

A Composite Conceptual Framework for Game-Based Learning and Tactical Decision-Making Skill Development in Basketball: Integrating Constructivist, Cognitive, and Situated Learning Perspectives

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ABSTRACT

Tactical decision-making is widely recognised as a defining component of expertise in invasion sports such as basketball, yet instructional research in this area remains theoretically fragmented, with cognitive, motivational, and technological explanations typically studied in isolation from one another. This paper addresses that fragmentation by proposing and justifying a composite conceptual framework that integrates game-based learning (GBL) as an instructional mechanism with four complementary theoretical traditions: constructivism, cognitive load theory, situated learning theory, and the Teaching Games for Understanding (TGfU) and Tactical Games Model (TGM) pedagogical tradition. The framework positions GBL as the independent variable, learner engagement and skill execution quality as mediating mechanisms, tactical decision-making as the dependent construct, and learner characteristics together with environmental factors as moderating conditions. Drawing on a systematic synthesis of recent empirical and theoretical literature (2021 to 2026), the paper demonstrates how each theoretical strand accounts for a distinct pathway within the framework, from the design of authentic game tasks to the calibration of cognitive load and the social, situated nature of tactical learning. A methodological approach for future empirical validation of the framework is outlined, together with its theoretical and practical implications for coaches, physical educators, and curriculum designers. The paper contributes a unifying, testable model to a literature that has, to date, lacked an integrative account of how instructional design, cognition, and context jointly shape tactical decision-making development in basketball and comparable invasion sports.

Keywords: game-based learning; tactical decision-making; conceptual framework; basketball pedagogy; cognitive load theory; situated learning

INTRODUCTION

Basketball performance at every level of competition depends on more than physical execution. Successful play requires players to read rapidly changing game states, anticipate opponent actions, and select an appropriate response under severe time constraints (Du et al., 2025; Wakatsuki et al., 2024). This capacity, commonly termed tactical decision-making, has become a central focus of sport pedagogy research because it appears to be trainable through instructional design rather than fixed by innate ability alone (Janssen et al., 2023; Manninen et al., 2025). Among the instructional approaches proposed to develop this capacity, game-based learning (GBL) has attracted sustained research attention over the past decade, on the premise that learning tactical behaviour within representative, game-like conditions produces better transfer to competitive performance than isolated technical drilling (Breed et al., 2025; Guan et al., 2024).

Despite this attention, the literature on GBL and tactical decision-making in basketball remains conceptually fragmented. Three separate strands of explanation recur across published studies. The first strand emphasises cognitive-perceptual mechanisms, examining how attention, pattern recognition, and working-memory demands shape a player's capacity to select appropriate actions under pressure (Makeeva et al., 2023; Mansikka et al., 2023). The second strand emphasises motivational and affective processes, showing that engagement, enjoyment, and self-efficacy influence how readily players commit cognitive resources to tactical learning tasks (Hidayah et al., 2025; Oprea et al., 2025). The third strand emphasises technological and instructional mediation, documenting how digital tools, augmented reality, and data-analytic feedback systems are increasingly used to scaffold tactical understanding (Chenyi et al., 2024; Lin et al., 2024; Omarov et al., 2024). Individually, each strand offers a partial account of why GBL appears to improve tactical performance. Collectively, however, they have rarely been integrated into a single model that specifies how cognitive, motivational, and contextual mechanisms operate together, and under what conditions their combined effect on tactical decision-making is strongest or weakest.

This paper responds to that gap. Rather than reporting a new empirical study, it develops and justifies a composite conceptual framework that draws together four established theoretical traditions, constructivism, cognitive load theory, situated learning theory, and the TGfU and TGM pedagogical tradition, into a single, internally coherent model of how GBL produces tactical decision-making gains in basketball. The framework specifies GBL as an independent variable, learner engagement and skill execution quality as mediating mechanisms through which GBL exerts its effect, tactical decision-making as the dependent outcome, and learner characteristics together with environmental and instructional conditions as moderating factors that determine the strength of the GBL to tactical decision-making relationship. In proposing this integration, the paper makes three contributions. First, it offers a theoretically grounded explanation for why GBL interventions succeed under some conditions and not others, addressing a recurring limitation identified in recent systematic reviews (Breed et al., 2025; Manninen et al., 2025). Second, it operationalises each construct in the framework using instruments already validated in cognate literatures, providing a concrete basis for future empirical testing. Third, it outlines a methodological approach through which the framework can be validated in applied basketball training contexts, without prematurely presenting empirical findings that have not yet been collected.

