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# Appropriation of Game-Based Strategies in Higher Education: A Systemic Approach Integrating Institutional, Pedagogical, Faculty-Level and Instrumental Dimensions

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# Abstract

The appropriation of game-based strategies (GBS) in higher education involves multiple factors that extend beyond individual teaching practices. This study aimed to develop and refine a systemic conceptual framework for understanding GBS appropriation through institutional, faculty-level, pedagogical, and instrumental dimensions. An exploratory–descriptive qualitative design was employed, using Framework Analysis with a deductive–inductive approach. A preliminary framework comprising four dimensions and 23 categories was developed through a literature review and subsequently examined through semi-structured interviews with 24 stakeholders, including university faculty, academic administrators, national and international experts, and government leaders. First-order analysis identified differences in category coverage across stakeholder groups and an emerging faculty-level category, *generational gap*. Second-order analysis revealed interrelationships among institutional conditions, faculty characteristics, pedagogical decisions, and game suitability, suggesting that GBS appropriation is a systemic and context-dependent process. The findings suggest that meaningful and sustained GBS appropriation in higher education should be understood not as an isolated faculty initiative, but as a systemic process requiring alignment among institutional support, faculty agency, pedagogical intentionality, and the contextual suitability of games. The resulting framework provides a basis for future quantitative examination of these relationships.


# 1. Introduction

A growing body of research highlights the educational potential of game-based strategies (GBS) across diverse fields of knowledge, with evidence of positive effects on learning outcomes, knowledge retention, motivation, engagement, and skill development. Meta-analytical findings indicate that serious games can enhance learning and retention compared with conventional instruction [1], while gamification has demonstrated positive effects on cognitive, motivational, and behavioral learning outcomes [2]. These findings position game-based strategies as promising approaches to educational innovation in higher education.

Despite this evidence, their integration into university teaching remains challenging. Research has identified multiple barriers and facilitators influencing their use, including faculty attitudes, instructional design requirements, time constraints, and administrative conditions [3]. However, understanding these factors individually does not necessarily provide institutions with an integrated perspective for planning and sustaining the appropriation of game-based strategies. A key challenge, therefore, concerns how higher education institutions can systematically address the conditions required to support their meaningful and sustained incorporation into educational practices.

Without such an integrated perspective, institutional initiatives may prioritize isolated interventions, individual faculty efforts, or resource acquisition while overlooking the interdependencies that shape educational innovation. Consequently, implementation outcomes may be inconsistent, context-

dependent, or difficult to anticipate, potentially limiting the long-term educational value of these strategies.

Addressing this challenge requires moving beyond the evaluation of individual game-based interventions toward a systemic understanding of their appropriation. Examining the relationships among institutional conditions, pedagogical practices, faculty-level characteristics, and instrumental resources may provide a more comprehensive foundation for institutional decision-making and the development of coherent, context-sensitive strategies that support sustainable innovation in teaching and learning.

# 1.1. Game-based Strategies

In this study, GBS appropriation is understood as the process through which educators and education institutions recognize, adapt, integrate, and progressively incorporate game-based approaches into their educational practices. Unlike initial adoption, which refers to the decision to use a strategy, appropriation involves its pedagogical adaptation and contextual integration. This distinction allows the study to examine not only the conditions influencing the initial use of GBS but also those potentially supporting their meaningful and sustained incorporation into higher education.

Game-based learning (GBL) involves the use of games as learning environments in which educational objectives are pursued through gameplay, enabling learners to engage with content through challenges, decision-making, feedback, and interaction [4]. Playful learning emphasizes meaningful, joyful, actively engaging, iterative, and socially interactive experiences, incorporating elements of play into educational processes without necessarily requiring a formally structured game [5]. Serious games are games intentionally designed for purposes beyond entertainment, including education and training, in which gameplay supports specific learning or developmental objectives [6]. Finally, educational gamification refers to the integration of game design elements, such as points, badges, challenges, or progression systems, into educational activities that are not themselves games [7].

The selection of these four approaches is informed by their established presence in the literature on games, play, and education, as well as their conceptual and empirical contributions to understanding learning processes [4, 5, 6, 7]. Although these approaches differ in their design, objectives, and implementation, they share the underlying principle of leveraging the educational potential of play and games. Their integration under the broader concept of GBS provides an inclusive foundation for examining their appropriation in higher education without restricting the analysis to a particular methodology, game format, or technological medium.

# 1.2. Institutional, pedagogical, faculty-level and instrumental dimensions

Adopting a systemic approach to understanding the challenges and barriers associated with integrating game-based strategies (GBS) in higher education requires examining four interconnected dimensions identified through a literature review: institutional, pedagogical, faculty-level, and instrumental. These

dimensions encompass the organizational conditions, educational practices, individual characteristics, and game-related factors that may influence the appropriation of GBS.

The institutional dimension addresses the organizational conditions that enable or constrain educational innovation. It encompasses institutional culture, including openness to experimentation and resistance to change [8, 9]; institutional support through policies, leadership, recognition, and professional development opportunities [10, 11]; and institutional flexibility to adapt organizational structures and processes [12]. It also considers faculty workload, training opportunities, and the availability of technological resources and infrastructure as conditions influencing the feasibility and sustainability of GBS integration.

