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Communicative Functions of Gamified Learning Management Systems in Higher Education

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ABSTRACT

This paper examines how gamified Learning Management Systems (LMSs) shape communication processes in higher education by mediating feedback, transmitting visual signals, and structuring social interactions between students and instructors. The paper synthesizes findings from contemporary research on gamification, digital pedagogy, user–system interaction and visual communication design to analyze how core gamified components such as points, badges, progress bars, leaderboards and dashboards operate as communicative cues that guide learners' interpretations of their performance, status and expected behaviors. Special emphasis is placed on the communicative function of automated feedback, including its immediacy, frequency and framing, as well as on the role of interface design in shaping how messages are perceived and acted upon. The paper further considers how gamified environments influence interpersonal communication by encouraging competitive or collaborative discourses and by redistributing visibility and recognition among learners. The findings highlight both the opportunities of gamified communication, such as increased clarity of expectations, enhanced engagement through transparent signaling and richer multimodal feedback, and its risks, including potential misinterpretation of signals, overreliance on automated messages and reinforcement of status disparities among students. The paper concludes that communication within gamified LMSs is a complex, layered process that requires careful pedagogical and design considerations, and proposes directions for future research focused on communicative effectiveness, ethical transparency and inclusivity in digitally mediated higher education.

Key words: *automated feedback, gamification, higher education, learning management systems, student engagement, user-system interaction, visual communication*

Introduction

The expanding digitalization of higher education has positioned Learning Management Systems (LMSs) as central platforms through which teaching, assessment and communication are organized. Within these environments, gamification, commonly defined as the use of game design elements in non-game contexts[1], has become a frequently adopted strategy intended to enhance student motivation and participation. In the educational domain, gamification is often framed as a means of increasing engagement through structured reward mechanisms, feedback loops and interactive design features[2,3]. Recent systematic reviews note sustained interest in these applications but they also indicate the need to examine the broader pedagogical implications of gamified systems[4,5].

Although gamification is typically approached from motivational or behavioral perspectives, the elements incorporated into LMS interfaces also carry communicative significance. Visual design frameworks emphasize that interface components operate as semiotic resources that guide user perception and interpretive processes[6]. Principles of interaction design further highlight their role as signifiers that communicate possible actions, expectations, and constraints within a system[7]. In gamified LMSs, commonly used elements such as points, badges, progress bars and dashboards therefore function not only as motivational stimuli but also as forms of communication that present condensed information about performance, progress, and desired activity patterns.

Moreover, these communicative dimensions are closely linked to the established theories of human motivation. Self-Determination Theory explains how the framing and

delivery of feedback influences learners' sense of competence, autonomy and relatedness[8], while the concept of flow underscores the importance of clear goals and timely information for sustained engagement[9]. Empirical work has shown that visual signals in dashboards and similar interface features can shape how students interpret their standing within a course and how they regulate their learning behaviour[10]. These findings suggest that gamified LMS elements constitute a layered communicative environment in which meaning is conveyed through visual cues, automated responses, and the structuring of social visibility.

Despite these developments, research on gamification in higher education provides only limited and often fragmented insights into its communicative dimensions, with most studies emphasizing motivational outcomes rather than interpretive or interactional processes. This gap is significant because visual and automated communication shape how learners understand expectations, regulate their activity and interpret their standing within digital learning environments.

Accordingly, the aim of this review is to synthesize existing research on the communicative functions of gamified LMS elements and to provide a critical interpretation of how visual, symbolic and automated cues shape learners' sense-making, feedback processing and social interaction in higher education. This paper presents a systematic literature review that examines these processes and identifies their implications for pedagogical design and practice.

Theoretical Background

In higher education, gamification is commonly understood as the integration of game-inspired design elements into instructional systems, a formulation that highlights its modular structure and its adaptability to varied learning environments. Hence, in Learning Management Systems (LMSs), these elements are not simply added decorative features but functional components that structure how information is framed and how learners engage with instructional processes. Foundational literature in educational technology highlights that points, badges, leaderboards, and progress indicators operate as symbolic cues that direct attention, shape user expectations and provide condensed representations of performance[2],[11]. Systematic reviews further indicate that while these elements are often introduced with motivational aims, their effects extend to how digital systems communicate with learners by influencing what information is emphasized, how feedback is delivered and how participation is socially organised[4,5].