The remainder of the paper is organised as follows. Section 2 synthesises the recent literature on GBL, tactical decision-making, and their cognitive, motivational, and technological correlates. Section 3 presents the four theoretical foundations underpinning the composite framework. Section 4 develops the framework itself, including its constituent constructs, hypothesised pathways, and operationalisation. Section 5 outlines a methodological approach through which the framework could be empirically validated. Section 6 discusses theoretical and practical implications, and Section 7 considers limitations and future research directions before the paper concludes.

LITERATURE REVIEW

Game-Based Learning as an Instructional Approach

Game-based learning refers to instructional designs in which learning content is embedded within game structures, rules, and objectives, so that learners acquire knowledge and skill through participation in the game itself rather than through decontextualised instruction (Behnamnia et al., 2023; Guan et al., 2024). In physical education and sport pedagogy specifically, GBL is most closely associated with the TGfU tradition, which restructures practice around modified, representative game forms designed to preserve the tactical problems learners must solve in the full game (Jarrett, 2022; Nopembri et al., 2022). A substantial body of applied research has examined GBL implementations in basketball and comparable invasion sports. Small-sided games, in which player numbers, court dimensions, or rules are systematically modified, have been shown to influence the tactical and technical demands placed on learners (de Souza et al., 2024; Mahyudi et al., 2025; Sansone et al., 2023), while comparative studies of drill-based and game-situation training report differing effects on both technical accuracy and decision quality (Sutriawan & Syafruddin, 2025).

Systematic reviews of this literature converge on a cautiously positive conclusion. Manninen et al. (2025), synthesising evidence through a multilevel meta-analysis, reported that game-based approaches produce

meaningful improvements in decision-making and tactical knowledge relative to technique-focused instruction, although effect sizes vary considerably across studies and moderating variables are inconsistently reported. Breed et al. (2025) similarly found that comparative tactical game-centred approaches in physical education differ substantially in content and implementation quality, limiting the generalisability of pooled effects. These reviews point to the same underlying problem that motivates the present framework: GBL is not a single, uniform intervention, and its effect on tactical decision-making likely depends on mediating and moderating conditions that have not been consistently modelled.

Tactical Decision-Making in Basketball

Tactical decision-making has been operationalised in the literature through several complementary approaches, including game-performance observation instruments, situational judgement tasks, and, more recently, computational and physiological measures of decision quality under pressure. The Game Performance Assessment Instrument (GPAI) tradition remains widely used to assess in-game decision appropriateness, skill execution, and support behaviour (Tsuda et al., 2023), and has recently been applied to evaluate the effect of a tactical games model on university basketball performance (Wang et al., 2025). Complementary physiological approaches have examined how activation states influence the speed and accuracy of intuitive decisions among basketball players of differing skill levels (Du et al., 2025), while behavioural analyses of shooting and passing decisions demonstrate that expert players process multiple response options in parallel rather than sequentially (Wakatsuki et al., 2024).

A recurring theme in this literature is that tactical decision-making does not develop in isolation from technical skill execution. Rusmana et al. (2023) found that combining tactical game exposure with structured encouragement improved both decision-making and skill execution among basketball athletes, suggesting that these two outcomes are mutually reinforcing rather than independent. This finding is consistent with observational-learning research showing that basketball players acquire tactical and technical competence through structured modelling and repeated exposure to representative game situations (Panganiban & San Miguel, 2023). Taken together, this literature supports treating skill execution quality as a mechanism through which broader instructional interventions, including GBL, translate into tactical decision-making gains, rather than as a separate, parallel outcome.

Cognitive-Perceptual and Attentional Mechanisms

A second strand of literature examines the cognitive-perceptual substrate of tactical decision-making. Attentional control, working memory, and pattern recognition have each been linked to decision quality under the time pressure characteristic of invasion sports (Makeeva et al., 2023; Oprea et al., 2025). Research on team situation awareness in high-demand simulated environments outside sport, such as air combat, has similarly shown that shared situational understanding predicts coordinated decision accuracy under pressure (Mansikka et al., 2023), offering a useful cross-domain parallel for how tactical awareness might be conceptualised in team sport contexts. Within basketball specifically, the relationship between mental processing capacity and technical fitness has been documented among adolescent players (Makeeva et al., 2023), reinforcing the view that cognitive and physical development are interdependent rather than separable targets of training.