The pedagogical dimension focuses on the educational coherence and implementation of GBS. It includes alignment between games, learning outcomes, competencies, and assessment strategies [13]; the transformation of faculty roles toward experience design, mediation, and learning facilitation [14]; and the influence of disciplinary characteristics on game selection and implementation [15]. Additionally, it considers curricular integration, assessment practices, and students' perceptions regarding the relevance, enjoyment, and educational value of game-based experiences.

The faculty-level dimension examines individual characteristics influencing educators' willingness and capacity to appropriate GBS. These include perceptions of their educational benefits and limitations [16], attitudes toward game-based approaches [17], previous personal and professional gaming experiences [18], perceived self-efficacy in implementing game-based activities [19], intrinsic and extrinsic motivation [20], and digital competencies [21].

Finally, the instrumental dimension concerns the characteristics and suitability of games as educational resources. It considers game selection according to learning objectives and student characteristics [22], appropriate difficulty levels [23], duration and temporal compatibility with instructional activities [24], cultural and contextual relevance [25], and accessibility for learners with diverse needs [26].

Accordingly, this study aimed to develop and refine a systemic conceptual framework for understanding the appropriation of game-based strategies in higher education by integrating evidence from literature and the perspectives of multiple stakeholder groups across instrumental, faculty-level, pedagogical, and institutional dimensions.

# 2. Method

## 2.1. Study Design

This study adopted an exploratory–descriptive qualitative design using Framework Analysis with a deductive–inductive approach [27]. A literature review informed a preliminary framework comprising institutional, pedagogical, faculty-level, and instrumental dimensions and their associated categories.

Semi-structured interviews explored stakeholders' experiences and perceptions regarding game-based strategy appropriation in higher education. Interview data were analyzed using the preliminary framework for deductive coding while allowing inductive identification of emerging factors. Findings were compared across stakeholder groups to identify convergences, divergences, and new elements. This iterative process informed the retention, modification, removal, or incorporation of categories, producing an empirically refined conceptual framework.

## 2.2. Participants

The study involved 24 participants across six stakeholder groups: university faculty members (n = 11), university administrators (n = 6), national experts (n = 2), international experts (n = 2), executive branch leaders (n = 2), and a legislative branch leader (n = 1). Executive branch participants had held senior leadership positions in the Colombian national government, while the legislative representative was a Colombian senator experienced in educational public policy. International experts from Spanish universities provided perspectives beyond Colombia.

Participants were selected through purposive sampling with maximum variation criteria to capture diverse institutional, territorial, demographic, and disciplinary perspectives. Selection considered Colombian geographic macroregions, city type, institutional sector (public or private), gender, and academic background (educational and social sciences versus other disciplines). This strategy incorporated perspectives from different educational, institutional, and policy contexts, supporting a multidimensional understanding of game-based strategy appropriation rather than statistical representativeness.

Sample adequacy was considered through the concept of information power [28], which emphasizes the relevance and richness of qualitative data over sample size alone. The study's specific research aim, participants' relevant professional experience, and the literature-informed analytical framework provided a basis for assessing the sample's informational contribution. The diversity of stakeholder perspectives further supported the exploration of convergences, divergences, and emerging themes without assuming theoretical saturation.

Table 1
Distribution of participants by stakeholder group and sampling criteria (n = 24)

| Characteristic | UF | UA | NE | IE | EL | LL | Total |
|---|---|---|---|---|---|---|---|
| **Geographic scope** | | | | | | | |
| Andean | 6 | 4 | 0 | 0 | 0 | 0 | 10 |
| Caribbean | 2 | 1 | 0 | 0 | 0 | 0 | 3 |
| Pacific | 2 | 1 | 0 | 0 | 0 | 0 | 3 |
| Amazon | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| National scope | 0 | 0 | 2 | 0 | 2 | 1 | 5 |
| International scope | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| **City type** | | | | | | | |
| Major metropolitan area | 7 | 5 | 2 | 2 | 2 | 1 | 19 |
| Intermediate city | 3 | 1 | 0 | 0 | 0 | 0 | 4 |
| Lower academic centrality | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| **Institutional sector** | | | | | | | |
| Private | 5 | 4 | 1 | 0 | 0 | 0 | 10 |
| Public | 6 | 2 | 1 | 2 | 2 | 1 | 14 |
| **Gender** | | | | | | | |
| Female | 5 | 4 | 2 | 1 | 1 | 0 | 13 |
| Male | 6 | 2 | 0 | 1 | 1 | 1 | 11 |
| **Academic background** | | | | | | | |
| Educational and social sciences | 5 | 4 | 2 | 1 | 1 | 0 | 13 |
| Other disciplines | 6 | 2 | 0 | 1 | 1 | 1 | 11 |

Note. UF= university faculty, UA= university administrators, NE= national experts, IE= international experts, EL= executive leaders, LL= legislative leader. National scope and international are sampling classifications rather than Colombian macroregions. Institutional sector refers to the affiliation recorded in the dataset; for government representatives, public indicates government affiliation. Academic background follows the classification used in the sampling matrix.

As shown in Table 1, faculty members (45.8%) and university administrators (25.0%) constituted the largest groups. The sample included 54.2% women and 45.8% men, with 58.3% affiliated with public institutions and 41.7% with private organizations. Regarding academic background, 54.2% were associated with educational and social sciences, while 45.8% represented other disciplines. Geographic

diversity encompassed four Colombian macroregions, national-level stakeholders, and international experts.