Understanding these communicative dimensions requires engaging with theories of visual communication, which conceptualize interface components as semiotic resources that convey meaning through form, layout and symbolic conventions. According to Kress and van Leeuwen[6], visual representations structure perception by organizing information into patterned arrangements that signal hierarchy, importance, and relational orientation. Within LMS interfaces, gamified elements such as progress bars or dashboards act as visual statements that portray learning trajectories or relative performance. Their meaning is not confined to numerical or graphical information. Instead, these elements frame how learners interpret their standing within a course and what actions appear necessary or desirable. Research supports this semiotic perspective. Namely, dashboards that visualize activity or achievement have been shown to affect how students assess their progress and regulate their behavior[10], while studies on achievement badges indicate that learners interpret these icons as signals of competence or recognition rather than neutral rewards[12,13]. Such findings reinforce the idea that visual objects in LMS environments do not merely present information. Namely, they communicate meaning through culturally learned conventions, layout, color, spatial grouping, and graphical emphasis.

Furthermore, interaction design provides another relevant lens for examining how gamified components communicate. Norman[7] describes interface features as signifiers that guide user behavior by indicating possible actions, constraints and pathways. Gamified LMS elements operate precisely in this manner. A leaderboard signals competition and comparative ranking, a badge signals recognition and valued contributions, and a progress bar signals incremental task progression. These signifiers do not act in isolation. They form a structured communicative system that suggests desirable behavior (e.g., "move up the ranking," "complete remaining tasks," "achieve the next milestone"). Empirical studies confirm that students respond to these system-generated cues by adjusting their learning strategies, allocating attention to highly visible metrics and interpreting automated signals as indicators of expected behavior[14,15]. Such findings reinforce the notion that gamification communicates norms and expectations through interface design, shaping the implicit rules of participation in digital learning environments. In this sense, the interface itself operates as an active communicative agent.

Moreover, motivational theories illuminate how learners interpret and internalize these communicative signals. Self-Determination Theory8 (SDT) argues that messages related to competence, autonomy, and relatedness influence engagement and persistence. In SDT, these three constructs are understood as fundamental psychological conditions that must be supported for motivation to develop and be sustained. Each of these needs can be directly affected by gamified cues:

Competence – visual indicators such as progress bars, immediate feedback, score updates and badges act as messages about learners' skill development and task success. When feedback is constructive, timely and informative, it can enhance a learner's sense of mastery. However, when cues are ambiguous, inconsistent or overly comparative,

they may introduce uncertainty or diminish perceived competence.

Autonomy – the way gamified systems frame choices, through paths, challenges or optional achievements, communicates how much control learners have. Systems that push constant notifications or impose rigid progress sequences can be interpreted as controlling, which SDT identifies as detrimental to autonomous motivation. Conversely, gamified environments that allow students to choose paths, reorder tasks or pursue side quests can foster autonomy-supportive communication.

Relatedness – leaderboards, collaborative challenges or public badges communicate social presence and visibility. They can foster a sense of belonging when recognition is inclusive or community-oriented. However, strongly competitive structures may undermine relatedness for students who perceive themselves as consistently low-ranking.

Seen through the lens of SDT, gamified elements are not neutral design choices. They actively communicate messages about ability, control and social value, which in turn shape motivational trajectories. A complementary motivational framework is provided by flow theory, which likewise foregrounds how learners respond to the structure and timing of information. Specifically, the concept of flow emphasizes the need for clear goals and timely feedback to sustain engagement[9]. Gamified systems often emulate these conditions through structured challenges and rapid system responses. Empirical evidence suggests that the clarity and immediacy of such signals can strengthen students' sense of direction and task involvement, particularly in LMS environments where communication is predominantly mediated through visual and automated channels[16]. From this perspective, flow is not merely a psychological state but a response to well-calibrated communicative cues.