This cognitive strand of the literature provides the empirical basis for incorporating cognitive load considerations into the composite framework. If tactical decision-making performance depends on the availability of attentional and working-memory resources, then instructional designs that impose excessive extraneous cognitive demand, through overly complex rules, unfamiliar equipment, or poorly scaffolded game modifications, would be expected to impair rather than enhance tactical learning, regardless of how motivationally engaging the game task appears on the surface.

Motivational, Affective, and Social Dimensions

A third strand of literature addresses the motivational and social conditions under which GBL interventions succeed. Teacher and coach interaction quality has been shown to enhance both engagement and motivation in game-centred basketball learning (Hidayah et al., 2025), while broader reviews of game-based physical

education report consistent associations between game-based formats and increased student participation and enjoyment (Fauziah et al., 2025). Structured feedback and encouragement embedded within tactical game tasks have likewise been associated with improved decision-making outcomes (Rusmana et al., 2023), suggesting that motivational and cognitive mechanisms operate in tandem rather than independently.

Comparable findings appear outside basketball. In youth football, attentional and creative capacity have both been linked to technical-tactical performance (Oprea et al., 2025), while game-based approaches applied to volleyball, handball, and school football consistently report improvements in both motivation and tactical or decision-making outcomes when game tasks are appropriately structured (Andriansyah et al., 2025; Azzahra & Mahendra, 2025; Pratama et al., 2026). This convergence across sports supports treating engagement as a generalisable mediating mechanism within the composite framework, rather than as a basketball-specific artefact.

Technological and Instructional Mediation

A fourth and more recent strand of literature examines how digital and analytic technologies mediate tactical learning. Applications of artificial intelligence and multisource data analytics to basketball have expanded rapidly, encompassing spatiotemporal performance modelling (Lin et al., 2024), talent identification systems (Susanto et al., 2024), and reinforcement-learning approaches to team tactical optimisation (Tong, 2024). Reviews of this emerging literature note both its promise and its immaturity, observing that artificial intelligence applications in basketball remain concentrated in performance analytics rather than in validated pedagogical tools (Chenyi et al., 2024). Augmented and virtual reality environments have shown more direct pedagogical application, including within physical education specifically, where augmented reality game-based environments have been associated with increased sport motivation (Omarov et al., 2024) and virtual reality-based educational games have improved learning outcomes in comparable instructional contexts (Shi et al., 2022). Broader reviews of augmented reality in STEM education report similar patterns of engagement gains, albeit with inconsistent evidence for durable skill transfer (Yu et al., 2022).

Digital tactical games platforms developed specifically for sport instruction have also begun to appear, including validated digital tactical games learning models (Nur et al., 2025) and technology-supported game activities associated with improved learner experience in basketball instruction specifically (Nurharisa et al., 2025). While this technological strand is not the primary focus of the present framework, it is incorporated as a component of the environmental and instructional conditions that moderate the relationship between GBL and tactical decision-making, consistent with evidence that the same underlying GBL principles produce different outcomes depending on the instructional medium through which they are delivered.

Synthesis and the Case for an Integrative Framework

Read together, these four strands of literature converge on a shared but under-specified conclusion: GBL affects tactical decision-making through cognitive, motivational, and contextual pathways that are rarely modelled jointly. Systematic reviews in the field explicitly identify this as a limitation. Manninen et al. (2025) call for future research that specifies moderating conditions rather than treating GBL as a uniform intervention, while Breed et al. (2025) note that comparative studies rarely make their underlying instructional theory explicit, complicating efforts to synthesise findings across implementations. Table 1 summarises how each literature strand maps onto a distinct component of the composite conceptual framework developed in Section 4, illustrating both the coverage that existing research already provides and the integrative gap the present framework is intended to close.

Table 1: Mapping of Literature Strands onto the Composite Conceptual Framework

Literature strand	Representative sources (2021 to 2026)	Framework component	Integrative gap addressed
Cognitive-perceptual mechanisms	Du et al. (2025); Makeeva et al. (2023); Mansikka et al. (2023)	Dependent variable (tactical decision-making) and	Specifies cognitive capacity as a moderator rather than an unexplained source of variance

		moderating variables (learner characteristics)	
Motivational and affective processes	Fauziah et al. (2025); Hidayah et al. (2025); Oprea et al. (2025)	Mediating variable (learner engagement)	Positions motivation as a mediating mechanism linking instruction to outcome, not a parallel outcome
Technological and instructional mediation	Chenyi et al. (2024); Lin et al. (2024); Nur et al. (2025); Omarov et al. (2024)	Moderating variables (environmental and instructional factors)	Treats instructional medium as a boundary condition on GBL effectiveness
Game-based instructional design	Breed et al. (2025); Guan et al. (2024); Manninen et al. (2025)	Independent variable (game-based learning)	Distinguishes GBL as a structured construct with calibrated cognitive demand, not a uniform intervention
Skill execution and tactical performance	Rusmana et al. (2023); Tsuda et al. (2023); Wang et al. (2025)	Mediating variable (skill execution quality) and dependent variable	Links execution quality to decision-making as a joint, partially overlapping outcome pathway