## 2.3. Analytical framework

An initial analytical framework was developed through a literature review to identify factors influencing the appropriation of game-based strategies (GBS) in higher education. This framework provided the deductive foundation for subsequent qualitative analysis and was organized into four interconnected dimensions: institutional, pedagogical, faculty-level, and instrumental.

Overall, the preliminary framework comprised four dimensions and 23 analytical categories, each supported by literature-derived conceptual definitions, operational definitions, and associated codes. These components established the theoretical scope and initial coding structure for interpreting interview data (Table 2).

Table 2
Dimensions and categories of the preliminary literature-informed analytical framework.

| Analytical dimension | Categories |
|---|---|
| Institutional | Institutional culture; Institutional support; Institutional flexibility; Faculty training and professional development; Faculty workload for educational innovation; Resources and infrastructure |
| Pedagogical | Pedagogical alignment with learning outcomes; Faculty role; Disciplinary field; Curricular integration; Assessment strategies; Student perceptions |
| Faculty-level | Faculty perceptions of games; Attitudes toward games; Previous gaming experience; GBS teaching self-efficacy; Faculty motivation; Digital skills |
| Instrumental | Game selection; Game difficulty; Game duration; Cultural and contextual relevance; Game accessibility |

*Source: Authors' elaboration based on the literature-informed analytical framework developed prior to stakeholder interviews.*

The framework was established prior to data collection and was not treated as a fixed classification system. Instead, it provided an initial deductive structure for the subsequent Framework Analysis, allowing the empirical evidence obtained from stakeholder interviews to inform the retention, modification, removal, or incorporation of categories and codes through a complementary inductive process. This approach enabled the preliminary framework to be critically examined and refined considering the diverse perspectives represented in the study.

## 2.4. Instruments

Semi-structured interviews were used as the primary data collection instrument. Four interview protocols were developed for the six stakeholder groups: (1) university faculty members, (2) university

administrators, (3) national and international experts, (4) executive branch leaders and the legislative branch leader.

The interview protocols were organized into three sections: general perceptions of games in higher education, factors influencing the integration of game-based strategies (GBS) and future perspectives. The first section explored participants' perceptions of the educational potential, opportunities, equity implications, and challenges associated with GBS. The second addressed factors related to the four dimensions of the preliminary analytical framework—institutional, pedagogical, faculty-level, and instrumental—through common questions and additional questions tailored to each stakeholder group. The final section examined the prospective role of GBS in higher education, particularly in relation to educational innovation and equity. Table 3 presents the interview questions and identifies those designed for specific stakeholder groups.

Table 3
Semi-structured interview questions

| Section | Interview questions | Target group |
|---|---|---|
| General perceptions of games in higher education | 1. How do you currently perceive the role of games and game-based strategies in higher education? | All groups |
| | 2. What opportunities do you identify for integrating games into university teaching and learning processes? | All groups |
| | 3. How can the integration of games promote equity in access to quality learning experiences in higher education? | All groups |
| | 4. What risks, challenges, or tensions do you identify regarding these strategies? | All groups |
| Factors related to GBS integration | 5. From your perspective, what personal characteristics or competencies facilitate faculty members' integration of games into their teaching practices? | All groups |
| | 6. What conditions are necessary for the use of games to achieve pedagogical legitimacy within the university? | All groups |
| | 7. What institutional considerations are important for promoting the integration of games into educational practices? What might hinder this process? | All groups |
| | 8. What criteria should be considered when selecting and acquiring games for educational purposes? | All groups |
| | 9. In an institutional process of integrating games into higher education, which academic areas, administrative units, and external stakeholders should be involved? What role should each play? How would you prioritize them, and why? | All groups |
| | 10. Beyond the aspects already discussed, what other elements are essential for the successful institutional integration of games in higher education? | All groups |
| | 11. What types of evidence or outcomes would be necessary to institutionally justify the introduction or expansion of GBS in higher education? | University administrators |
| | 12. Based on your experience in government, what factors influence whether the integration of games becomes a priority for higher education institutions? | Government leaders |
| | 13. Based on your research and professional experience, which aspects of GBS integration in higher education remain insufficiently studied or understood? | National and international experts |

*Note. The complete set of protocols contained 15 distinct questions: 11 common questions and four stakeholder-specific questions. Each stakeholder group was presented with the common questions and its corresponding specific question.*

| Section | Interview questions | Target group |
|---|---|---|
| | 14. Considering specific experiences of GBS use, either your own or those you know of, which factors have most influenced the success or failure of these strategies in a university course? | University faculty |
| Future perspectives | 15. Looking ahead, what role do you anticipate different game-based strategies will play in higher education institutions, particularly in relation to educational innovation and equity in access to learning experiences? | All groups |

*Note. The complete set of protocols contained 15 distinct questions: 11 common questions and four stakeholder-specific questions. Each stakeholder group was presented with the common questions and its corresponding specific question.*

The interview protocols underwent content validation by four experts, comprising two national and two international experts, with equal gender representation (two women and two men). The validation process considered three criteria: pertinence, relevance, and clarity of wording. These criteria were assessed in relation to the conceptual definitions of the institutional, pedagogical, faculty-level, and instrumental dimensions established in the preliminary analytical framework. This process aimed to examine the correspondence between the interview questions and the conceptual dimensions under investigation, as well as the clarity and appropriateness of their formulation. The semi-structured format allowed participants to elaborate on their perspectives and introduce factors not initially contemplated in the framework.

