fortknight is used in the CMD project as a playful route into:

- Figure sequences (growing/reducing figures) and early understandings relevant to growth/functions,
- Similarity/scaling through repeated resizing of the same square shape,
- Area as "the inside" (counting unit squares),
- Boundary properties (edges/corners) and, potentially, perimeter.

3.1 Rules and Mechanics: The “Storm”

Fortknight is played in pairs on a standard chessboard with all pieces, except the king, in their starting positions. A timer triggers storm events at regular intervals (typically 3 min for the initial phase, then 2 min, then 1 min for subsequent phases). When the storm arrives, all pieces standing on the outermost ranks and files become casual ties: pieces on rank 1, rank 8, file a, and file h are removed after the first storm; pieces on rank 2, rank 7, file b, and file g are removed after the second storm; and so on. The grey storm zone becomes unplayable, and play continues the progressively reduced board ($8 \times 8 \rightarrow 6 \times 6 \rightarrow 4 \times 4 \rightarrow 2 \times 2$) with surviving pieces. The game concludes when only the four central squares remain playable. The winner is determined by: (1) the player with the most knights on the four central squares at the end of the final phase, or (2) if no knights remain, the player with the highest total piece value using standard chess values (pawn = 1 point, knight/bishop = 3 points, rook = 5 points, queen = 9 points). Table 1 illustrates the mathematical structure latent in the game. (Perimeter here is the boundary length of an $n \times n$ unit-square region in unit lengths, i.e., $4n$.)

Table 1. Board sizes as a reducing figure sequence

Phase	Board	Area (unit squares)	Perimeter (unit lengths)	Example “attention-directing prompt”
Start	8×8	64	32	“How big is the playing area now?”
Storm 1	6×6	36	24	“What changed, area or boundary or both?”
Storm 2	4×4	16	16	“How many squares did we lose?”
Storm 3	2×2	4	8	“What strategies still work in a tiny area?”

The table also highlights the design challenge addressed in this paper: these relations are available in the material structure, but they are not automatically noticed as mathematics unless participation is shaped accordingly.

4 Method

This is a qualitative, comparative case study (Stake 2006) examining how the same game design unfolds differently across two classroom contexts. As part of the CMD project, a three-year design research initiative, this analysis focuses on understanding Fortknight’s enactment in practice rather than its iterative development. The empirical material comprises time-stamped field notes and classroom video recordings from two Fortknight sessions, supplemented by selective video-based transcripts of key sequences.

Field notes captured classroom organization and salient interactional moments, while video was used to revisit storm transitions and short whole-class pauses, refine case descriptions, and verify dialogue snippets and timing (Hammersley and Atkinson 2004).

Two contrasting cases were constructed to analyze enactments of the same Fortknight design – timed “storms” that progressively reduce the playable board – under different conditions of mathematical coupling to area and comparison. Case A comprises two lessons (90 min total) with 14 pupils (8 girls, 6 boys) and one teacher. Case B comprises one lesson (45 min) with 17 pupils (7 girls, 10 boys) and two teachers (Teacher A and Teacher B). Both enactments took place during the CMD project’s initial phase (Autumn 2025) with Grade 4 classes from two different schools. In Case B, the teachers introduced Fortknight as a gameplay activity rather than as a mathematical task. During post-session interviews, teachers explained that they used the game as a “placeholder” activity because it did not align closely with their current mathematical curriculum focus at the time of piloting. This pedagogical choice provides a naturalistic contrast: Case B represents how the game functions when treated primarily as an engaging activity, while Case A represents intentional mathematical coupling.

Transcript excerpts were selected from (i) the game introduction and (ii) the first storm transition, as these moments constitute “trigger points” where gameplay constraints can be reframed as mathematical comparison events. These two moments were identified *a priori* as analytically productive on theoretical grounds: the game introduction establishes the initial framing of the activity’s object, and the first storm transition constitutes the earliest material opportunity for mathematical comparison. No excerpts were selected on the basis of confirming a particular outcome. Within-case interpretations were developed iteratively: preliminary readings of field notes were tested against video replays of the same episodes, and dialogue excerpts were verified against times-tamped recordings to ensure descriptions of teacher moves and pupil responses were accurate. Analytical categories – activity object, participation structure, and teacher move type – were applied consistently across both cases before cross-case comparison was conducted.

