



GUIDELINES

ON THE USE AND MISUSE OF GAMES IN EDUCATION

Literature Review Report aligned with India's
National Education Policy 2020, and Sustainable
Development Goal 4

COL-CEMCA Project C26-076

Phase 1: Desk Research & Framework Development



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SUMMARY

This literature review synthesises global evidence on game-based learning (GBL) and gamification in education, drawing from 30+ systematic reviews and meta-analyses published between 2012 and 2025. The review directly supports the United Nations Sustainable Development Goal 4 (SDG 4) - ensuring inclusive and equitable quality education while addressing India's National Education Policy (NEP) 2020 objectives for experiential, play-based, and technology-integrated learning.

Alignment with SDG 4 and Global Education Agenda

This literature review synthesises global evidence on game-based learning (GBL) and gamification in education, drawing from 30+ systematic reviews and meta-analyses published between 2012 and 2025. The review directly supports the United Nations Sustainable Development Goal 4 (SDG 4) - ensuring inclusive and equitable quality education while addressing India's National Education Policy (NEP) 2020 objectives for experiential, play-based, and technology-integrated learning.

Key Findings:

- Games and gamification demonstrate consistent positive effects on learning (effect sizes $g=0.25$ to $g=0.96$ across meta-analyses)
- NEP 2020 Section 4.6 explicitly mandates experiential learning including gamification, and these guidelines provide pointers for implementation
- Southeast Asia leads Asian GBL research (60%), but India and other Commonwealth Asia nations remain critically underrepresented
- STEM subjects show particularly strong effects (Effect Size=0.67); language learning shows large effects ($g=0.96$ for mobile games)
- Implementation barriers include: infrastructure gaps, teacher training needs, and lack of validated guidelines
- Six categories of misuse identified: cognitive overload, reward gaming, hint dependency, dependency, surface learning, addiction

NEP 2020 Alignment

This review directly supports NEP 2020 implementation through evidence-based guidelines for:

- Section 4.6: Experiential learning, including gamification across all stages
- Section 4.21: Language teaching through gamification and apps
- Section 4.2: Play-based learning in Foundational Stage (ages 3-8)
- Chapter 23: Technology integration via DIKSHA and digital platforms

Key Messages

This report synthesises over 30 meta-analyses representing 600+ primary studies and 60,000+ participants to provide evidence-based guidelines for game-based learning in Indian education. The global evidence consistently demonstrates positive effects, with effect sizes ranging from $g=0.25$ to $g=0.96$ across different domains, though this evidence is unevenly distributed – 60% of Asian GBL research comes from Southeast Asia, while India has limited systematic reviews or meta-analyses despite the NEP 2020 mandate.

The evidence reveals that implementation quality matters as much as the decision to use games. STEM subjects show particularly strong effects (Effect Size=0.67), and mobile language games achieve the largest effects ($g=0.96$). Shorter interventions paradoxically outperform longer ones, and games used as supplements to direct instruction consistently outperform games used as replacements. However, six categories of misuse threaten these benefits: cognitive overload, reward gaming, hint dependency, surface learning, competitive anxiety, and addiction patterns. The ‘Ghost Effect’ – where students achieve high game performance without corresponding learning gains – represents a particularly concerning pattern that requires active monitoring.

India's implementation context presents unique challenges. Only 34% of rural areas have 4G coverage and fewer than 20% of rural schools are connected to the internet, yet 84% of rural households have smartphone access with only 57% educational use among teenagers. DIKSHA already reaches 275 million users and NEP 2020 explicitly mandates gamification, yet this scale-up proceeds without validated guidelines. This report

addresses that gap by providing evidence-based guidelines for effective use, warning signs for misuse, and recommendations for policy and practice aligned with India's educational infrastructure realities.

KEY TAKEAWAYS: What Works in Game-Based Learning

- Effect sizes range from $g=0.25$ to $g=0.96$ across 30+ meta-analyses - GBL is evidence-based pedagogy
- STEM ($ES=0.67$) and language learning ($g=0.96$) show the strongest effects
- Games as SUPPLEMENT to instruction outperform games as REPLACEMENT
- Competition combined with collaboration yields the strongest behavioral outcomes
- Teacher scaffolding before and debriefing after gameplay is critical for learning transfer
- Shorter, intensive interventions (<1 week) paradoxically show larger effects than longer ones



1. INTRODUCTION AND RATIONALE

1.1 Background

Game-based learning (GBL) and gamification have emerged as significant pedagogical approaches in 21st-century education. GBL involves using complete games designed for educational purposes, while gamification applies game design elements (points, badges, leaderboards, challenges) to non-game educational contexts. Both approaches leverage the motivational and engagement potential of games to enhance learning outcomes.