## 2.5. Procedure

The study followed three sequential phases. First, a literature review informed the development of a preliminary analytical framework comprising four dimensions and 23 categories, alongside four semi-structured interview protocols.

Second, 24 participants were recruited through purposive sampling with maximum variation criteria. Interviews explored their general perceptions of games in higher education and perspectives on the preliminary framework, allowing additional factors to emerge. All participants provided informed consent before participating in the interviews. Participation was voluntary, and interview data were treated confidentially. The interviews were transcribed and analyzed in their original language (Spanish). Participant identities were represented using anonymized identifiers corresponding to their stakeholder groups. Selected interview excerpts were subsequently translated into English for inclusion in the manuscript, preserving their original meaning.

Third, interview data were examined through deductive–inductive Framework Analysis. Findings were compared across stakeholder groups and contrasted with the preliminary framework to identify convergences, divergences, and emerging factors, informing the refinement of its categories and subcategories.

All methods were carried out in accordance with relevant ethical guidelines and regulations governing research involving human participants. The study protocols were reviewed and approved by the Institutional Research Ethics Committee

## 2.6. Data analysis

Interview data were examined using deductive–inductive Framework Analysis [27], incorporating two complementary levels. First-order analysis involved coding participants' perceptions and experiences using the preliminary framework of four dimensions and 23 categories, while identifying emerging factors inductively. The coding process was conducted using ATLAS.ti software (version 25).

Second-order analysis examined conceptual relationships among categories by comparing coded interview segments within and across stakeholder groups. Particular attention was given to accounts in which participants connected individual dispositions, institutional conditions, pedagogical decisions, and game characteristics. These relationships were grouped into broader interpretative themes according to their conceptual convergence, while contrasting perspectives were considered to identify tensions and contextual variations. This process informed the development of five interconnected themes describing potential relationships among the framework's dimensions.

# 3. Results

## 3.1. First-Order Analysis: Identification and Refinement of Framework Categories

First-order analysis examined stakeholders' perceptions and experiences regarding the appropriation of game-based strategies (GBS) in higher education. Following a deductive–inductive approach, coding began with the preliminary framework comprising four dimensions and 23 categories. These literature-informed categories guided the initial coding process, while inductive analysis allowed additional factors to emerge.

The analysis revealed differences in the coverage of coded categories across stakeholder groups. No interview segments were assigned to certain categories within particular groups, although these absences should not be interpreted as evidence of disagreement, perceived irrelevance, or lack of importance. Because the interview protocols included questions addressing the preliminary framework, category coverage reflects the evidence captured and coded within each group rather than the spontaneous emergence of factors.

These differences reflect variations in the factors addressed by each stakeholder group, without necessarily indicating disagreement or perceived irrelevance. Therefore, the absence of a category within a particular group was not considered sufficient evidence for its exclusion from the overall framework.

Inductive coding also identified an emerging category within the faculty-level dimension: *generational gap*. This category was introduced to capture perceived differences across generations in their familiarity with games, gaming experiences, and attitudes toward their educational use. One faculty member referred to generational differences when discussing resistance to game-based approaches: *"I don't know about the new generations now, but the main problem is that people think this is nonsense and that it doesn't matter because there is no suffering involved"* (Faculty member). This account suggests that generational characteristics may intersect with established beliefs about learning and the educational legitimacy of games. However, the evidence does not establish that such perceptions are determined by chronological age. The emerging category was therefore retained as an exploratory analytical distinction, potentially related to previous gaming experience and attitudes toward games, whose conceptual independence requires further investigation.

Table 4 presents the resulting analytical framework, including its dimensions, categories, and associated codes following first-order coding. It integrates the literature-informed categories with the emerging category identified through empirical analysis, documenting the resulting coding structure, and providing the basis for subsequent second-order interpretation.

Table 4
Resulting analytical framework: dimensions, categories, and codes following first-order analysis.

| Analytical dimension | Categories | Codes |
|---|---|---|
| Institutional | **Institutional culture**: Shared norms and values that support or constrain educational innovation.[8] | Innovation-supportive culture; resistance to change; openness to experimentation; legitimacy of innovation; risk aversion |
| | **Institutional support**: Institutional policies, leadership, and recognition supporting innovation. [10] | Institutional policies; academic leadership; faculty recognition; institutional guidance; lack of institutional support |
| | **Institutional flexibility**: Capacity to adapt institutional rules, structures, and processes. [12] | Structural flexibility; process flexibility; regulatory flexibility; adaptability; decentralization; bureaucracy |
| | **Faculty training and professional development**: Professional learning opportunities for designing and using educational games. [29] | Pedagogical training; teacher training; game-specific training; lack of training |
| | **Faculty workload for educational innovation**: Work demands and available time for educational innovation. [30] | Faculty overload; time availability; planning time; innovation design time; administrative demands |
| | **Resources and infrastructure**: Availability and adequacy of technology, facilities, and technical support. [31] | Hardware availability; software availability; connectivity; digital platforms; resource shortages |
| Pedagogical | **Pedagogical alignment with learning outcomes**: Coherence between games, learning outcomes, activities, and assessment. [13] | Alignment with learning outcomes; alignment with competencies; game–activity alignment |
| | **Faculty role**: Educators' responsibilities in designing, facilitating, and reflecting on gameplay. [14] | Teacher mediation; learning facilitation; support during gameplay; post-game reflection; transformation of faculty role |
| | **Disciplinary field**: Disciplinary conditions shaping educational game use. [15] | Disciplinary fit; disciplinary limitations; differences across fields |
| | **Curricular integration**: Integration of games into course objectives, content, and competencies. [32] | Alignment with educational objectives; alignment with content; alignment with competencies |