Written parental consent was obtained prior to video recording and the use of anonymized still images in research reporting. Still images were selected to avoid identifiable facial features and were edited (e.g., cropping and blurring where needed) to minimize recognizability. All names and identifying details were anonymized in transcripts and reporting, and video data were stored securely in accordance with institutional procedures. The broader CMD project follows focal pupils, this paper foregrounds classroom interaction at the class level as the unit of analysis.

4.1 Case Strategy and Analysis

The cases are used as analytic windows into the interactional conditions under which the game’s potential affordances are enacted. This comparative analytical strategy enables identification of the mediating role of teacher attention-directing moves by systematically examining how the same game design is enacted differently, as a mathematical learning activity versus as a strategic gameplay activity, depending on teachers’ attention-directing practices (Miles et al. 2014). The analysis proceeds in two steps:

Within-case analysis: identifying what counts as the activity's object (winning vs. measuring/comparing), participation structure (whole-class gathering vs. pair-only play), and teacher attention-directing moves (e.g., prompts, pointing, shared counting).

Cross-case comparison: examining how the same design trigger (storm) functions differently depending on attention-directing moves and participation structures.

The four comparative dimensions used in cross-case analysis, activity object, participation structure, teacher move type, and storm framing, were established a priori from the theoretical framework rather than derived inductively from the data, to ensure systematic comparison across structurally different enactments.

The vignettes are interpreted through (a) playful learning components (active, engaging, meaningful, socially interactive, joyful, iterative) and (b) scaffolding as described in the math games literature (Zosh et al. 2018). Claims are treated as indicative rather than exhaustive accounts of all peer talk; findings are best read as a proposed mechanism to be tested across additional sessions, game designs, and age groups.

5 Findings: Two Fortknight Cases

5.1 Case A

This case includes pre-game mathematical preparation and the start of Fortknight. In this enactment, pupils' participation is oriented towards playing Fortknight and towards attending to measurement and comparison of space. Pre-game work establishes area as a shared conceptual resource, which is then explicitly coupled to the storm mechanic at the point of game introduction. At the outset, the teacher anchors area as what is "inside" a figure and distinguishes it from perimeter as what is "around/outside" e.g., "it is what is inside" and "the perimeter is outside/around" (Teacher). A pupil confirms the distinction "the perimeter is outside" (Pupil). These framing positions area as a legitimate object of attention before gameplay begins and prepares pupils to interpret later board changes as changes in "how much is inside." The attention-directing is then operationalized through a grid-based task in which pupils are instructed to produce different shapes with the same area (12 cm^2), defined as twelve-unit squares "draw different shapes that have an area of 12 cm^2 " and "count 12 squares together on the small chess games" (Teacher) (Fig. 2A). The teacher models the counting procedure aloud ("1... 12") (Teacher), reinforcing area-as-counting within a bounded space. When introducing Fortknight, the teacher explicitly links the storm mechanic to area, framing the reduced board as a mathematical event rather than only a game-play hazard: "each time the storm comes, the area we play on becomes smaller, the area becomes smaller" (Teacher) (Fig. 2B).

This explicit naming of reducing area positions storm transitions as occasions for comparison (before/after; more/less space), which can be reactivated during play through brief prompts e.g., "what happens when the area becomes smaller and smaller?" (Teacher). In this case, the storm still structures action, but it also reorganizes the object of participation towards measurement and comparison, making the game's mathematical affordances visible and usable in the unfolding activity. The storm functions here as a design event, the storm interrupts play and makes spatial change unavoidable, and a participation structure, the storm creates a shared moment where talk can shift from "moves" to "measures." With the attention-directing prompt, the storm becomes a mathematical

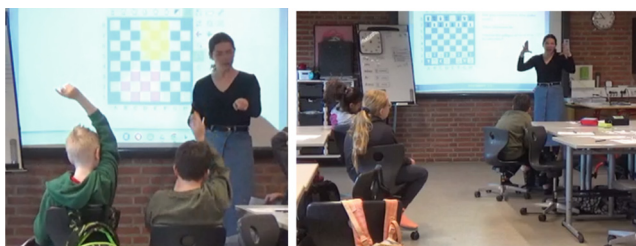


Fig. 2. Teacher’s attention-directing moves. Left (2A): teacher demonstrates area-as-counting by modelling how to count 12 unit squares on a grid. Right (2B): teacher uses gestures to indicate reducing playable space as storm approaches

trigger rather than only a game constraint. In this enactment, *Fortnight*’s reduced-board mechanic becomes an iterative opportunity for comparative reasoning about area and spatial constraints, enabled by brief teacher attention-directing moves and preparatory concept work.