The global education technology market has grown exponentially, with the Asia-Pacific region projected to develop at the highest pace. Research activity in this domain is substantial, with over 1,000 studies identified in recent systematic searches. Yet, as Hafiza and Pratolo (2024) note, 'teachers may face several challenges when introducing game-based learning into their classrooms including infrastructure, resources, theoretical guidance, and teacher capacity barriers.

1.2 NEP 2020 Mandate for Game-Based Learning

India's National Education Policy 2020 provides an explicit mandate for game-based approaches across multiple educational stages. Section 4.6 states that experiential learning will be adopted as standard pedagogy, including hands-on learning, arts-integrated education, sports-integrated education, and story-telling-based pedagogy. Section 4.21 specifically mandates that teaching of all languages will be enhanced through innovative and experiential methods, including through gamification and apps.

For younger learners, Section 4.2 emphasises play-based and activity-based learning for the Foundational Stage (ages 3-8), while Section 4.4 continues this emphasis for the Preparatory Stage (ages 8-11) with play, discovery, and activity-based interactive classroom learning. Chapter 23 addresses technology integration through DIKSHA and digital platforms. This comprehensive policy mandate creates both opportunity and urgency for developing evidence-based guidelines on effective GBL implementation.

1.3 Research Gap and Project Objectives

Despite the NEP 2020 mandate, India lacks systematic guidance on GBL implementation. This project aims to address this gap through comprehensive synthesis of global meta-analytic evidence on GBL and gamification, identification of effective use patterns and warning signs of misuse, and development of NEP 2020-aligned guidelines for Indian educational settings. Particular attention is given to underrepresented student populations and resource-constrained environments where implementation challenges are most acute.

2. METHODOLOGY

2.1 Search Strategy

This review follows systematic review principles, searching major academic databases including Web of Science, Scopus, ERIC, PubMed, Google Scholar, and ResearchGate. Search terms included combinations of: game-based learning, gamification, serious games, educational games, meta-analysis, systematic review, effect size, learning outcomes, and education.

2.2 Inclusion Criteria

The review included meta-analyses and systematic reviews published between 2012 and 2025, focusing on K-12 or higher education settings with quantitative effect size data where available. Studies examining learning outcomes, motivation, or engagement were prioritized, with special attention to Asia-focused research and studies documenting negative effects. Domain-specific reviews covering language learning, STEM education, physical education, history, and early childhood were included to capture subject-specific patterns.

2.3 Data Extraction and Verification

Each meta-analysis was verified against original sources to confirm effect sizes, author attributions, and statistical findings. Misattributed or unverifiable claims were excluded. The final evidence base comprises 30+ verified meta-analyses and systematic reviews, representing analysis of over 600 primary studies and 60,000+ participants.



3. COMPREHENSIVE EVIDENCE BASE: META-ANALYSES

3.1 Global Meta-Analyses on Effectiveness

Reference	Focus	k	Effect Size	Key Finding
Sailer & Homner (2020)	Gamification learning outcomes	19-44	g=0.49 (cog)	Competition+collaboration most effective
Li, Ma & Shi (2023)	Gamification effectiveness	41	g=0.82	Large effect; discipline matters
Zeng et al. (2024)	Academic performance	22	g=0.78	Moderate-positive across regions
Huang et al. (2020)	Gamification outcomes	30	g=0.464	Positive in formal settings
Bai et al. (2020)	Student learning	30	ES=0.504	Shorter interventions more effective
Xu et al. (2024)	Intrinsic motivation	35	g=0.257	Autonomy, relatedness enhanced
Clark et al. (2016)	Digital games design	69	d=0.33	Design features matter more than medium
Wouters et al. (2013)	Serious games	77	d=0.29	Effective but not more motivating

3.2 Domain-Specific Meta-Analyses

Reference	Domain	k	Effect Size	Key Finding
Wang et al. (2022)	STEM education	-	ES=0.67	Strong effects in science/tech
Tokac et al. (2019)	Mathematics	-	d=0.37	Positive for math achievement
Chen et al. (2025)	Mobile language learning	38	g=0.96	Large effect for language learning
Alotaibi (2024)	Early childhood	-	Moderate-large	Strong for young learners
Camacho-Sanchez (2023)	Physical education	-	-	Enhances motivation, commitment

Lai & Hu (2025)	History education	118	-	Benefits but implementation challenges
Hafiza & Pratolo (2024)	English language teaching	17	-	8 game genres identified; positive outcomes

3.3 Asia-Focused Research

A critical finding: 60% of Asian gamification research originates from Southeast Asia, with limited representation from South Asia including India.