| Analytical dimension | Categories | Codes |
|---|---|---|
| | **Assessment strategies**: Approaches to gathering and evaluating evidence of learning through games. [33] | Formative assessment; gameplay-generated evidence; competency assessment; assessment validity; assessment difficulties |
| | **Student perceptions**: Students' acceptance, engagement, and perceived value of educational games. [34] | Student acceptance; student rejection; enjoyment; student motivation; student engagement; perceived usefulness |
| Faculty-level | **Faculty perceptions of games**: Educators' beliefs about the benefits and limitations of educational games. [16] | Perceived learning benefits; perceived motivational benefits; perceived engagement benefits; perceived pedagogical limitations; perceived implementation challenges; perceived educational usefulness |
| | **Attitudes toward games**: Educators' favorable, unfavorable, or ambivalent disposition toward educational games. [17] | Openness to game-based teaching; acceptance of educational games; resistance to game use |
| | **Previous gaming experience**: Prior personal or professional familiarity with games. [18] | Personal gaming experience; professional gaming experience; previous educational game use; limited gaming experience |
| | **GBS teaching self-efficacy**: Educators' perceived capability to design, facilitate, and implement game-based teaching activities effectively. [19] | Perceived pedagogical competence; confidence in game facilitation; confidence in game design; perceived implementation difficulty |
| | **Faculty motivation**: Intrinsic and extrinsic reasons for adopting games in teaching. [20] | Intrinsic motivation; enjoyment of teaching with games; creative motivation; professional achievement |
| | **Digital skills**: Digital competencies supporting game-based teaching and assessment. [35] | Digital literacy; digital game proficiency; technology integration skills; digital content creation; technological difficulties |
| | **Generational gap**: Generational differences in gaming familiarity, experiences, and perceptions. *(Emergent category)* | Generational differences in gaming familiarity; generational gaming preferences; perceived generational barriers; intergenerational differences in educational game acceptance |
| Instrumental | **Game selection**: Criteria for choosing games appropriate to learners and objectives. [22] | Learning-outcome alignment; interaction mechanics; challenge level; game flexibility; adaptability; skill-development potential; technological/aesthetic criteria |
| | **Game difficulty**: Suitability of game challenge relative to | Low difficulty; excessive difficulty; appropriate challenge; gradual progression; scaffolding; |

| Analytical dimension | Categories | Codes |
|---|---|---|
| | learners' abilities. [23] | difficulty adjustment; cognitive overload |
| | **Game duration**: Fit between gameplay time and instructional constraints. [24] | Required time; available time; time on task; perceived time; appropriate duration; inappropriate duration; temporal sequencing; time self-regulation |
| | **Cultural and contextual relevance**: Fit between game content and learners' sociocultural contexts. [25] | Sociocultural fit; sociocultural mismatch; local narratives; community values; meaningful contexts; students' cultural capital |
| | **Game accessibility**: Design features enabling participation across diverse abilities. [26] | Visual barriers; auditory barriers; cognitive barriers; multiple information channels; simplified interface |

Comparison of the preliminary and resulting frameworks showed that the four original dimensions and 23 literature-informed categories were retained. One additional faculty-level category, generational gap, was identified through inductive coding, resulting in a framework comprising four dimensions and 24 categories. Qualitative analysis also enabled the categories to be examined in relation to participants' experiences and perspectives. Thus, the refinement primarily involved confirming the relevance of the preliminary structure, incorporating an emerging factor, and developing an interpretative understanding of relationships among categories.

Overall, first-order analysis documented differences in category coverage across stakeholder groups and identified an additional factor beyond the preliminary framework. These findings informed subsequent second-order analysis and conceptual refinement of the framework.

## 3.2. Second-Order Analysis: Interrelationships Among Dimensions of GBS Appropriation

Second-order analysis examined the relationships among the categories identified in the first-order analysis, moving beyond their individual descriptions to explore how institutional, faculty-level, pedagogical, and instrumental factors interact in the appropriation of game-based strategies (GBS) in higher education. Five interconnected themes emerged from the comparative interpretation of stakeholder perspectives. These themes reflect recurring relationships and tensions across dimensions rather than additional categories or statistically established associations. These themes concerned (1) academic legitimacy and faculty attitudes, (2) faculty motivation and institutional conditions, (3) pedagogical intentionality and game selection, (4) instrumental suitability and learner diversity, and (5) institutional coordination and broader educational priorities. Participant quotations are presented in English translations from the original Spanish interviews.