These insights collectively position gamified LMSs as layered communicative environments in which meaning is transmitted through symbolic, visual and automated modalities. Leaderboards and progress displays communicate relational information, such as relative standing among peers, which can influence patterns of collaboration or competition[17,18]. Badges and reward markers communicate recognition and value, shaping perceptions of achievement and status within the learning community. At the same time, systematic reviews caution that learners may interpret gamified signals in divergent ways, depending on their prior experiences, expectations and the specific design of the system[4,5]. This interpretive variability highlights that the communicative functions of gamified elements cannot be assumed or generalized but must be understood in relation to context, interface design, and pedagogical intentions. Elements that successfully trigger competence cues for one student may evoke pressure or disengagement in another, underscoring the contextual sensitivity of communicative interpretation.

Literature suggests that gamification in LMSs encompasses more than the implementation of game-like mechanics. It constitutes an integrated communicative framework through which digital systems structure the visibility of information, convey evaluative and regulative messages, and shape social dynamics among learners. These theoretical perspectives provide the foundation for examining how empirical research has addressed the communicative functions of gamified LMS elements and for identifying the implications such functions hold for the pedagogical design of digitally mediated learning environments.

Materials and Methods

This paper adopted a systematic literature review to identify research addressing the communicative functions of gamified elements in Learning Management Systems within the context of higher education. The search was conducted in Scopus and Web of Science, as these databases index high-quality, peer-reviewed literature in educational technology, communication studies and information science, and provide broad multidisciplinary coverage relevant to digital learning environments. The Boolean search string was defined in advance and applied uniformly across both databases: ("gamification" AND ("learning management system" OR "LMS") AND "higher education") AND ("feedback" OR "visual" OR "communication" OR "dashboard" OR "interaction"). Additional synonyms (e.g., "digital badges", "progress indicators", "learning analytics") were included through Boolean OR operators.

The search covered the period 2013–2025, which corresponds to the period in which gamification became integrated into mainstream LMS platforms and when visual analytics, dashboards, and badge systems were widely adopted in higher education. The upper limit (2025) reflects the date of the final database search, which also captured several online-first publications not yet assigned to print issues. This timeframe therefore represents a period of stable technological and pedagogical development for examining the evolution of LMS-based gamification. Only full-text, peer-reviewed publications written in English were considered.

Inclusion criteria required that studies examine gamification within higher education settings and that gamified elements were implemented or analyzed within an LMS or a directly comparable online learning system. Studies also had to address communicative dimensions of gamification, such as automated feedback, visual performance indicators, symbolic cues, or mechanisms of social visibility. Exclusion criteria comprised research focused on primary or secondary education, non-digital gamification, standalone serious games, or studies centered exclusively on technical development without a communicative component.

All retrieved records were screened manually. Titles and abstracts were examined to remove irrelevant publications and duplicates, after which full texts were assessed according to the predefined criteria. This process

resulted in a final corpus of twenty-five studies, supplemented by several foundational theoretical works relevant to gamification, visual communication, interaction design, and motivational theory. The final set of studies was examined for recurring themes related to gamification and LMS communication.

As with most systematic reviews, the search was limited by language, database selection, and the defined time frame, meaning that relevant studies published in other languages, databases, or earlier periods may not have been captured.

Results

The analysis of the twenty-five studies identified four interconnected dimensions through which gamified elements in Learning Management Systems function as communicative structures in higher education. Across the corpus, gamification was shown to influence how information is conveyed, interpreted, and acted upon by students. Although the specific elements that were studied varied, the findings indicate that gamified LMSs structure learning through visual cues, automated responses, symbolic markers, and social visibility. Several studies examined gamification from design and implementation perspectives and described the communicative nature of interface elements in LMS-based learning environments[19–21].

Studies examining dashboards, progress bars and point displays showed that these graphical elements convey condensed information about task advancement, participation patterns and overall course standing. Dashboards that visualize performance were found to shape learners' interpretations of their progress and the relative importance of specific tasks[10]. Research on point-based and leaderboard-based systems similarly indicated that students often read numeric and rank-related displays as evaluative rather than neutral, interpreting them as signals of success, insufficiency, or prioritization[22]. Progress bars were found to communicate direction and momentum, with studies showing that students rely on such cues to determine pacing and perceived workload[10,22,23]. Research on visual indicators in LMS-based formative assessment reported that interface visuals guided learners in monitoring progress and identifying priorities[23].