Reference	Focus	Region Coverage	Key Finding
Diaz & Estoque-Lonez (2024)	Gamification in Asia	SE, S, E, W Asia	Positive effects; Kahoot most effective; 60% from SE Asia
Mehnaz (2025)	Primary education GBL	Bangladesh	Advantages, challenges, scope in South Asian context
Hibana et al. (2024)	Early childhood cognitive	Indonesia	Teachers and parents perspectives on GBL
Yusof et al. (2025)	GBL systematic review 2021-25	Malaysia	Exploring GBL landscape

Countries with substantial GBL research: Malaysia, Indonesia, Philippines, Thailand (SE Asia); China, Taiwan, South Korea (East Asia); Iran, Turkey, Saudi Arabia (West Asia). India remains underrepresented in dedicated meta-analytic research, though emerging studies are beginning to address this gap.

3.4 Negative Effects and Misuse Research

Reference	Focus	Key Findings
Almeida et al. (2023)	Negative effects in gamification	Identified: loss of performance, undesired behavior, indifference, decline in motivation
Zhai et al. (2024)	Hint/scaffold over-reliance	Cognitive offloading risks; reduced critical thinking in AI-assisted learning
Meng et al. (2022)	Digital addiction prevalence	Global: 27% smartphone, 17% social media, 6% gaming addiction
Ghosh (2022)	Educational game development	Challenges in designing effective educational games

4. KEY PATTERNS AND INSIGHTS

This section synthesizes patterns from the evidence base to identify what works, what goes wrong, and under what conditions. These insights directly inform the guidelines framework in Section 6.

4.1 What Works: Patterns of Effective Use

4.1.1 Game Design Elements That Enhance Learning

Meta-analyses consistently identify specific game elements that contribute to learning effectiveness:

- Competition combined with collaboration: Sailer & Homner (2020) found this combination yields the strongest behavioural outcomes ($g=0.49$ for cognitive, $g=0.36$ for motivational)
- Immediate feedback: Chen et al. (2025) note that instant feedback in mobile language games contributes to the large effect size ($g=0.96$) by allowing rapid error correction
- Game fiction and narrative: Clark et al. (2016) found narrative elements enhance engagement when aligned with learning objectives, not as mere window-dressing
- Points, badges, and leaderboards (PBL): Most commonly used elements, but effectiveness depends on implementation context - can backfire if overemphasised
- Adaptive difficulty: Games that adjust challenge level maintain optimal engagement without frustration or boredom
- Clear goals with meaningful progress indicators: Essential for maintaining motivation across extended play

Hafiza & Pratolo (2024) identified eight game genres in language teaching: interactive games (most used), role-play, memory, simulation, strategy, quiz, reality-testing, and puzzle games. Each genre offers distinct pedagogical affordances.

4.1.2 Implementation Factors

How games are implemented matters as much as the games themselves:

- Duration paradox: Shorter interventions (<1 week) show larger effect sizes than longer ones (Bai et al., 2020). This suggests intensive, focused game use may outperform prolonged exposure
- Supplement vs replacement: Games as COMPLEMENT to direct instruction consistently outperform games as a replacement. Lai & Hu (2025) emphasise integration challenges in formal education
- Teacher scaffolding: Pre-game briefing and post-game debriefing critical for learning transfer. Without teacher mediation, games become entertainment rather than education
- Alignment with curriculum: Games must be explicitly connected to learning objectives, not used as filler or reward
- Platform considerations: Lampropoulos (2023) found teachers identify both benefits and challenges in classroom DGBL implementation

4.1.3 Contextual Moderators

Effectiveness varies by context:

- Subject domain: STEM subjects show particularly strong effects (ES=0.67 for digital game-based STEM), possibly due to procedural learning alignment with game mechanics
- Language learning: Chen et al. (2025) meta-analysis of 38 studies found large effects ($g=0.96$) for mobile games in language learning - among the strongest in the literature
- Age: Early childhood shows moderate-to-large effects (Alotaibi, 2024); Hibana et al. (2024) document positive perceptions from teachers and parents for young learners
- Physical education: Camacho-Sanchez et al. (2023) found GBL significantly impacts motivation, performance, and health commitment
- Cultural context: Diaz & Estoque-Lonez (2024) found regional moderators in Asia, with Kahoot identified as most effective platform across Asian countries
- Infrastructure: Effectiveness correlates with technology access - digital games require reliable connectivity that may not exist in all settings

4.1.4 Platform and Tool Effectiveness

Research identifies specific platforms with demonstrated effectiveness:

- Kahoot!: Most frequently studied and consistently effective across contexts; identified as most effective in Diaz & Estoque-Lonez (2024) Asian meta-analysis
- Quizizz: Strong evidence for engagement and formative assessment (Zuhriyah & Pratolo, 2020)
- Duolingo and language apps: Demonstrated effectiveness for vocabulary and grammar acquisition
- Non-digital games: Board games (Aini et al., 2021 - Snakes and Ladders), card games, and physical games show comparable effects and require less infrastructure