THEORETICAL FOUNDATIONS

The composite conceptual framework draws on four theoretical traditions, each accounting for a distinct mechanism through which GBL is hypothesised to influence tactical decision-making. Figure 1 illustrates how the four theories map onto the framework's structure before the framework itself is presented in full in Section 4.

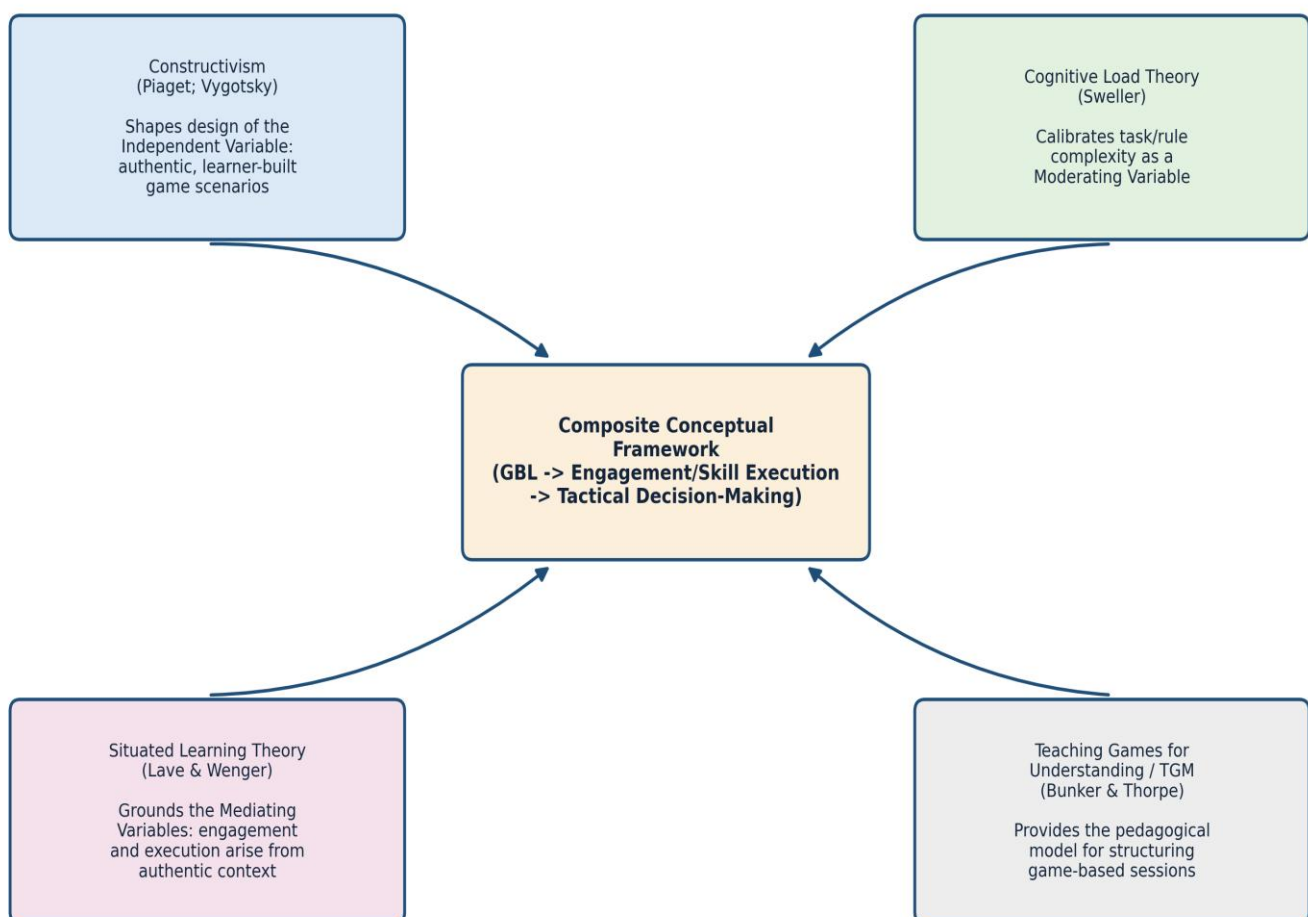


Figure 1. Theoretical integration underpinning the composite conceptual framework. Each of the four theoretical traditions accounts for a distinct pathway within the model presented in Figure 2.

