

CHAPTER 3

THEORY AND METHODS OF VOCATIONAL EDUCATION

Inclusive Gamification in Education: Engagement, Accessibility, and Equity by Design

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Abstract. Gamification, understood as the use of game design elements in non-game contexts, is increasingly used in education to strengthen engagement and to support accessibility in diverse learning environments. The article aims to synthesize evidence on gamification in education and to propose an inclusive gamification framework that improves meaningful engagement while reducing accessibility barriers for learners with diverse needs and participation constraints. A structured narrative literature review with thematic synthesis is applied. The review integrates conceptual definitions of gamification, empirical syntheses on effectiveness, and accessibility-oriented frameworks, then codes findings into themes related to engagement mechanisms, accessibility safeguards, risks and negative effects, and evaluation practices. The analysis indicates that gamification may produce positive average effects on motivation and engagement, but results are heterogeneous and depend on design quality, context, and learner characteristics. Inclusive gamification is most credible when it supports autonomy, competence, and belonging through flexible pathways, adjustable pacing, multimodal feedback, and accessible interfaces, while limiting exclusion risks created by time pressure and social comparison. Gamification should be treated as instructional architecture rather than a reward layer, with accessibility designed from the outset and monitored through both learning outcomes and equity-sensitive participation indicators. Future studies should test inclusive gamification designs in diverse contexts, strengthen causal evidence on accessibility impacts, and develop validated metrics for participation quality, belonging, and differential effects across learner groups.

Keywords: gamification; learner engagement; accessibility; inclusive design; Universal Design for Learning; motivation; self-determination theory; learning analytics; educational equity; assistive technology; negative effects; evaluation metrics.

JEL Classification: I21; I24; I28; D63; O33; L86

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Introduction. Gamification, defined as the use of game design elements in non-game contexts, has become an influential approach for improving learner engagement and supporting accessibility in education and training environments (Deterding et al., 2011). In educational settings, gamification is commonly implemented through points, badges, leaderboards, levels, quests, feedback loops, narrative structures, and collaborative challenges designed to encourage participation and persistence (Kapp, 2012). The core rationale is that well-designed motivational affordances can strengthen attention, effort, and self-regulation, particularly when tasks are repetitive or cognitively demanding (Hamari et al., 2014). At the same time, engagement is not ethically neutral, because persuasive design can manipulate behavior or intensify competition, potentially marginalizing learners who already face participation barriers (Nicholson, 2015). Therefore, the problem is not whether gamification increases activity, but whether it improves meaningful engagement aligned with learning goals while supporting equitable access for diverse learners (Sailer & Homner, 2020).

Accessibility is increasingly central because learning environments include neurodiversity, disability, linguistic diversity, and unequal digital access, which can constrain participation even when learners are formally enrolled. Inclusive approaches emphasize that barriers may be created by design choices in content, interface, assessment, and interaction norms, rather than by learner limitations alone (CAST, 2018). From this perspective, gamification can support accessibility when it offers multiple ways to participate, reduces anxiety through low-stakes practice, provides clear feedback, and enables self-paced progression (Toda et al., 2019). However, gamification can also harm accessibility if it relies on time pressure, complex visual stimuli, social comparison, or reward systems that exclude learners who require accommodations (Nicholson, 2015). This article develops an applied framework for “inclusive gamification” that connects motivational design to accessibility standards and learning outcomes.

Literature review. Gamification is commonly defined as the use of game design elements in non game contexts, a definition that separates gamification from full educational games while preserving a focus on specific mechanics such as points, badges, and progression (Deterding et al., 2011). Review literature indicates that the field has expanded rapidly, but empirical designs and theoretical foundations vary widely, which complicates accumulation of evidence and comparison across settings (Seaborn & Fels, 2015; Koivisto & Hamari, 2019). Within education, engagement is a multidimensional construct that includes behavioral participation, cognitive investment, and affective connection to learning activities, and gamification tends to influence these dimensions through feedback, goal clarity, and social interaction affordances (Landers, 2014; Sailer & Homner, 2020). A key interpretive risk is the conflation of activity

logs with meaningful engagement, because increased clicks or time on task may reflect compliance rather than sustained learning motivation. This distinction matters for accessibility because design choices that increase measurable activity can still exclude learners who require flexible pacing or alternative interaction modes. Consequently, the literature recommends aligning gamified elements with learning objectives and with psychologically plausible mechanisms rather than assuming that game elements are inherently motivating (Landers, 2014; Seaborn & Fels, 2015). This conceptual clarification establishes the basis for evaluating effectiveness and equity, because it frames gamification as an instructional design intervention, not a motivational shortcut.