4.2 What Goes Wrong: Patterns of Misuse

4.2.1 Cognitive Risks

Poor implementation can undermine learning:

- Cognitive overload: Complex interfaces or excessive simultaneous game elements overwhelm working memory, reducing learning
- Hint dependency: Zhai et al. (2024) document cognitive offloading where students depend on hints and scaffolds without developing independent problem-solving
- Surface engagement (Ghost Effect): Students rush through content, game rewards without achieving understanding - high scores mask low learning
- Distraction from learning objectives: Entertainment elements can overshadow educational purpose if not carefully designed
- Split attention: Poorly designed games require attention to game mechanics at expense of learning content

4.2.2 Motivational Risks

Game elements can backfire motivationally:

- Undermining intrinsic motivation: Excessive extrinsic rewards (points, badges) can reduce intrinsic interest in the subject matter
- Competition anxiety: Leaderboards and competitive elements harm performance in some learners, particularly those with lower self-efficacy
- Gaming addiction: 6% global prevalence among youth (Meng et al., 2022), with higher rates during COVID-19 pandemic
- Dependency on scaffolding: Over-reliance on hints and supports prevents development of autonomous learning strategies
- Learned helplessness: Games that are too difficult or provide inadequate feedback can discourage continued effort

4.2.3 Implementation Risks

Implementation failures identified in the literature:

- Pointification: Superficial addition of points without meaningful game design - common but ineffective
- Misalignment: Game rewards for behaviors not connected to learning objectives
- Excluding non-gamers: Some students do not enjoy or benefit from game-based approaches
- Technology barriers: Digital divide excludes students without device/connectivity access
- Teacher unpreparedness: Hafiza & Pratolo (2024) identify teacher capacity as a key barrier to GBL implementation
- Assessment disconnect: Game performance not connected to formal learning assessment

KEY TAKEAWAYS: Warning Signs of Misuse

- Ghost Effect: High game scores but low learning gains - students gaming the system, not learning from it
- Reward Gaming: Students focused on points/badges rather than understanding content
- Hint Dependency: Students depending on hints and scaffolds without developing independent problem-solving
- Competition Anxiety: Leaderboards causing stress rather than motivation, particularly in lower self-efficacy students
- Addiction Signs: 6% global gaming addiction prevalence among youth; watch for compulsive use patterns
- Cognitive Overload: Complex interfaces overwhelming students' working memory, reducing learning

4.3 Implementation Challenges Across Contexts

4.3.1 Challenges in Formal Education Settings

Lai & Hu (2025) identify specific challenges for integrating GBL into formal history education that generalise across subjects:

- Curriculum alignment: Games rarely map directly to curriculum standards and learning objectives
- Teacher readiness: Many teachers lack training in selecting, implementing, and assessing game-based learning
- Instructional time: Games require time investment that competes with content coverage pressures
- Assessment integration: Difficulty translating game performance into traditional grading systems
- Institutional resistance: Traditional educational culture may resist game-based approaches

4.3.2 Challenges in Resource-Constrained Settings

Particularly relevant for the Indian context:

- Infrastructure gaps: Only 34% rural 4G coverage; <20% rural schools with internet
- Device availability: 84% smartphone access but only 57% using phones for education
- Language barriers: Most quality educational games in English; limited regional language options
- Teacher digital literacy: Many teachers unfamiliar with technology integration
- Cost: Quality educational games often require paid subscriptions

4.3.3 Low-Tech Alternatives

Evidence supports non-digital game-based approaches:

- Board games: Aini et al. (2021) demonstrate the effectiveness of the giant snake and ladder game for primary language learning in Indonesia
- Card games and physical games: Require no technology infrastructure
- Hybrid approaches: Combine simple technology (QR codes) with physical games
- Traditional Indian games: Potential for culturally-adapted GBL requiring exploration

4.4 Evidence Quality and Gaps

4.4.1 Strengths of the Evidence Base

- Multiple meta-analyses converge on positive effects ($g=0.25$ to $g=0.96$)
- Large combined sample sizes (60,000+ participants)
- Increasing methodological rigour in recent studies
- Growing attention to moderator analyses

4.4.2 Limitations and Gaps

- Publication bias: Studies with positive results more likely to be published
- Short-term focus: Few studies examine sustained effects beyond intervention
- India gap: Limited systematic reviews or meta-analyses specifically on GBL in Indian education
- Underrepresented populations: Limited research on rural, first-generation, special needs learners
- Misuse underexplored: Most research focuses on effectiveness, not harm
- Implementation fidelity: Unclear how games are actually used in classrooms