Constructivism

Constructivist learning theory holds that learners actively build understanding through direct engagement with authentic problems, rather than passively receiving transmitted knowledge (Piaget, 1962; Vygotsky, 1978). Applied to tactical instruction, constructivism implies that players develop tactical understanding most effectively when placed in game situations that require them to construct, test, and revise their own tactical solutions, rather than executing pre-specified movement patterns in isolation. This principle underlies the design of the independent variable within the composite framework: GBL tasks are conceptualised not merely as motivational devices but as structured opportunities for learners to construct tactical knowledge through direct, representative game engagement. Recent applications of constructivist-aligned game design in physical education report consistent gains in higher-order tactical understanding when game tasks are deliberately structured to require learner-generated solutions rather than instructor-dictated responses (Nopembri et al., 2022).

Cognitive Load Theory

Cognitive load theory (Sweller, 1988) distinguishes between intrinsic load, arising from the inherent complexity of a task, extraneous load, arising from how a task is presented, and germane load, representing the cognitive effort directed at schema construction and learning itself. Within the composite framework, cognitive load theory provides the mechanism by which learner characteristics and environmental factors moderate the GBL to tactical decision-making relationship. Game tasks that are too simple relative to a learner's existing tactical schema fail to generate germane load sufficient for learning, while tasks that are too complex, whether through unfamiliar rules, excessive player numbers, or unmanageable court dimensions, generate extraneous load that impairs rather than supports decision-making development. This theoretical mechanism is consistent with applied findings that systematically increasing contextual interference during basketball skill training produces different performance outcomes depending on the interference level relative to learner capability (Wang et al., 2024), and with evidence that structured, incrementally scaffolded game modifications outperform undifferentiated game exposure in developing tactical competence (Saputri et al., 2025).

Situated Learning Theory

Situated learning theory (Lave & Wenger, 1991) holds that knowledge and skill are inseparable from the social and physical context in which they are acquired, and that authentic participation within a community of practice is central to genuine skill development. This theoretical strand grounds the mediating variables within the composite framework: learner engagement and skill execution quality are conceptualised not as generic motivational states but as situated outcomes that arise specifically from authentic participation in representative, socially embedded game contexts. Empirical support for this mechanism appears in research demonstrating that collaborative, peer-embedded game formats produce stronger engagement and tactical gains than individually structured drilling (Rusmana et al., 2023), and in observational-learning research showing that basketball players acquire tactical competence substantially through situated peer modelling rather than isolated instruction (Panganiban & San Miguel, 2023).

Teaching Games for Understanding and the Tactical Games Model

The fourth theoretical strand is pedagogical rather than purely psychological. The TGfU approach, and its related Tactical Games Model (TGM), provide the concrete instructional architecture through which constructivist, cognitively calibrated, and situated principles are translated into deliverable basketball training sessions. TGfU-based instruction is structured around a sequence of modified games, tactical questioning, and skill practice embedded within the game context, rather than technique-first instruction followed by unstructured game play (Jarrett, 2022). Recent applications of TGfU and TGM specifically to basketball report improvements in higher-order tactical thinking (Nopembri et al., 2022) and, in a controlled university-level implementation, in overall basketball performance relative to comparison instruction (Wang et al., 2025). The TGfU and TGM tradition therefore does not compete with the three psychological theories above but rather operationalises them, providing the pedagogical vehicle through which constructivist task design, cognitively calibrated complexity, and situated, socially embedded practice are jointly delivered within a single coherent instructional model.

THE COMPOSITE CONCEPTUAL FRAMEWORK

Overview

Building on the theoretical foundations above, the composite conceptual framework specifies four categories of variables and the pathways connecting them: an independent variable (GBL), two mediating variables (learner engagement and skill execution quality), a dependent variable (tactical decision-making), and two moderating variables (learner characteristics and environmental and instructional factors). Figure 2 presents the full framework.