Furthermore, automated feedback mechanisms were consistently identified as a central communicative channel within gamified LMSs. Studies reported that feedback delivered through notifications, score updates, or symbolic reinforcements influenced students' sense of competence, clarity of expectations, and understanding of task progression. Research on cloud-based LMSs showed that immediate feedback helped students adjust performance strategies and understand task requirements[14]. Work examining blended gamified environments reported that the framing and frequency of system responses shaped students' interpretations of their abilities and informed their self-regulation[15]. Other studies found that automated LMS feedback influenced how learners inferred instructional intent or urgency, particularly when feedback frequency or tone was perceived as directive[19,21].

Research also showed that well-timed automated prompts supported interpretation of learning pathways, whereas inconsistent triggers created confusion about expected actions[24]. Studies addressing symbolic reward structures demonstrated that badges communicated achievement, credibility, or belonging, rather than functioning solely as motivational reinforcers. Research on the effects of badges reported that students interpreted them as indicators of competence or as symbols that increased their visibility among peers[12,13]. Studies conducted in LMS-based courses found that badges structured expectations about the desired forms of participation and communicated what types of contributions were valued[25]. While badges were often received positively and seen as helpful indicators of achievement[12, 13,25], several studies noted risks of misinterpretation when criteria for earning badges were unclear or when students perceived discrepancies between their actual effort and the recognition received[12,26,27,28]. Additional analyses reported that reward structures influenced how students perceived valued behaviors and participation norms in online courses[19,29].

Furthermore, research on social visibility and comparison mechanisms highlighted the communicative effects of leaderboards and public performance indicators. Leaderboards were shown to function as salient signals that communicated relative position and comparative standing between students[27]. Studies consistently found that comparative structures influenced interpersonal communication by encouraging competitive or collaborative orientations depending on design choices and classroom culture. Some contexts showed that leaderboards strengthened peer recognition and stimulated supportive interactions, particularly when group performance was emphasized[18]. Other studies reported that increased visibility produced pressure or reluctance to participate, especially among students positioned lower on the ranking lists[17]. Further research described social visibility elements as cues that suggested behavioral expectations and participation norms[30,31].

Several studies investigated students' interpretations of gamified signals, revealing variation across contexts and individual characteristics. Research showed that students often assigned personal meaning to visual and symbolic elements, drawing on their prior experiences and expectations[28]. This pattern reflects differences in how learners read and respond to system-generated cues, which is consistent with the heterogeneity reported across the reviewed studies. Furthermore, some studies showed that students attributed considerable importance to visible indicators of progress and often interpreted them as accurate representations of their learning trajectory[10,22,23,25]. However, other studies reported skepticism toward competitive structures or automated recognition systems[17,26,27,28]. Hence, research conducted in different higher education contexts demonstrated that cultural,

disciplinary, and institutional factors influenced how gamified messages were understood[30]. Cross-platform comparisons found that interpretation depended on prior digital literacy and familiarity with game conventions, which shaped perceived clarity or ambiguity of system-generated signals[21,32].

Studies examining multimodal feedback structures identified combinations of numeric scores, colored indicators, and verbal feedback that communicated layered information about correctness, improvement opportunities and task completion[13]. Work on graphical summarization reported that color coding and visual summaries helped students identify priorities and distinguish between categories of progress[23]. Other studies found that misalignment between visual and textual cues occasionally led to confusion[13,23].

Several studies also examined the risks and limitations associated with communicative features of gamified LMSs. Some identified concerns about students misinterpreting system-generated signals or focusing disproportionately on highly visible metrics at the expense of deeper learning processes[26]. Others reported that competitive structures could amplify status differentials or lead to reduced participation among students who perceived themselves as underperforming[27]. Review studies noted that communicative effects depended on how interface design aligned with pedagogical intentions[4,5]. Consistent with this, additional analyses observed that misalignment between gamified cues and learning objectives could result in students prioritizing visible indicators over conceptual understanding[21,29].

Across all twenty-five studies, gamified LMS elements were consistently shown to communicate information through visual indicators, automated feedback, symbolic recognition, and mechanisms of social visibility. The findings collectively show how these elements shape students' interpretations of progress, task demands, and participation dynamics in digital learning environments. Together, the studies provide a detailed overview of the various communicative channels through which gamified components operate in LMS-based higher education contexts.