4.5 Summary of Key Patterns

Pattern Category	Key Finding	Implication
Effect Size	Consistent positive effects (g=0.25 to g=0.96)	GBL is evidence-based pedagogy
Design	Competition + collaboration most effective	Avoid pure competition or pure individual play
Duration	Shorter interventions show larger effects	Intensive, focused use outperforms prolonged exposure
Integration	Supplement, don't replace instruction	Teacher role remains central
Scaffolding	Pre/post-game teacher support critical	Games alone don't teach; teachers do
Domain	STEM and language show strong effects	Prioritize these domains for GBL adoption
Risks	6 misuse categories identified	Guidelines must address both use AND misuse
India	No systematic research exists	Urgent need for India-specific validation

5. INDIA-SPECIFIC CONTEXT AND NEP 2020 ALIGNMENT

5.1 NEP 2020 Provisions Supporting GBL

NEP 2020 provides explicit mandate for game-based and experiential learning at multiple stages:

NEP Section	Stage/Topic	Relevant
4.2	Foundational (3-8)	Play-based, activity-based learning; flexible, multilevel curriculum
4.4	Preparatory (8-11)	Play, discovery, and activity-based interactive classroom learning
4.5	Middle (11-14)	Experiential learning; subject explorations with hands-on activities
4.6	All Stages	Experiential learning, story-telling pedagogy as standard; competency-based learning
4.21	Language Teaching	Teaching through gamification and apps; experiential-learning pedagogy
4.8	Sports Integration	Sports-integrated education for collaboration, teamwork, citizenship
Ch 23	Technology	DIKSHA, digital platforms; technology for personalized learning

5.2 Current Digital Infrastructure

Indicator	Status (ASER 2024 / TRAI 2023 / MoE 2023)
Rural smartphone access	84% (dramatic increase from 36% in 2018)
Educational use of phones (teens)	Only 57% use phones for education
Internet access gap	29% rural vs 64% urban
Rural 4G coverage	Only 34% of villages
Schools with internet	<20% rural schools connected
DIKSHA reach	27.5 crore users; cost-effectiveness at Rs.545/user
DIKSHA state adoption	90% Tamil Nadu; 60% northeastern states
Teacher digital training impact	20-30% competency improvements reported

These infrastructure realities, combined with the limited availability of India-specific meta-analyses or validated guidelines, mean that global GBL findings are being applied without adequate validation for Indian contexts. Systematic research remains sparse on GBL effectiveness for underrepresented populations (rural, first-generation learners), low-tech alternatives for resource-constrained settings, or culturally-adapted games using Indian traditional games and regional languages.

However, there are also a few examples of educational game research that have emerged from Indian institutions. At IIT Tirupati, the RISHA Lab has developed multiple educational games with systematic evaluation: ML-Quest (Priya et al., 2024) introduces machine learning concepts to K-12 students and was evaluated using the MEEGA+ quality model in Interactive Learning Environments; the SurviveCovid-19 series (Venigalla et al., 2020, 2021) demonstrated rapid development capacity for socially-relevant educational games. IIT Madras offers NPTEL courses on 'Making Learning Engaging Through Interactive Games' that have trained over 5,000 faculty and students across institutions on gamified learning techniques. IIT Bombay's IDC School of Design includes game design coursework, while the Centre for Technology Alternatives for Rural Areas (C-TARA) has developed board games like Capacitor Raja and Sinchan Sharyat for teaching energy-efficient practices to rural communities. These examples illustrate the growing capacity for rigorous, India-based educational game research and practice, while highlighting the need for more systematic research programmes that can inform national policy.

5.3 Moderating Factors: Evidence Gaps

Meta-analytic evidence reveals important dimensions beyond subject domain and age that moderate GBL effectiveness. Several represent critical research gaps.

Regarding gender, multiple meta-analyses find no significant gender differences in GBL effectiveness (Kaschel et al., 2022), with both male and female students benefiting similarly from well-designed educational games. Socioeconomic status represents a critical gap: Kaschel et al. (2022) reported too few studies reporting information on socioeconomic status to include in their meta-regression model. Whether GBL narrows or widens equity gaps remains unknown, which is particularly concerning for India's diverse SES contexts.

Special educational needs populations are similarly underrepresented in the literature. Targeted studies show promise for dyslexia (Ronimus et al., 2019) and autism (Ke & Moon, 2018), but systematic evidence is lacking. Infrastructure level presents another consideration: digital games require connectivity, while non-digital alternatives such as board games and card games show comparable benefits where infrastructure is limited (Aini et al., 2021). These gaps highlight the need for India-specific research addressing diverse learner populations and infrastructure contexts.