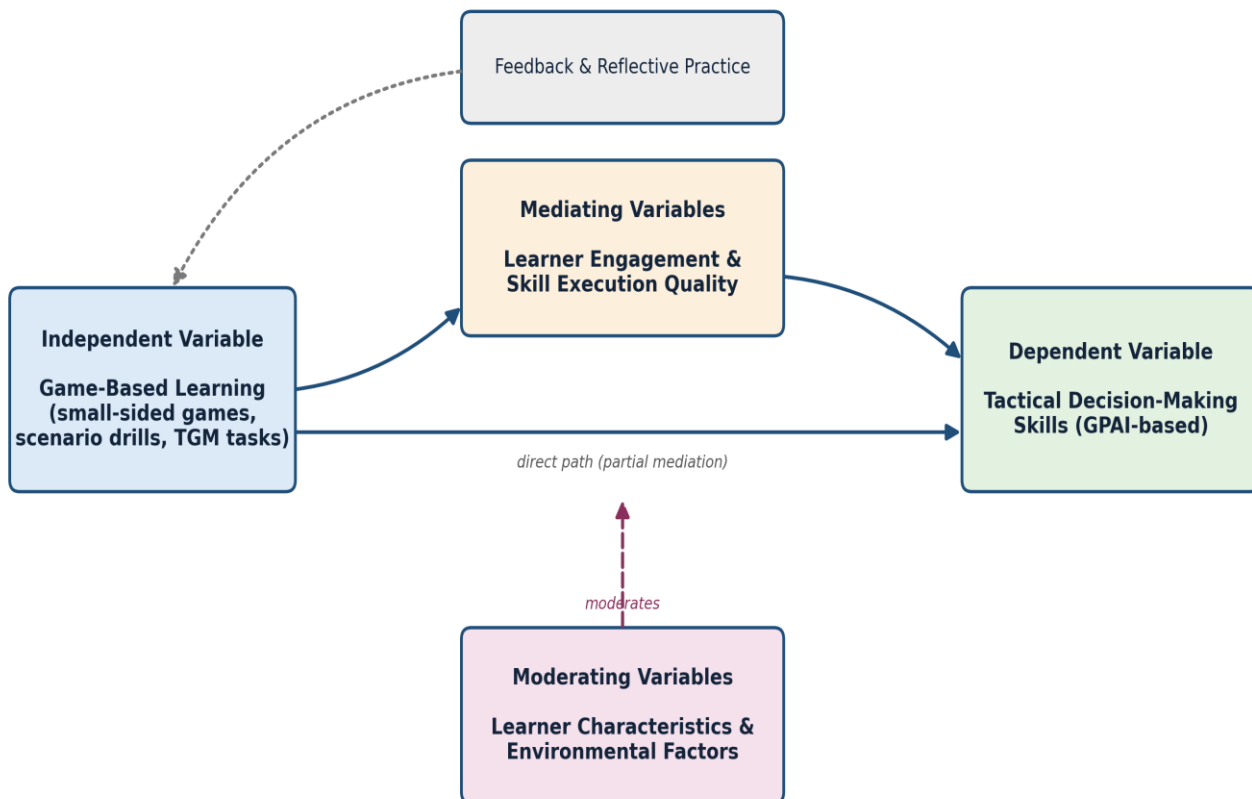


Figure 2. Composite conceptual framework linking game-based learning to tactical decision-making in basketball, showing mediating (engagement, skill execution quality) and moderating (learner characteristics, environmental factors) pathways.

Independent Variable: Game-Based Learning

GBL is operationalised within the framework as structured instructional strategies, including small-sided games, scenario-based tactical drills, and TGM-aligned activities, that embed tactical problems within representative, rule-modified game contexts (de Souza et al., 2024; Mahyudi et al., 2025). Consistent with the constructivist foundation described in Section 3.1, GBL tasks are treated as opportunities for active, learner-driven tactical problem-solving rather than as motivational supplements to conventional instruction.

Mediating Variables: Engagement and Skill Execution Quality

The framework specifies two mediating mechanisms through which GBL is hypothesised to influence tactical decision-making. Learner engagement, encompassing attentional investment, enjoyment, and willingness to persist with challenging tactical tasks, is grounded in the situated learning perspective described in Section 3.3 and has been empirically linked to game-centred instructional quality in basketball specifically (Hidayah et al., 2025). Skill execution quality, encompassing the technical accuracy with which tactical decisions are physically enacted, is included as a second, related mediator on the basis that tactical decisions cannot be meaningfully evaluated independently of the execution quality through which they are observed in competitive play (Rusmana

et al., 2023; Tsuda et al., 2023). The framework treats these two mediators as partially overlapping rather than fully independent constructs, consistent with evidence that engagement and execution quality tend to improve together under effective GBL conditions (Panganiban & San Miguel, 2023).