Discussion

The findings of this systematic review demonstrate that gamified LMSs function as complex communicative systems in which visual, symbolic, and automated cues mediate students' interpretation of tasks, expectations, and social dynamics. This communicative role becomes clearer when the empirical results are interpreted through relevant theoretical frameworks in visual communication, human–computer interaction, motivation, and instructional design. Drawing on these perspectives, this chapter provides an integrated interpretation of how the communicative functions identified in the reviewed studies shape learners' meaning-making processes within digitally mediated learning environments.

The first major insight concerns the communicative function of visual indicators. The results showed that dashboards, progress bars, and point displays guided learners' prioritization, pacing, and interpretations of task relevance, functioning as directional cues rather than neutral informational graphics. In these contexts, visual elements functioned as instructional messages that guided attention and influenced decisions about time allocation and effort. This aligns with Kress and van Leeuwen's[6] argument that visual layouts operate as "modal grammars" that structure meaning through composition, salience and framing. In gamified LMS interfaces, progress bars and dashboards provide directional metaphors and hierarchical cues that guide learners' perception of urgency, relevance and mastery. Students consistently interpreted these visual markers as messages about what the system considers important, echoing Norman's[7] concept of signifiers, which communicate action possibilities and expectations. This pattern aligns with design-focused analyses showing that students frequently interpret visual cues as meaningful signals about task hierarchy. Students' tendency to treat visual metrics as evaluative references suggests that gamified visuals shape epistemic judgments as much as motivational responses. While Norman's signifiers explain how interface cues indicate possible actions, their motivational implications emerge only when learners interpret these cues as information about competence, autonomy, or social meaning, consistent with Self-Determination Theory.

The communicative nature of automated feedback can be interpreted through theories of instructional communication and cognitive processing. Across studies, automated notifications, score updates, and performance prompts shaped learners' perceptions of competence, clarity of expectations, and task progression. Automated feedback thus operated not only as evaluative information but also as a communicative signal that learners monitored and interpreted as indicating approval, urgency, or required action. According to Clark and Mayer[33], feedback is a core instructional message that guides learners' mental models and reduces uncertainty in task progression. The immediacy and frequency of automated feedback strongly influenced students' self-regulation strategies, resonating with Self-Determination Theory[8], which holds that informational feedback supporting competence strengthens intrinsic motivation. However, when automated cues were ambiguous or overly prescriptive, they were interpreted as controlling messages, which SDT identifies as detrimental to autonomy. These findings illustrate that automated feedback in gamified LMSs acts as a communicative channel whose valence depends on message framing and alignment with psychological needs.

Results regarding badges and symbolic rewards can be situated within theories of symbolic communication and motivational signaling. The reviewed studies consistently showed that badges communicated achievement, credibility, and valued forms of participation, though interpretations varied depending on the clarity and transparency of

the criteria. These reward markers acted as symbolic messages that conveyed recognition and signaled norms about engagement within the learning community. Badges serve as semiotic resources that express identity, competence, and group belonging, reflecting the argument that digital symbols shape social meaning and behavioral expectations[1]. From a motivational perspective, badges operate as competence cues that influence perceived position within an achievement structure, consistent with Kapp's[2] interpretation of gamification as a communication of progress and mastery. However, several studies identified communicative breakdowns when badges failed to reflect effort or when criteria were insufficiently explained. This aligns with Hamari et al.[3], who emphasize that the effectiveness of gamified elements depends on users' interpretations and the perceived transparency of the system. In some cases, symbolic reward structures implicitly communicated values about ideal learner identities or preferred patterns of participation, illustrating their capacity to influence norms within learning communities.

Findings on social visibility mechanisms, such as leaderboards and public metrics, connect strongly with social comparison theory and communicative models of digital interaction. Leaderboards communicated relational standing and frequently shaped whether learners adopted competitive or collaborative orientations. These dynamics indicate that public performance elements communicate relational messages that shape the interpersonal climate of LMS environments. This is consistent with Zichermann and Cunningham[11], who argue that leaderboards embody competitive narratives that shape social identity and behavior. In supportive contexts, visibility enhanced relatedness and peer engagement, aligning with SDT's notion that social recognition satisfies the need for belonging. However, negative reactions among lower-ranked students reflected the risk that visible metrics communicate exclusion or inadequacy. These findings show that public performance indicators operate not as neutral gamification features but as communicative artefacts that shape social positioning and interpersonal tone.