6. EVIDENCE-BASED GUIDELINES FRAMEWORK (NEP 2020 ALIGNED)

6.1 Guidelines for Policymakers (Ministry of Education, NCERT, State Governments)

#	Guideline	NEP Section	Evidence	Priority
P1	Develop national standards for educational game evaluation aligned with NCF	4.6	Strong	High
P2	Mandate GBL modules in teacher training (DIKSHA/SWAYAM integration)	Ch 23	Strong	High
P3	Prioritize multilingual, low-bandwidth game solutions for rural contexts	4.13	Context	High
P4	Include digital wellness and screen time guidance in GBL policy	-	Moderate	Medium
P5	Fund India-specific GBL research across diverse populations	-	Gap	High
P6	Support non-digital game development for foundational stage	4.2	Emerging	Medium
P7	Curate quality games on DIKSHA with regional language support	4.21	Strong	High
P8	Promote educational games as Open Educational Resources (OER) under Creative Commons License	Ch 23	Strategic	Medium
P9	Develop vocational and skill-based educational games for employability, aligned with COL's skills development for sustainable livelihoods goal	Ch 16	Strategic	Medium

6.2 Guidelines for Teachers

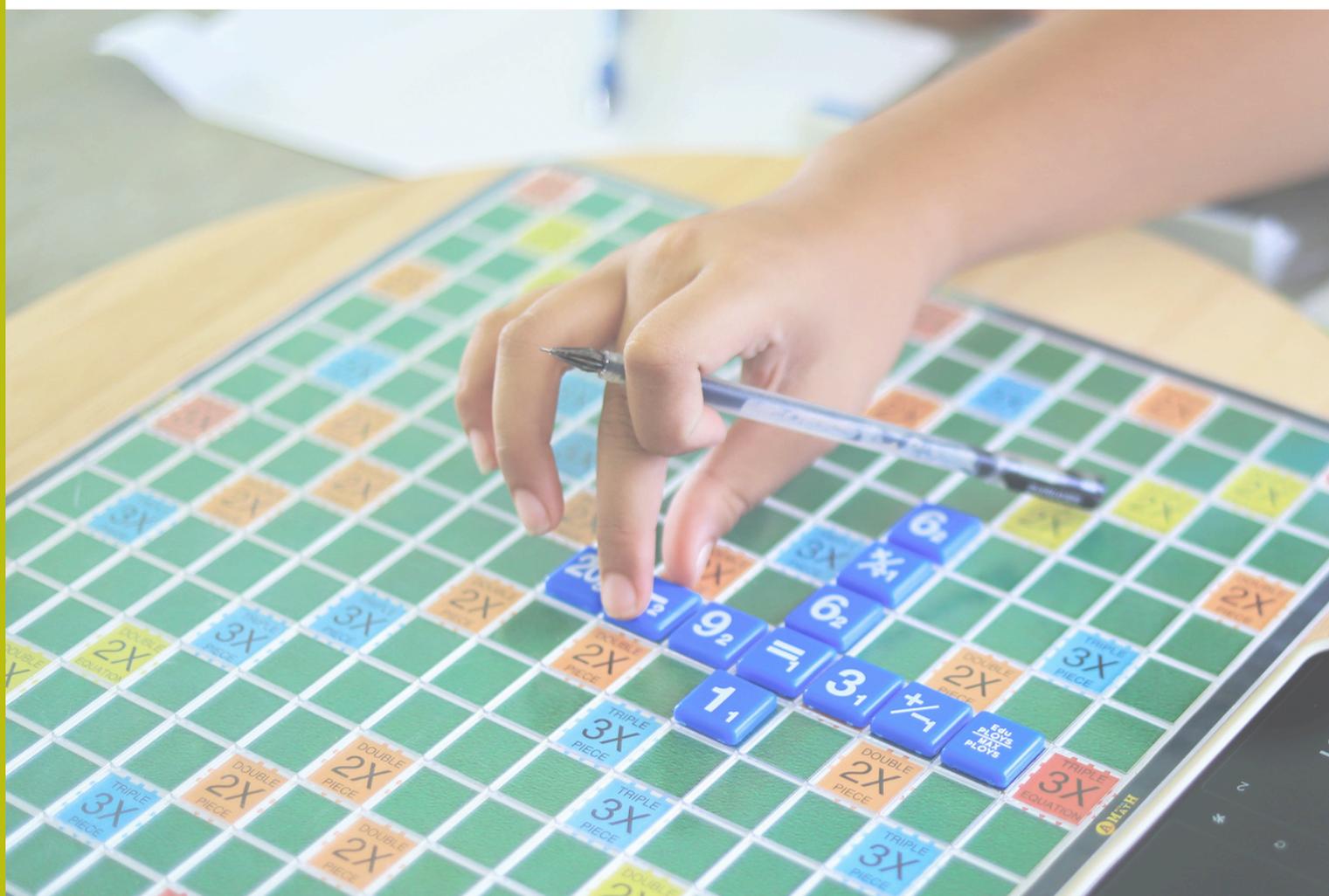
#	Guideline	NEP Section	Evidence	Validation Need
T1	Align game mechanics with specific learning objectives BEFORE implementation	4.6	Strong	Low
T2	Use games as COMPLEMENT to direct instruction, not replacement	4.6	Strong	Low
T3	Provide scaffolding before and debriefing after gameplay	-	Moderate	Medium
T4	Monitor for deep learning vs superficial engagement (Ghost Effect)	-	Emerging	High
T5	Balance competition with collaboration in game activities	-	Strong	Medium
T6	Use play-based approaches for Foundational Stage (ages 3-8)	4.2	Strong	Low
T7	Have offline/low-tech alternatives ready for connectivity issues	-	Context	High
T8	Limit session duration; incorporate breaks for sustained attention	-	Moderate	Medium