Across syntheses, gamification shows positive average effects on learning related outcomes, but results are heterogeneous and sensitive to context and implementation quality (Hamari et al., 2014; Sailer & Homner, 2020). Meta analytic evidence suggests small effects on cognitive, motivational, and behavioral outcomes, which supports cautious optimism while emphasizing that gamification is not a high impact intervention by default (Sailer & Homner, 2020). Large reviews likewise conclude that outcomes depend on user characteristics, the specific mechanics deployed, and the surrounding instructional design, including feedback quality and task structure (Hamari et al., 2014; Koivisto & Hamari, 2019). This variability has direct relevance for accessibility because learners differ in prior gaming experience, self regulation, language proficiency, and disability related needs, so a uniform mechanic can have unequal motivational consequences. Studies and reviews therefore recommend moving from “whether gamification works” to “for whom, under what conditions, and through which mechanisms” (Koivisto & Hamari, 2019; Landers, 2014). The theory of gamified learning provides a useful explanatory model by proposing that game elements influence learning through mediating processes such as motivation and attention, and through moderating effects on the quality of instructional design (Landers, 2014). This theoretical framing supports evaluation designs that track both proximal motivational indicators and distal learning outcomes, rather than relying only on satisfaction surveys or platform analytics. Overall, the evidence base supports effectiveness claims only when gamification is treated as part of instructional architecture and when its impact is assessed across diverse learner groups.

The most frequently implemented gamification elements in education are points, badges, leaderboards, and levels, often combined with progress indicators and feedback loops (Koivisto & Hamari, 2019; Seaborn & Fels, 2015). These elements can improve engagement by clarifying goals, providing immediate informational feedback, and supporting persistence through visible progress, especially for practice intensive tasks (Sailer & Homner, 2020). However, mechanistic research indicates that points and performance indicators may increase performance without necessarily

increasing intrinsic motivation, suggesting that informational and framing effects may be more important than rewards alone (Mekler et al., 2013; Nicholson, 2015). This aligns with motivational theory emphasizing autonomy, competence, and relatedness as determinants of sustained engagement, which implies that controlling reward structures can undermine long term motivation (Ryan & Deci, 2000; Nicholson, 2015). For accessibility, the mechanism question is decisive because learners who require accommodations may experience reduced autonomy if systems impose pace constraints or punitive streak mechanics. The literature increasingly argues for “meaningful gamification,” where game elements are used to support reflection, choice, and personal relevance rather than to maximize short term compliance (Nicholson, 2015). Cooperative structures can support relatedness and belonging, yet competitive leaderboards can increase anxiety and disengagement for novices and marginalized learners, producing uneven benefits. Thus, engagement gains are most defensible when gamification is autonomy supportive, mastery oriented, and connected to instructional feedback that learners can act on.

Accessibility oriented frameworks argue that learning design should offer multiple means of engagement, representation, and action and expression, which provides a direct bridge between universal design and inclusive gamification (CAST, 2018). From this perspective, gamification supports accessibility when it enables flexible pathways to progress, offers adjustable challenge and pacing, and provides feedback in multimodal formats compatible with assistive technologies. Recent disability focused reviews and scoping studies suggest that gamification has been used in both educational and therapeutic apps for children with disabilities, often to increase engagement and practice adherence, although design choices and evidence quality vary (Mahmoudi et al., 2024). Systematic reviews in special education similarly report benefits for motivation, social interaction, and skill development, while also indicating that research is fragmented by disability type, outcome measures, and intervention duration (Hussein et al., 2023). Broader accessibility reviews in human computer interaction highlight that gamified solutions can be beneficial for neurodevelopmental disorders and for sensory impairments, but they also underscore the need for rigorous accessibility testing and context sensitive evaluation (Boubakri & Nafil, 2025). The inclusive implication is that accessibility is not an add on to gamification, but a design requirement that shapes mechanic selection, interface decisions, and social rules. For example, time limited challenges can conflict with extended time accommodations, and leaderboard based ranking can stigmatize learners whose participation is constrained by disability related fatigue or assistive technology latency. Therefore, inclusive gamification requires explicit safeguards such as opt in competition, mastery based progression, and alternative routes to recognition that do not rely on speed or constant connectivity.