5.2 Case B

In Case B, pupils are highly engaged in playing *Fortnight*, yet their participation is organized differently. Here, the activity’s object remains singular (winning/survival), participation structure is primarily pair-based with teacher managing rules and timing, and teacher attention-directing moves focus on gameplay logistics rather than mathematical connections. The storm is introduced and maintained primarily as a timed gameplay event that removes pieces and reduces the playable board: “Every time three minutes have passed... Storm,” and pieces in the storm zone “are dead” (Teacher A).

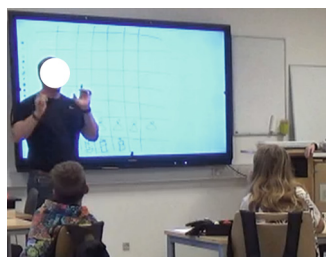


Fig. 3. Teacher introduction in Case B. Teacher explains storm mechanic using drawn chessboard, demonstrating that pieces outside the safe zone are eliminated when storm arrives

Figure 3 illustrates the storm introduction in Case B. The teacher uses a hand-drawn chessboard with pieces (pawns and rooks) to explain the storm mechanic, stating that pieces outside the safe zone “are dead” when the storm arrives. In contrast to Case A (Fig. 2), this explanation frames the storm primarily as a gameplay constraint, a threat to be avoided, rather than as an occasion for measuring or comparing spatial change. The teacher’s attention-directing moves focus on rule enforcement and piece survival, with no explicit coupling to area, unit squares, or figure properties.

Pupils' sensemaking draws strongly on Fortnite-related language and imagery, for example describing a protected region as "a circle where the storm cannot come in" (Pupil). During storm transitions, talk and action are tightly coordinated around immediate repositioning and survival "Storm... Storm... we need to get in" (Pupil). Across these moments, teacher contributions (Teacher A and Teacher B) focus on maintaining game flow rules, timing, legal moves, and managing the storm mechanic, rather than introducing prompts that link reduced space to area, unit squares, or figure sequences.

As a result, when the playable region reduces, pupils adopt strategies (protecting key pieces, repositioning, avoiding elimination), but no shared mathematical language is introduced that would turn the transition into an explicit comparison opportunity (e.g., how much space remains, how the board has changed, or what has been lost/gained across phases). Fortnight functions as an engaging strategy game that develops adaptive planning and spatial awareness, while mathematical opportunities related to area, scaling, and measurement remain latent. The storm structures action, but it does not reorganize the object of participation towards measurement and comparison.

5.3 Cross-Case Comparison

The contrast suggests that Fortnight's storm mechanic is a strong potential trigger, but its educational effect depends on enactment (Table 2).

Table 2. Case comparison

Dimension	Case A (with area coupling)	Case B (without area coupling)
Object of activity	Dual: play + inquire/compare measures	Single: play-to-win/survive
Participation structure	Whole-class gathering + small-group negotiation + transition prompts	Primarily pair play; teacher manages rules
Teacher moves	Prompts linking game event to area; pointing; shared counting	Rule enforcement; timing; no measurement prompts
What storm "is"	A comparison event (before/after; bigger/smaller)	A constraint event (avoid/escape)
Mathematical language	Area as "inside"; shape properties ("square/not square"; corners)	Minimal/absent

This finding aligns with the math games literature emphasizing the role of scaffolded interaction and adult guidance in gameplay contexts (DePascale and Ramani 2025; Zosh et al. 2018). However, the case comparison extends existing research by identifying specific attention-directing moves such as transition-timed prompts, pointing, and shared counting, as well as critical timing windows including the game introduction and first

storm transition, where minimal teacher input shifts the activity's object from strategic to mathematical. In Fortknight, the mechanism is not that the storm itself leads to mathematics, but that the combination of storm transitions and attention-directing moves can lead to measurement talk and comparative reasoning. An important observation is that when mathematical affordances remain latent, teacher moves can activate other learning opportunities. In Case B, pupils developed chess skills, piece movement rules, strategic positioning, and board navigation, demonstrating that teacher attention-directing moves determine which of the game's multiple affordances are enacted as learning opportunities.