Variability in how students interpret gamified cues can be understood through theoretical work on media literacy and interpretive framing. The reviewed studies revealed substantial variation shaped by cultural, disciplinary, and individual factors. These findings suggest that communicative effects cannot be reduced to the mechanics of individual elements but that they depend on the interpretive frameworks through which learners read system-generated cues. Differences in digital experience, gaming familiarity, and cultural norms influence how students decode visual and symbolic messages. This reflects Kress and van Leeuwen's[6] emphasis on the socially situated nature of visual literacy and the idea that meaning-making depends on learners' prior semiotic repertoires. Likewise, Norman's[7] work on perceived affordances helps explain why some students navigate gamified interfaces intuitively while others experience interpretive friction.

Multimodal feedback structures further illustrate the communicative complexity of gamification. Studies demonstrated that combinations of visual, numeric, and textual cues communicated layered information about correctness, progress, and priorities. Multimodal representations formed a coherent communicative whole when visual and textual indicators aligned, but created processing difficulty when they conveyed conflicting messages. According to multimodal learning theory, multiple representational channels must align coherently for messages to be interpreted without cognitive strain[33]. These findings also resonate with the concept of flow[9], in which clear goals and immediate, interpretable feedback are essential for maintaining engagement. Gamified systems that sent mixed messages disrupted coherence, reducing interpretability and diminishing learners' sense of direction.

The limitations identified across the reviewed studies can likewise be interpreted through theoretical perspectives. Short-term interventions made it difficult to determine whether communicative interpretations stabilize over time, an important consideration given that meaning-making in digital environments is cumulative and experience-dependent. Cultural variability in response to competitive structures and symbolic cues suggests that design-driven approaches are insufficient without attention to contextual understandings of symbols, color conventions, competition, and collaboration. These observations underline the importance of careful design choices and the potential for visual and symbolic cues to generate unintended messages.

Taken together, the findings indicate that gamified LMSs operate as layered communicative systems in which visual, symbolic, and automated elements convey messages about progress, expectations, and social positioning. These communicative processes shape how learners interpret their standing, regulate their activity, and understand instructional intent within LMS environments. Recognizing gamification as a communicative framework rather than a set of motivational tools provides a more precise basis for designing LMS environments that support meaningful engagement and ensure alignment between interface signals and pedagogical goals.

Conclusion

This review examined the communicative functions of gamified elements in Learning Management Systems in higher education by synthesizing findings from twenty-five empirical studies and anchoring them in established theoretical frameworks from visual communication, motivational psychology, and instructional design. In line with the aim of clarifying how LMS-based gamification communicates instructional messages, the analysis showed that gamified LMSs operate as multi-layered communicative environments in which visual indicators, automated feedback, symbolic recognitions, and mechanisms of social visibility transmit structured messages that shape learners' interpretations, expectations, and inter-

actions. Rather than functioning solely as motivational devices, these elements serve as semiotic resources that influence how students conceptualize progress, authority, competence, and belonging within digital learning spaces. By foregrounding these communicative mechanisms, the review contributes a consolidated perspective that moves beyond motivational framings and highlights the role of gamification in structuring meaning within digital instruction.

The findings underscore the importance of communicative coherence in gamified design. When visual and symbolic cues align with pedagogical intentions, they clarify expectations, stabilize learner orientation, and foster constructive engagement. When misaligned, ambiguous, or unbalanced, the same cues risk generating contradictory messages, cognitive overload, or unintended social hierarchies. This highlights an essential design implication. Namely, gamification in LMS environments should not be implemented as an isolated layer but as an integrated communicative system whose visual and symbolic structures require careful calibration.