The first relationship concerned the interaction between perceptions of games, faculty attitudes, and institutional legitimacy. Participants described persistent assumptions that games are primarily recreational and therefore incompatible with the perceived seriousness of university education. One expert explained that *"for many teachers, games are not taken seriously; they are seen as something recreational"* (Expert). An academic administrator similarly described faculty concerns that introducing games might lead students to question their professional credibility: *"If I implement games in higher education, I will lose the legitimacy I have with my students"* (Academic administrator). These perceptions were not confined to faculty. Administrators also reported situations in which adult learners preferred conventional teaching resources over playful activities. Such accounts suggest that resistance to GBS may arise from shared expectations about legitimate academic practices, linking individual attitudes with institutional and disciplinary cultures. Conversely, direct experience with games appeared to offer opportunities to reconsider these assumptions. As one expert recommended, *"They have to explore them themselves; they have to play themselves to understand the possibilities of games in their academic space"* (Expert). Appropriation therefore appears connected to both individual openness and opportunities for experiential engagement.

A second relationship involved faculty motivation and the institutional conditions enabling implementation. Participants frequently associated GBS adoption with curiosity, creativity, and willingness to experiment. One faculty member characterized innovative teachers as those who *"always have the initiative to search, to use tools, to identify how they can be implemented"* (Faculty member). However, positive dispositions did not necessarily translate into sustained implementation. The same participant explained that developing serious games requires additional planning to reconcile disciplinary content, game rules, and learning outcomes. Another faculty member observed that *"playing a game may require more time than one has"* (Faculty member). These accounts connect faculty agency with workload, preparation time, and organizational resources.

Institutional stakeholders expanded this relationship by emphasizing leadership, academic autonomy, and professional development. One administrator argued that institutional leaders should explicitly support innovation and establish the organizational capabilities required for implementation. Another described academic freedom as the possibility for faculty to select the pedagogical methods they consider most appropriate for their learning objectives. An expert similarly emphasized the importance of institutional endorsement, suggesting that such support makes teachers feel *"a little less insecure about moving away from PowerPoint"* (Expert). Taken together, these perspectives indicate that institutional support may influence appropriation not only through material resources but also by legitimizing experimentation and reducing the perceived risks of departing from established teaching practices.

A third relationship emerged between pedagogical intentionality, game selection, and the faculty role. Across stakeholder groups, participants distinguished meaningful GBS integration from introducing games merely to increase entertainment or participation. An administrator questioned practices in which institutions *"buy LEGO and a thousand other things, and only afterwards ask what to do with them"*

(Academic administrator). This account illustrates the potential tension between acquiring instructional resources and establishing their educational purpose. Similarly, a government leader cautioned that *"not just any game works"* (Government leader), emphasizing the importance of design quality, alignment with course objectives, and teacher-guided reflection. Faculty participants reinforced this perspective by describing game selection as a decision that should follow the identification of learning outcomes and disciplinary needs.

Assessment practices introduced additional tension. One faculty member questioned whether students' apparent success in a game necessarily demonstrated learning, observing that players might identify response patterns and advance without engaging meaningfully with the intended content. Another expressed concern about the limited evidence available to distinguish perceived engagement from measurable learning improvements. Conversely, an expert described facilitating post-game discussions in which students explained the strategies they used to achieve their objectives. However, the same expert warned that excessive instrumentalization could undermine the experience: *"Here they are evaluating me; they are trying to teach me"* (Expert). These contrasting accounts suggest that pedagogical appropriation involves balancing learning assessment, reflective mediation, and the experiential qualities of play.

A fourth relationship connected instrumental characteristics with student diversity and contextual suitability. Participants described game difficulty, duration, accessibility, and cultural relevance as characteristics whose educational implications depend on learners' experiences and institutional circumstances. One expert reported that participants unfamiliar with games sometimes experienced considerable frustration when encountering complex puzzles, requiring designers to reduce the intended level of challenge. Another noted that some university students encountered certain board games for the first time. These experiences complicate assumptions that students possess comparable gaming backgrounds or interpret game mechanics similarly.

Administrators also observed that some adult learners may feel uncomfortable with competition or role-playing, highlighting the need to adapt activities to student characteristics. Material accessibility further shaped implementation. One faculty member emphasized that a game designed for one university could not automatically be transferred to another without contextual adaptation. Another identified connectivity, technological infrastructure, and students' access to devices as practical constraints. Thus, instrumental suitability appears relational rather than intrinsic: a game considered appropriate in one educational setting may require substantial adaptation in another.

Finally, participants connected sustainable appropriation with institutional coordination and broader educational priorities. Administrators described the importance of faculty development, collaboration across organizational units, and institutional strategies that extend beyond isolated initiatives. Government stakeholders situated games within challenges such as educational access, retention, and territorial inequalities, while emphasizing the need for curricular integration and evidence of educational

values. These perspectives suggest that appropriation may involve different levels of decision-making, from individual classroom experimentation to institutional policies and educational system priorities.

Overall, the second-order analysis portrays GBS appropriation as a systemic and context-dependent process shaped by interrelationships among the four dimensions. Institutional conditions influence opportunities for faculty action; faculty characteristics shape pedagogical decisions; and the suitability of games depends on learning objectives, student diversity, and available resources. The emerging category of *generational gap* may contribute to understanding differences in gaming familiarity, although the interviews do not establish age as an independent explanatory factor. Figure 1 presents the resulting conceptual framework, illustrating the four dimensions and their associated categories and variables identified through the first- and second-order analyses. The proposed relationships should therefore be interpreted as qualitative propositions for subsequent empirical examination rather than confirmed causal mechanisms.