Dependent Variable: Tactical Decision-Making

Tactical decision-making is operationalised as the outcome construct of the framework, encompassing decision appropriateness, anticipation, and situational adaptability during live or simulated game play. This construct draws on the GPAI observational tradition (Tsuda et al., 2023; Wang et al., 2025) and on more recent behavioural and physiological approaches to measuring decision quality under time pressure (Du et al., 2025; Wakatsuki et al., 2024).

Moderating Variables: Learner Characteristics and Environmental Factors

Consistent with the cognitive load mechanism described in Section 3.2, the framework specifies that the strength of the GBL to tactical decision-making relationship, whether mediated through engagement or through skill execution quality, depends on learner characteristics (prior experience, cognitive maturity, and existing tactical schema) and environmental or instructional factors (court dimensions, player numbers, rule modifications, coaching quality, and instructional medium, including digital or technologically mediated delivery). This moderation pathway is supported by evidence that game modification effects vary systematically with player numbers and court size (de Souza et al., 2024), by contextual interference research showing that the same instructional manipulation produces different outcomes depending on learner capability (Wang et al., 2024), and by evidence that technologically mediated GBL delivery, including augmented reality and digital tactical games platforms, produces motivational and engagement effects that are not uniform across instructional contexts (Nur et al., 2025; Omarov et al., 2024).

Feedback and Reflective Practice

The framework incorporates a feedback loop, informed by coach and peer commentary and structured reflective practice, that feeds back from the mediating and dependent variables into subsequent GBL task design. This reflective mechanism is supported by evidence that structured feedback embedded within tactical game tasks strengthens both decision-making and skill execution outcomes over successive training sessions (Rusmana et al., 2023), and reflects the iterative, cyclical character of situated skill development rather than a single, one-directional causal pathway.

Operationalisation of Framework Constructs

Table 2 summarises how each construct in the composite framework can be operationalised using instruments already validated in cognate literatures, providing a concrete basis for the empirical validation approach outlined in Section 5.

Table 2: Operationalisation of Composite Conceptual Framework Constructs

Construct	Framework role	Proposed measure	Source of instrument
Game-based learning exposure	Independent variable	Structured intervention protocol: small-sided games, scenario drills, TGM-aligned tasks	de Souza et al. (2024); Mahyudi et al. (2025)
Cognitive flexibility	Covariate / mechanism indicator	Cognitive Flexibility Scale for Sport (CFSS)	Korucuk et al. (2025)
Learner engagement	Mediating variable	EGAMEDU game-based learning experience scale	Gonzalez et al. (2022)
Skill execution quality	Mediating variable	Observational rating of technical execution during game play	Tsuda et al. (2023)
Tactical decision-making	Dependent variable	GPAI-aligned observational instrument; decision-appropriateness index	Oslin et al. (1998); Wang et al. (2025)

Learner characteristics	Moderating variable	Demographic and prior-experience questionnaire	Ibanez & Feu (2026)
Environmental and instructional factors	Moderating variable	Structured coding of court dimensions, player numbers, rule modification, instructional medium	de Souza et al. (2024); Omarov et al. (2024)

PROPOSED METHODOLOGICAL APPROACH FOR EMPIRICAL VALIDATION

The composite conceptual framework developed above is presented as a theoretical contribution and has not yet been empirically tested. This section outlines a methodological approach through which future research could validate the framework, without presenting findings that have not been collected.

Research Design

A convergent parallel mixed-methods design is proposed, in which quantitative and qualitative data are collected simultaneously, analysed independently, and integrated at the interpretation stage (Creswell & Plano Clark, 2023). This design would allow triangulation between measured tactical decision-making outcomes and learners' own accounts of engagement and skill development, addressing the motivational and situated dimensions of the framework that quantitative performance measures alone cannot capture. A quasi-experimental, intact-group comparison between GBL and conventional instruction, incorporating pre-test and post-test measurement, is recommended as the quantitative component, given the practical constraints of randomising individual learners within existing training programmes (Ibanez & Feu, 2026).

Instrumentation

Consistent with the operationalisation summarised in Table 2, cognitive flexibility could be measured using the recently validated Cognitive Flexibility Scale for Sport (Korucuk et al., 2025), game-based learning experience using the EGAMEDU scale (Gonzalez et al., 2022), and tactical decision-making outcomes using a GPAI-aligned observational instrument (Tsuda et al., 2023; Wang et al., 2025). Structured, semi-structured interviews with a purposively selected subsample of participants would allow the mediating mechanisms of engagement and skill execution to be examined qualitatively, consistent with recommended approaches to sampling in applied sport science research (Ibanez & Feu, 2026).