A growing strand of scholarship examines negative effects of gamification, including reduced performance, overemphasis on extrinsic rewards, social comparison harms, and ethical concerns related to manipulation and surveillance (Toda et al., 2018; Hyrynsalmi et al., 2017). Mapping studies identify leaderboards and certain competitive mechanics as frequently associated with adverse effects, which is relevant to education because classroom motivation is socially situated and sensitive to perceived fairness (Toda et al., 2018). Tertiary reviews argue that negative impacts are understudied relative to positive outcomes, creating a publication and design bias that can obscure equity harms (Hyrynsalmi et al., 2017). From an accessibility standpoint, these risks concentrate among learners who are already vulnerable to exclusion, including students with disabilities, low confidence, or limited time and connectivity. Ethical constraints therefore require that gamified learning environments preserve learner autonomy, avoid coercive nudging, and support dignity through transparency about scoring and recognition criteria (Nicholson, 2015; Ryan & Deci, 2000). This also implies a governance requirement: institutions should monitor differential outcomes, not only average engagement, and should treat accessibility complaints as design signals rather than individual exceptions. In synthesis, the literature supports a precautionary stance where gamification is evaluated as a sociotechnical intervention that can produce both motivational benefits and exclusionary effects depending on implementation choices.

Aim. The article aims to synthesize research on gamification in education and training and to propose design principles that improve engagement while strengthening accessibility for diverse learners. The objectives are: (a) to distinguish behavioral activity from meaningful engagement; (b) to identify mechanisms through which gamification supports or undermines accessibility; (c) to propose a design matrix that aligns game elements with Universal Design for Learning and inclusive interaction patterns; and (d) to outline evaluation measures that capture both learning outcomes and equity impacts (CAST, 2018; Kapp, 2012; Sailer & Homner, 2020).

Methodology. This study uses a structured narrative literature review with thematic synthesis to examine how gamification affects engagement and accessibility in educational contexts. The search strategy prioritizes peer reviewed journal articles, conference proceedings, and authoritative design frameworks, because gamification evidence is distributed across education, human computer interaction, and information systems research (Seaborn & Fels, 2015; Koivisto & Hamari, 2019). Conceptual and foundational works were included to stabilize definitions and theoretical assumptions, especially on what counts as gamification and how game elements relate to motivation and learning (Deterding et al., 2011; Landers, 2014). Empirical syntheses were prioritized to capture the average direction and magnitude of effects,

including meta analysis and large reviews (Hamari et al., 2014; Sailer & Homner, 2020). Accessibility oriented literature was sampled through two routes: (a) universal design and inclusive learning frameworks, and (b) disability focused reviews and scoping studies that examine how gamified systems are adapted for diverse learners (CAST, 2018; Mahmoudi et al., 2024; Hussein et al., 2023). Studies were coded into themes that reflect an applied logic of design and evaluation: engagement mechanisms, accessibility barriers and safeguards, risks and negative effects, and measurement practices (Seaborn & Fels, 2015; Toda et al., 2018). The synthesis integrates findings across themes to derive design implications that emphasize inclusive participation and avoid treating engagement gains as sufficient evidence of educational value.

Results. Engagement is typically conceptualized as a multidimensional construct that includes behavioral participation, emotional involvement, and cognitive investment in learning tasks. Gamification often targets the behavioral dimension through reinforcement and feedback, but sustainable engagement depends on autonomy, competence, and relatedness, which align with self-determination theory (Ryan & Deci, 2000). If game elements reduce autonomy through controlling rewards, or if they undermine competence by promoting shallow performance metrics, engagement gains can be short-lived or unevenly distributed across learners (Nicholson, 2015). Accessibility can be framed through inclusive education and Universal Design for Learning, which recommend providing multiple means of engagement, representation, and action and expression (CAST, 2018). This framework is compatible with gamification because both emphasize feedback, scaffolding, and adaptive pathways, yet accessibility requires that these affordances are usable for learners with sensory, motor, cognitive, and linguistic differences. Consequently, an accessibility-oriented gamification approach should prioritize flexible pacing, adjustable difficulty, multimodal feedback, and low-friction interfaces.

Meta-analytic and review literature suggests that gamification can have positive effects on motivation and engagement, although outcomes vary by context, design quality, and learner characteristics (Hamari et al., 2014; Sailer & Homner, 2020). Points and progress bars can enhance clarity of goals and provide immediate feedback, supporting persistence in practice-oriented tasks (Kapp, 2012). Badges can function as micro-credentials that visualize mastery and encourage goal setting, especially when linked to meaningful competencies rather than trivial participation (Kapp, 2012). Narratives and quests can strengthen coherence and purpose by connecting tasks to a story of progress, which can be especially beneficial for sustained learning projects (Toda et al., 2019). Collaboration and team challenges can increase relatedness and social support, which are key drivers of sustained engagement when designed to avoid exclusion and dominance by high-performing peers (Ryan & Deci, 2000).

However, leaderboards and competitive ranking can produce mixed effects because they may motivate some learners while discouraging others, particularly novices or learners who require accommodations (Nicholson, 2015). Time-limited challenges can increase excitement but may conflict with accessibility needs related to pacing, executive function, or anxiety. For these reasons, engagement-oriented gamification should be evaluated not only by activity logs but also by persistence, learning quality, and distributional equity.