6.3 Guidelines for Students

#	Guideline	Rationale	Age Group
S1	Focus on learning goals, not just winning or high scores	Prevents reward gaming	All
S2	Try problems independently before using hints or scaffolds	Builds problem-solving	Middle +
S3	Explain your reasoning, not just answers	Ensures deep processing	All
S4	Take breaks during extended gaming sessions	Prevents fatigue	All
S5	Balance educational games with other learning activities	Holistic learning	All
S6	Report technical issues or inappropriate content	Safety/quality	All

6.4 Warning Signs Quick Reference

Warning Sign	Observable Indicator	Recommended Response
W1: Reward Gaming	High game scores but low assessment performance	Realign game with assessments; add reflection tasks
W2: Dependency	Cannot work without hints/scaffolding	Gradually fade support; build autonomous strategies
W3: Surface Learning	Rushing through content; skipping instructions	Restructure rewards; require demonstration of understanding
W4: Anxiety	Avoiding competitive elements; distress around leaderboards	Offer collaborative alternatives; reduce public comparison
W5: Hint Dependency	Uses hints/scaffolds for answers without attempting first	Require reasoning explanation; gradually reduce hint availability
W6: Addiction Signs	Excessive gaming; neglecting other activities	Set clear time limits; involve parents; consider counseling



7. RESEARCH GAPS AND OPEN QUESTIONS

7.1 Critical Research Gaps

- Limited India-specific GBL systematic reviews or meta-analyses available
- No field-validated guidelines for GBL implementation
- Limited research on GBL for underrepresented populations (rural, first-generation, special needs)
- No systematic catalogue of GBL misuse patterns and their prevalence
- No research on AI-enhanced games in Indian languages or contexts
- Limited evidence on low-tech or non-digital game approaches for resource-constrained settings
- Insufficient longitudinal research on sustained GBL effects
- Lack of teacher perspective research on GBL implementation challenges in India

7.2 Open Questions for Investigation

Several critical questions remain for future investigation. What game elements engage versus frustrate underrepresented Indian students? How do rural and first-generation learners experience competitive game elements? What is the prevalence of misuse patterns such as reward gaming and the Ghost Effect in Indian classrooms? What are the primary implementation challenges teachers face with GBL, and what factors enable successful implementation in resource-constrained settings? How should guidelines be adapted for different infrastructure levels? Can traditional Indian games be effectively adapted for educational purposes? What policy mechanisms can ensure quality and prevent misuse at scale? Additionally, how can AI-based solutions enhance GBL effectiveness while mitigating over-reliance risks – a question directly aligned with CEMCA’s 2021-2027 strategic priority of developing “AI-based solutions for reaching the last mile”?

8. RECOMMENDATIONS AND FUTURE DIRECTIONS

8.1 Stakeholder Engagement and Dissemination

To ensure these guidelines inform national policy and practice, we recommend a structured engagement strategy with key stakeholders at multiple levels.

At the national level, findings should be presented to the Secretary (School Education) and the Secretary (Higher Education) in the Ministry of Education. Engagement with the NCERT Director and curriculum development teams is essential for NCF integration. NIEPA leadership should be briefed on policy implications for educational planning, while coordination with DIKSHA and NCTE teams will support teacher training module development. State education secretaries should be engaged for regional implementation planning.

Panel discussions and brainstorming sessions should be organised to build consensus and gather diverse perspectives. A national panel discussion with MoE officials, NCERT experts, and educational technology practitioners would provide high-level visibility. Regional brainstorming sessions with State Council of Educational Research and Training (SCERT) directors can address state-specific implementation challenges. Roundtables with ed-tech industry stakeholders on quality standards, expert consultations on adapting guidelines for different infrastructure contexts, and teacher educator workshops on GBL integration in B.Ed. and D.El.Ed. curricula will build the necessary capacity base.