# 4. Discussion

The findings advance a systemic understanding of game-based strategies (GBS) appropriation in higher education by integrating institutional, faculty-level, pedagogical, and instrumental dimensions within a common conceptual framework. Previous research has identified multiple drivers and barriers influencing educators' use of gamification and game-based learning[3], including faculty experiences and predispositions[16,17], pedagogical competencies[14], and game characteristics[22]. While these contributions provide valuable insights into particular conditions of implementation, the present study offers an integrative perspective that considers how such conditions may be connected. Its contribution is therefore not the identification of entirely new determinants of GBS use, but the organization and qualitative examination of their potential interrelationships within a systemic framework. This perspective shifts attention from whether individual factors facilitate or constrain implementation toward how their configurations may shape the broader process of educational appropriation.

One implication concerns the relationship between individual agency and organizational conditions. Research on educators' experiences and implementation barriers[3,16] provides a foundation for understanding why positive dispositions do not necessarily result in the incorporation of GBS into teaching. The present findings suggest that faculty motivation and pedagogical initiative should be interpreted in relation to the institutional conditions under which educators work. This interpretation is compatible with research examining the role of leadership and institutional support in teacher innovation competency[11]. From a systemic perspective, organizational resources, professional development, academic autonomy, and workload conditions may influence the opportunities available for translating individual intentions into educational practices. These relationships suggest that institutional strategies focused exclusively on increasing faculty motivation or providing isolated training opportunities may overlook other conditions relevant to appropriation. A more integrated approach would consider how different forms of support operate together, although the relative contribution of each remains to be established empirically.

The findings also suggest that GBS appropriation has a cultural dimension extending beyond technical or pedagogical competence. Research on teachers' predispositions toward game-based pedagogy[17] offers a relevant starting point for understanding favorable and unfavorable orientations toward educational games. However, the present study indicates that these orientations may be embedded in broader expectations regarding academic legitimacy, professional identity, and acceptable university teaching practices. This interpretation is important because it suggests that resistance to GBS cannot always be addressed through additional resources or training alone. Institutional cultures may influence whether experimentation with games is recognized as legitimate academic work and whether faculty feel supported in departing from established instructional conventions. Consequently, the proposed framework positions faculty attitudes and institutional culture as conceptually related conditions, while leaving their specific relationships open to further examination.

A further theoretical implication concerns the relationship between pedagogical intentionality and instrumental suitability. Constructive alignment in educational game design[13] and research on game-based learning characteristics[22] provide foundations for understanding the importance of matching games with learning objectives. The present findings extend this perspective by suggesting that instrumental suitability is not simply an inherent property of a particular game. Rather, it may depend on the relationship between game characteristics, pedagogical purposes, learners' experiences, and institutional circumstances. A game may possess desirable design features yet remain unsuitable for a specific educational context because of its complexity, duration, accessibility requirements, or incompatibility with curricular objectives. Accordingly, game selection and adaptation should be understood as pedagogically situated decisions. This interpretation also reinforces the relevance of faculty competencies in game-based pedagogy[14], particularly the ability to evaluate and adapt games rather than merely operate or facilitate them.

This relational understanding has implications for educational assessment and learner diversity. The educational potential of GBS cannot be inferred solely from participation, enjoyment, or successful progression through a game. Pedagogical appropriation requires consideration of how learning is mediated, interpreted, and assessed without assuming that engagement necessarily constitutes evidence of achievement. At the same time, assessment practices must be considered alongside the experiential characteristics of play. This creates a conceptual tension between educational accountability and preserving meaningful playful experiences, which warrants further investigation. Similarly, research on accessibility in educational game design[26] highlights the importance of considering learners' diverse needs. The present framework situates such considerations within a broader relationship involving instructional objectives, student characteristics, game design, and available resources. Thus, contextual adaptation emerges as a potentially important feature of appropriation rather than a secondary implementation adjustment.

The qualitative refinement of the framework constitutes another contribution. Through interviews with 24 stakeholders representing university faculty, academic administrators, national and international experts, and executive and legislative government leaders, the study examined the preliminary

framework across different professional and organizational perspectives. Consistent with the comparative possibilities of Framework Analysis[27], this approach enabled the interpretation of categories beyond their individual occurrence and supported the identification of relationships spanning classroom practices, institutional management, and educational policy. The resulting framework retained the four literature-informed dimensions and 23 initial categories while incorporating *generational gap* as an emerging faculty-level category. This addition suggests that perceived generational differences in gaming familiarity and educational expectations deserve further consideration. Nevertheless, the evidence does not establish chronological age as an independent determinant of appropriation, nor does it demonstrate that this emerging category is conceptually independent of previous gaming experience or attitudes toward games.

The study's contribution must be considered alongside its limitations. The qualitative design and purposive sampling strategy supported conceptual exploration and refinement but do not establish the prevalence, magnitude, or causal direction of relationships among factors. Although the inclusion of different stakeholder groups broadened the perspectives considered, the findings remain situated within the participating contexts, predominantly in Colombia. Moreover, retaining the preliminary categories should not be interpreted as evidence that their dimensional organization or explanatory relevance has been statistically validated. The proposed relationships are therefore best understood as theoretically informed and qualitatively supported propositions.