6 Discussion: When is a Game “Mathematical”?

The two cases produce a clear empirical contrast. In Case A, the teacher's language at the moment of storm transition names a mathematical property: “*each time the storm comes, the area we play on becomes smaller*” and “*what happens when the area becomes smaller and smaller?*” These moves share three features: they are timed to a material change in the game state, they name a mathematical concept (area) rather than a game consequence, and they invite comparison across states rather than action within a state. In Case B, the equivalent moment is framed as: “*Storm... pieces are dead.*” This move is also timed to the transition, but it names a game consequence (elimination) and invites repositioning rather than comparison.

This contrast allows a working distinction between two move types: *attention-directing moves*, which orient pupils toward a mathematical property of the game state, and *rule management moves*, which orient pupils toward legal gameplay within the current state. Both are legitimate teacher contributions, but only the former reorganizes the activity's object from strategic to mathematical. The distinction is not about the quantity of teacher talk but about its referent: what the prompt points to in the shared material situation.

The Fortknight design embeds an explicit mathematical structure: the storm mechanic progressively reduces a bounded square playing area, enabling comparisons of “more/less room” and inviting reasoning about area as unit squares and change across phases. Yet the cases show that mathematical structure in game rules is not sufficient. Fortknight becomes mathematical only when the reduced space is treated interactionally as an object for measurement and comparison, rather than solely as a constraint to manage for winning. This supports the distinction introduced earlier between mathematical affordance and mathematical enactment. Fortknight affords mathematics through its visible sequence of progressively reduced squares, but it is enacted as mathematics when participants name the relevant mathematical property (area), mobilize shared procedures (counting unit squares), and use transitions as comparison moments. In Case A, this enactment is enabled through attention-directing moves that frame the storm as reducing “*the area*,” supported by pre-game establishment of shared language (“*the inside*”) and operational methods (counting squares). In Case B, the same storm transition is framed primarily as a gameplay hazard (“*pieces are dead*”) with no stabilized language measurement. The game remains engaging and strategically rich, but the mathematical

object remains latent. This pattern aligns with Mason's (2002) account of teacher noticing: making a mathematically salient feature requires an act of directed attention, not merely its presence in the environment.

An important observation concerns Fortknight's capacity to engage pupils broadly, including those typically struggling in mathematics, the CMD project's primary target group. Field notes indicate active participation among pupils who, according to teachers, often withdraw during conventional instruction. However, the contrasting cases reveal that while accessible mechanics create conditions for inclusive engagement, only Case A, where attention-directing moves activated mathematical affordances, transformed this engagement into mathematical learning opportunities. This suggests that game-based designs for pupils experiencing difficulties must attend to both participation through accessible mechanics and learning through deliberate scaffolding. Accessible design is necessary but not sufficient. From a sociocultural perspective, learning opportunities in games depend on how attention is mediated through interaction (DePascale and Ramani 2025). The cases indicate that games become mathematical when teachers perform attention-directing moves at "trigger points", especially game introduction and first storm transition, where the activity's object can shift from "play-to-win" to "play-and-measure." Three conditions appear particularly important across both cases: treating transitions as brief noticing moments rather than merely game constraints; using event-anchored prompts that name what to compare exactly when material change occurs; and establishing a shared conceptual repertoire before play – such as area as "the inside" and counting as the shared procedure – that can be reactivated during transitions without interrupting gameplay flow. Future work could examine whether minimal support such as prompt cards increase the stability of measurement talk across teachers and whether pupils begin to direct mathematical attention themselves over time. The analysis draws on two enactments with selective video excerpting rather than full transcription of all pair talk; claims are therefore best read as a proposed mechanism to be tested in additional sessions across different game designs, age groups, and sustained implementation periods.

7 Conclusion

This paper examined Fortknight, a Fortnite-inspired reduced-board chess game used in the CMD project to create tangible experiences with area, boundaries, and scaling. Through two contrasting cases, the analysis demonstrates that Fortknight's storm mechanic is a strong design trigger but does not automatically produce mathematical reasoning. Mathematical talk emerged when the teacher coupled gameplay transitions to measurement and comparison through brief prompts and participation structures such as whole-class gatherings, pointing, and shared counting. Without such attention-directing, the game functioned primarily as an engaging strategy activity, supporting chess skill development but leaving mathematical opportunities latent. The paper argues that teacher attention-directing moves constitute a portable pedagogical repertoire that determines which of a game's multiple affordances are enacted as learning opportunities in classroom practice. The implication for design is not that games require heavy instruction, but that they benefit from lightweight, strategically timed prompts at critical transition points,

especially game introduction and first storm transition, where gameplay constraints can be reframed as mathematical comparison events.

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