Consultations with national bodies should include presentation to CABE (Central Advisory Board of Education) for policy endorsement, engagement with UGC on higher education GBL guidelines, coordination with AICTE on technical education applications, and collaboration with CBSE and state boards on curriculum-aligned game recommendations.

For international visibility and Commonwealth engagement, findings should be presented at UNESCO Education Sector forums as a contribution to SDG 4 monitoring. Guidelines should be shared with Commonwealth Asia member states including Bangladesh, Malaysia, Pakistan, Sri Lanka, Maldives, Singapore, and Brunei through COL networks. Contributions to the UNESCO Global Education Monitoring Report on technology in education, engagement with UNICEF Education programmes, presentation at CHOGM education sessions, and collaboration with Asian Development Bank education technology initiatives will position this work on the global stage.

8.2 Policy Recommendations

For the Ministry of Education and NCERT, key recommendations include incorporating GBL guidelines into the NCF implementation framework aligned with NEP 2020 Section 4.6, developing quality criteria for educational games on the DIKSHA platform, commissioning India-specific research on GBL effectiveness across diverse populations, and including digital wellness guidance in technology policies per NEP 2020 Chapter 23.

For State Education Departments, recommendations focus on identifying and curating evidence-based educational games for state curricula in regional languages, providing teacher professional development on GBL aligned with the NEP 2020 50-hour CPD mandate, and developing low-tech game alternatives for connectivity-challenged areas where digital infrastructure remains limited.

8.3 Field Validation of Guidelines

The guidelines proposed in this report require field validation before national-scale brainstorming. Initial validation can be conducted with undergraduate students in higher education settings, examining the effectiveness of selected guidelines in undergraduate STEM education contexts, student perceptions and engagement patterns with game-based learning approaches, identification of misuse patterns such as the Ghost Effect and reward gaming in controlled settings, and teacher/instructor feedback on implementation feasibility. Broader validation across K-12 settings, diverse infrastructure levels, and underrepresented populations would require subsequent studies with appropriate partnerships and resources.

8.4 Future Work

Given the rapid adoption of AI-powered educational tools in India and globally, there is an urgent need to conduct a similar systematic review for AI in Education. Intelligent Tutoring Systems, AI-assisted learning platforms, and generative AI tools share pedagogical concerns with GBL including adaptive learning, feedback mechanisms, and engagement strategies, while introducing unique challenges such as over-reliance on automated assistance, algorithmic bias, and data privacy concerns. A parallel guidelines development effort for AI in Education would complement this GBL work and address an equally critical gap in evidence-based guidance for Indian education.

9. CONCLUSION

This literature review establishes an evidence base for game-based learning in education, synthesising 30+ meta-analyses and systematic reviews representing 60,000+ participants. The evidence consistently supports moderate to strong positive effects of well-designed games and gamification on learning outcomes, with effect sizes ranging from $g=0.25$ to $g=0.96$.

The review directly aligns with India's National Education Policy 2020, which explicitly mandates experiential learning including gamification (Section 4.6) and play-based approaches (Sections 4.2, 4.4). NEP 2020 Section 4.21 specifically calls for language teaching through gamification and apps. These policy provisions create both a mandate and an opportunity for evidence-based GBL implementation in Indian education.

However, effectiveness depends critically on implementation quality. The evidence identifies six categories of misuse: cognitive overload, reward gaming, hint dependency, scaffold over-reliance, surface learning, and addiction. Guidelines must address both effective use patterns and warning signs of misuse.

For India, this review highlights a significant gap. Despite the NEP 2020 mandate and platforms like DIKSHA reaching 270 million users, India-specific meta-analyses remain scarce, and large-scale implementation proceeds without validated guidelines. The limited availability of India-focused systematic research means global findings are often applied without adequate validation for the unique contexts of Indian education: diverse languages, variable infrastructure, and specific pedagogical traditions.

The guidelines framework presented here provides immediate actionable guidance for policymakers, teachers, and students, explicitly aligned with NEP 2020 provisions. Field validation of these guidelines in diverse Indian contexts remains an essential next step before national-scale implementation.

As NEP 2020 implementation accelerates, evidence-based guidance for game-based learning becomes increasingly urgent. The guidelines framework is designed for adaptation across Commonwealth Asia, supporting COL-CEMCA's mission to expand quality learning through appropriate technologies.

Through strategic engagement with national bodies, international organisations, and UN agencies, these evidence-based guidelines can inform policy dialogue at the highest levels - from Ministry of Education consultations to UNESCO forums. This work establishes a replicable model for developing similar guidelines for AI in Education, positioning COL-CEMCA as a thought leader in educational technology policy for the Commonwealth and beyond.

Note: The original ideas, analysis, and research synthesis in this report are the intellectual contribution of the authors. AI-assisted tools were used to enhance the clarity and presentation of the writing.

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