Inclusive gamification can be structured as a set of design principles that translate accessibility and equity goals into concrete choices about mechanics, interface, and social rules.

Principle 1: Multiple participation pathways. Provide alternative routes to earn progress and recognition, so learners can choose tasks that match their strengths and needs. This aligns with UDL's multiple means of action and expression (CAST, 2018).

Principle 2: Autonomy-supportive rewards. Use rewards as informational feedback rather than controlling incentives, emphasizing mastery, reflection, and self-set goals to preserve intrinsic motivation (Ryan & Deci, 2000; Nicholson, 2015).

Principle 3: Adjustable challenge and pacing. Offer difficulty levels, retries, and self-paced progression to reduce performance anxiety and accommodate diverse processing speeds.

Principle 4: Accessible feedback and interface. Ensure multimodal feedback (text, audio, visual cues), readable typography, and compatibility with assistive technologies, and avoid relying on color-only signals.

Principle 5: Social design for belonging. Prefer cooperative mechanics, shared goals, and peer support over zero-sum competition; when competition is used, implement opt-in modes and "personal best" leaderboards.

Principle 6: Minimize cognitive and sensory overload. Limit flashing animations, clutter, and time pressure; allow learners to disable non-essential effects and notifications.

Principle 7: Fairness and transparency. Clearly explain rules, scoring, and data use, and provide mechanisms to contest errors in automated scoring or progression.

Table 1 maps common gamification elements to engagement mechanisms and accessibility risks, offering practical guidance for inclusive design choices.

Inclusive gamification requires balancing motivational affordances with safeguards that ensure usability and dignity for diverse learners, especially where pacing and social comparison can create exclusion.

Table 1. Gamification elements, engagement mechanisms, and accessibility safeguards

Game element	Engagement mechanism	Accessibility risk	Accessibility safeguard
Points, progress bars	Feedback, goal clarity	Overemphasis on speed	Score mastery and effort; allow self-paced progress
Badges, achievements	Recognition, mastery signaling	Exclusion if criteria narrow	Multiple pathways; competency-based criteria
Leaderboards	Social comparison, competition	Discouragement, stigma	Opt-in competition; personal best ranking
Levels, unlocking	Structured progression	Gatekeeping, frustration	Alternative routes; adjustable difficulty
Quests, narrative	Meaning, coherence	Language or cultural barriers	Plain language; multimodal storytelling
Timed challenges	Arousal, urgency	Anxiety, pacing barriers	Optional timers; extended time accommodations
Collaboration	Relatedness, support	Dominance by some learners	Role rotation; inclusive group rules
Avatars, customization	Identity, belonging	Interface complexity	Simplified options; accessible defaults

Source: systematized by the author

Evaluation should combine learning outcomes with engagement quality and accessibility indicators. Learning outcomes include mastery, retention, transfer, and performance on authentic tasks. Engagement metrics should go beyond clicks and time-on-task to include persistence, self-regulation, and reflective use of feedback. Accessibility evaluation should include usability testing with diverse learners, compatibility checks with assistive technologies, and analysis of differential outcomes across learner groups. The literature suggests that effects vary by context, so mixed-method evaluation can help explain why certain mechanics work for some learners but not others (Sailer & Homner, 2020; Toda et al., 2019). Institutions should also monitor unintended consequences such as excessive competition, anxiety, or gaming the system.

Discussion. The reviewed research indicates that gamification can improve engagement, but outcomes depend on design choices and on alignment with learning goals. When gamification is treated as a superficial layer of rewards, it can degrade intrinsic motivation and increase inequity by privileging speed and visibility. In contrast, when game elements are used to scaffold competence, support autonomy, and build belonging, they can enhance both engagement and accessibility. The major trade-off concerns persuasion versus empowerment: systems that maximize activity can become manipulative, whereas inclusive design aims to empower learners with options and meaningful feedback. Another key implication is that accessibility should be integrated from the beginning, not added through accommodations after deployment, because many barriers are created by default settings and social mechanics.

Conclusion. Gamification has real potential to strengthen engagement and accessibility when designed as an inclusive learning architecture rather than a competitive reward system. The most effective approach aligns game mechanics with UDL principles, autonomy-supportive motivation, accessible interfaces, and fair social rules. Future research should develop stronger causal evidence on inclusive gamification in diverse settings, including disability inclusion and multilingual contexts, and should create validated metrics for participation quality, belonging, and equitable learning gains. Research should also examine how generative AI can personalize gamified pathways while protecting privacy and avoiding harmful profiling.

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