Analytical Approach

Testing the mediating pathways specified in the framework (Section 4.3) would require an analytical approach capable of estimating indirect effects, such as bootstrapped mediation analysis, rather than simple between-group comparison alone. Testing the moderating pathways specified in Section 4.5 would similarly require interaction-term or moderated-regression analysis rather than subgroup description alone. A formal a priori power analysis, specifying the minimum sample size required to detect the hypothesised indirect and interaction effects at conventional statistical power, is recommended before data collection begins, given that mediation and moderation effects typically require larger samples than simple mean comparisons to detect reliably.

Ethical Considerations

Any empirical validation of the framework involving human participants, particularly student athletes within an existing training programme, would require prior institutional ethics review and documented informed consent, with particular attention to voluntary participation, the right to withdraw without academic or athletic consequence, and the protection of participant confidentiality throughout data collection, storage, and reporting.

THEORETICAL AND PRACTICAL IMPLICATIONS

Theoretical Implications

The composite framework offers three theoretical contributions to the sport pedagogy literature. First, it provides an integrative account of why GBL interventions produce inconsistent effects across studies, addressing the gap

identified in recent systematic reviews (Breed et al., 2025; Manninen et al., 2025) by specifying learner characteristics and environmental factors as explicit moderating conditions rather than unexplained sources of heterogeneity. Second, it treats engagement and skill execution quality as parallel, partially overlapping mediating mechanisms rather than as a single undifferentiated pathway, offering a more precise account of how GBL exerts its effect than models that treat motivation and execution as separate outcomes. Third, by explicitly connecting four established theoretical traditions, constructivism, cognitive load theory, situated learning theory, and the TGfU and TGM pedagogical model, the framework demonstrates how psychological theory and applied pedagogical models can be integrated within a single testable structure, offering a template that could be adapted to other invasion sports in which comparable tactical decision-making demands exist.

Practical Implications

For basketball coaches and physical educators, the framework suggests that GBL task design should be evaluated not only for its motivational appeal but for its cognitive load calibration relative to learner experience, consistent with evidence that undifferentiated game exposure produces weaker tactical gains than deliberately scaffolded game modification (Wang et al., 2024). Practitioners are encouraged to treat engagement and skill execution as jointly monitored indicators during training, using structured observation and feedback rather than relying on either indicator alone, consistent with evidence that combining tactical game exposure with structured encouragement improves both outcomes simultaneously (Rusmana et al., 2023). For curriculum designers, the framework provides a basis for specifying which environmental and instructional factors, including the increasing use of digital and augmented-reality tools, are most likely to moderate the effectiveness of GBL implementations, supporting more targeted resource allocation than a one-size-fits-all approach to game-based curriculum design.

Limitations and Future Research Directions

The composite conceptual framework presented in this paper is a theoretical contribution and has not yet been empirically validated; the framework's proposed pathways, while grounded in existing empirical literature from cognate contexts, should be treated as hypotheses pending direct testing. The framework also draws primarily on literature from basketball and closely related invasion sports, and its generalisability to sports with substantially different tactical structures, such as individual or non-invasion team sports, has not been established. Future research should prioritise three directions. First, empirical validation of the framework using the methodological approach outlined in Section 5, including formal mediation and moderation testing rather than simple group comparison. Second, longitudinal research examining whether tactical decision-making gains attributed to GBL persist beyond the immediate intervention period, addressing a limitation noted across the broader GBL literature (Guan et al., 2024). Third, comparative research examining whether the framework's structure, and in particular the relative weighting of its cognitive, motivational, and technological moderating factors, differs across cultural, institutional, and resource contexts, given that much of the existing literature synthesised in this paper originates from a narrow range of national and institutional settings.

CONCLUSION

This paper has developed a composite conceptual framework that integrates constructivist, cognitive load, situated learning, and TGfU and TGM perspectives into a single, internally coherent model of how game-based learning influences tactical decision-making in basketball. By specifying learner engagement and skill execution quality as mediating mechanisms and learner characteristics and environmental factors as moderating conditions, the framework offers a theoretically grounded explanation for the inconsistent effects reported across the existing GBL literature, and a concrete, operationalised basis for future empirical validation. The framework does not claim to resolve every open question in this literature, but it offers a more integrative starting point than the fragmented, single-mechanism accounts that have dominated prior research, and provides a template that coaches, physical educators, and researchers can apply and adapt to the ongoing challenge of developing tactical intelligence in basketball and comparable invasion sports.

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