While this review offers a systematic and theoretically grounded synthesis of current research, several contextual considerations inherent to the field should be noted. The included studies vary in disciplinary focus, course duration, and technological implementation, reflecting the diversity of higher education contexts in which gamified LMSs are deployed. Such heterogeneity enriches the interpretive scope of the review, although it necessarily limits the extent to which findings can be directly compared across settings. This variability also constrains the precision with which stable communicative effects can be distinguished from context- or platform-specific influences. In particular, most empirical work in this domain employs self-report measures, short-term interventions or single-course case studies. These approaches are typical for research on instructional technologies, yet they provide only partial insight into long-term communicative dynamics. The aim of this review was therefore not statistical aggregation but conceptual integration, which is methodologically appropriate for synthesizing studies with diverse designs. This interpretive orientation enables the identification of cross-cutting communicative patterns while acknowledging that future research may build on these foundations with more uniform or longitudinal methodologies.

Building on these foundations, the review highlights several promising directions for future work. Longitudinal studies are particularly needed to determine how learners' interpretations of visual and symbolic cues develop over sustained interaction with gamified systems. Such research could reveal whether communicative signals retain their initial meaning, strengthen through repeated exposure, or shift as learners become more familiar with the interface. Comparative studies across disciplines and institutional contexts would further clarify whether communicative patterns identified in the present synthesis are generalizable or shaped by specific pedagogical cultures. Moreover, controlled experimental research could help isolate the communicative effects of individual design elements. Systematic variations in progress indicators, feedback timing, or badge visibility would make it possible to identify which combinations of cues support interpretive clarity and which contribute to ambiguity or cognitive load. Integrating behavioral analytics with targeted qualitative insights may also offer a more nuanced understanding of how students make sense of system-generated messages during actual task engagement.

Finally, this paper highlights the need for future frameworks that conceptualize gamification as a communication process rather than solely a motivational strategy. By synthesizing dispersed empirical findings into a coherent communicative framework, this review contributes a clearer conceptual basis for understanding how gamified LMS elements convey meaning, structure interpretation, and shape social dynamics. Future frameworks would support the development of design principles that emphasize message transparency, coherence between visual and textual cues, and sensitivity to learners' interpretive differences. Advancing this line of inquiry may support the development of gamified LMS environments that communicate expectations more clearly and promote pedagogically aligned, comprehensible, and equitable learning experiences for learners and instructors alike.

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KOMUNIKACIJSKE FUNKCIJE IGRIFICIRANIH SUSTAVA ZA UPRAVLJANJE UČENJEM U VISOKOM OBRAZOVANJU

S A Ž E T A K

Rad istražuje način na koji igrificirani sustavi za upravljanje učenjem (LMS) oblikuju komunikacijske procese u visokom obrazovanju posredujući povratne informacije, prenoseći vizualne signale i strukturirajući društvene interakcije između studenata i nastavnika. U radu se sintetiziraju spoznaje suvremenih istraživanja o igrifikaciji, digitalnoj pedagogiji, interakciji korisnika i sustava te vizualnom dizajnu komunikacije kako bi se analiziralo na koji način ključne igrifikacijske komponente poput bodova, znački, traka napretka, ljestvica poretka i nadzornih ploča djeluju kao komunikacijski znakovi koji usmjeravaju interpretaciju studentskog uspjeha, statusa i očekivanih obrazovnih ponašanja. Posebna se pozornost posvećuje komunikacijskoj ulozi automatiziranih povratnih informacija, uključujući njihovu neposrednost, učestalost i način uokvirivanja, kao i ulozi dizajna sučelja u oblikovanju načina na koji su poruke percipirane i na njih se reagira. Pregled dodatno razmatra kako igrificirana okruženja utječu na interpersonalnu komunikaciju poticanjem kompetitivnih ili kolaborativnih diskursa te preraspodjelom vidljivosti i prepoznavanja među studentima. Rezultati ističu i potencijale igrificirane komunikacije, poput veće jasnoće očekivanja, povećane angažiranosti kroz transparentne signale i bogatije multimodalne povratne informacije, ali i rizike, uključujući moguću pogrešnu interpretaciju signala, pretjerano oslanjanje na automatizirane poruke i jačanje statusnih razlika među studentima. Rad zaključuje da je komunikacija unutar igrificiranih LMS-ova složen, višeslojan proces koji zahtijeva pažljive pedagoške i dizajnerske odluke te predlaže smjerove budućih istraživanja usmjerene na komunikacijsku učinkovitost, etičku transparentnost i uključivost u digitalno posredovanom visokom obrazovanju.