Future research should examine these propositions through a quantitative study involving a larger and more diverse sample of university faculty. Developing and validating measures for the identified constructs would allow researchers to assess their dimensional structure and investigate how institutional, faculty-level, pedagogical, and instrumental factors relate to GBS appropriation. Depending on the theoretical specification and measurement properties, confirmatory factor analysis and structural equation modeling could support the examination of alternative explanatory structures and potential direct, indirect, or moderating relationships. Such investigation would move the framework from qualitative conceptual refinement toward empirical testing, while providing a stronger foundation for informing faculty development, institutional innovation strategies, and educational policy.

## Declarations

# Additional Information (including a Competing Interests Statement)

The authors declare no competing interests.

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# Author Contribution

DSBP contributed to all stages of the research process, including study conceptualization, methodological design, development of the analytical framework, data collection, data analysis, interpretation of findings, and manuscript preparation. SLG and JRR contributed to study conceptualization, methodological design, and manuscript preparation. ANDV contributed to data analysis and interpretation of findings. All authors reviewed and approved the final version of the manuscript.

# Data Availability

The qualitative data generated and analyzed during this study consist of semi-structured interview transcripts from 24 participants. These data are not publicly available because they contain potentially identifiable information and were collected under conditions of participant confidentiality. De-identified excerpts and supporting analytical materials may be made available by the corresponding author upon reasonable request, subject to ethical considerations, participant confidentiality, and applicable data protection requirements.

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# Figures

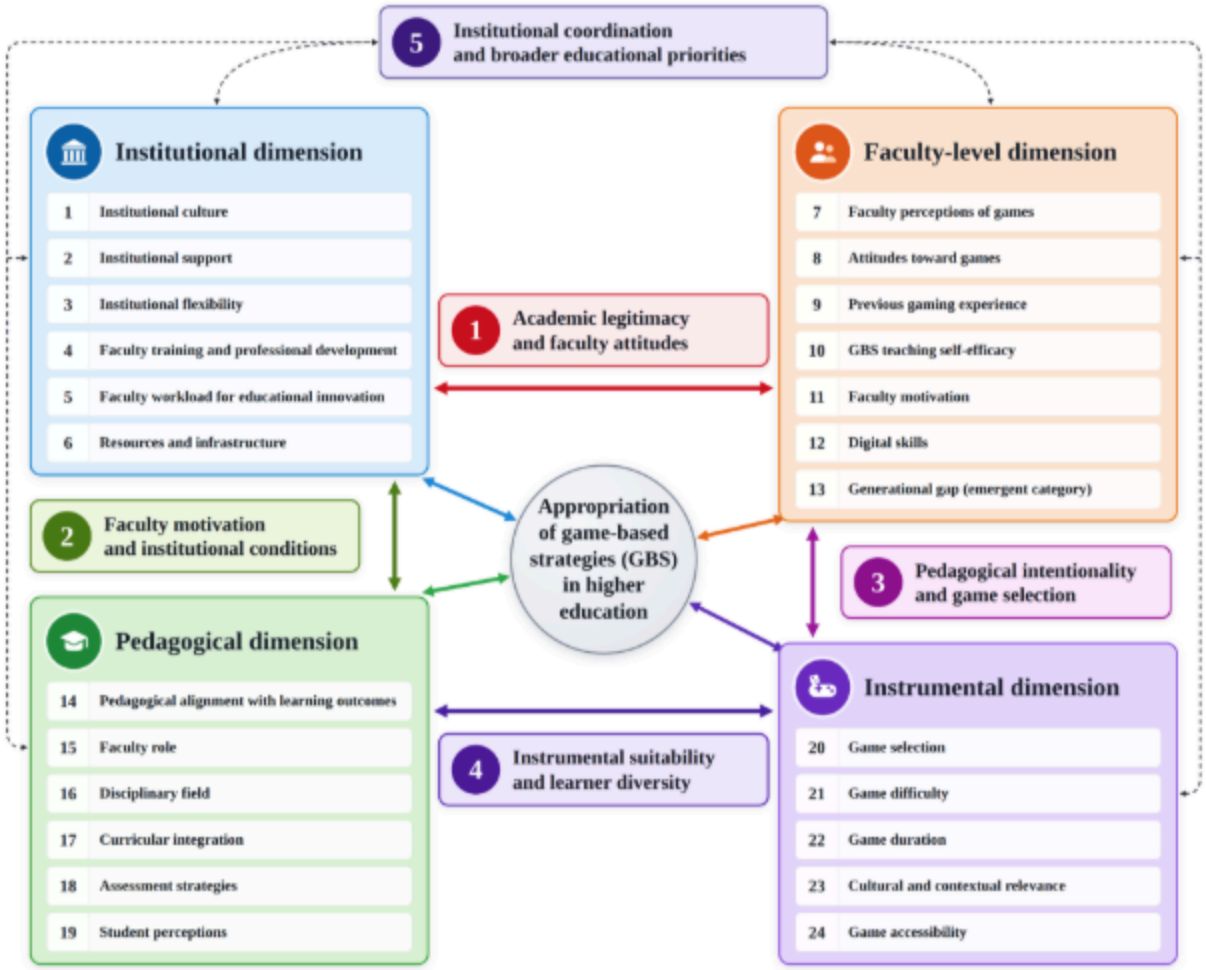



**Figure 1**

Five interrelated themes shaping the appropriation of game-based strategies in higher education: A systemic framework of dimensions and categories.