South American Publishing

SAP Gamification and Augmented Reality. 2024;3:62
doi: 10.62486/gr202462

REVIEW

Learning theory in game-based learning at Spanish-speaking universities in Latin America

Teoría del aprendizaje en el aprendizaje basado en juegos en universidades hispanohablantes de América Latina

Francis Feldick

[1] Gerencia Operativa de Atención al Docente, Ministerio de Educación. CABA, Argentina

Submitted: 07-07-2024 | Revised: 09-09-2024 | Accepted: 08-12-2024 | Published: 10-12-2024

Corresponding Author: Francis Feldick

ABSTRACT

Game-based learning is widely adopted in universities, yet the learning theory behind it is seldom examined outside research on gamification. This narrative review described how learning theory grounded game-based learning in Spanish-speaking Latin American higher education and appraised whether the theory invoked corresponded to the evidence reported. A total of 39 studies from 9 countries were coded on five dimensions: theoretical anchoring, theory family, design and evaluation frameworks, study design with outcome evidence, and the relations among them. Of the studies, 20 named a theory, model or framework, 10 invoked a pedagogical principle only and 9 identified neither. Constructivist and sociocultural theories were named most often. A comparison group was present in 9 studies, and 13 reported an objective learning or performance measure. Only 7 of the 20 studies naming a theory used an instrument matched to it. Theory framed most activities but seldom determined what was measured, and studies with no stated basis reported objective measures as often as those naming a theory. Authors could state the mechanism that a game is meant to activate, choose outcome measures that match it and compare versions of a game, not only games against lectures.

Keywords: game-based learning; learning theory; higher education; Latin America; serious games.

RESUMEN

El aprendizaje basado en juegos se usa ampliamente en las universidades, pero la teoría del aprendizaje que lo sustenta se examina poco fuera de la investigación sobre gamificación. Esta revisión narrativa describió cómo la teoría del aprendizaje fundamentó el aprendizaje basado en juegos en la educación superior hispanohablante de América Latina y valoró si la teoría invocada concordaba con la evidencia. Se codificaron 39 estudios de 9 países en cinco dimensiones: anclaje teórico, familia teórica, marcos de diseño y evaluación, diseño del estudio con la evidencia de resultados, y las relaciones entre ellas. De los estudios, 20 nombraron una teoría, modelo o marco, 10 invocaron solo un principio pedagógico y 9 no identificaron ninguno. Las teorías constructivistas y socioculturales fueron las más nombradas. Hubo grupo de comparación en 9 estudios y 13 notificaron una medida objetiva de aprendizaje o desempeño. Solo 7 de los 20 estudios que nombraron una teoría emplearon un instrumento concordante con ella. La teoría enmarcó la mayoría de las actividades, pero rara vez determinó lo que se midió. Los autores podrían declarar el mecanismo que el juego debe activar, elegir medidas concordantes y comparar versiones de un juego.

Palabras clave: aprendizaje basado en juegos; teorías del aprendizaje; educación superior; América Latina; juegos serios.

© 2024; The Authors. This Open access article is distributed under CC BY 4.0 licence.

INTRODUCTION

Game-based learning places students in a game, or in the design of one, as the activity through which content is learned. Gamification adds game elements such as points or rankings to tasks that are not games.(1,2) A conceptual mapping of 22 texts on higher education compared the notions of gamification, serious games, game-based learning and educational games to clarify how they differ.(3)Meta-analyses favor learning with games over conventional instruction, with modest effects: serious games gave small advantages in learning and retention,(4)and digital games improved learning relative to non-game conditions.(5)

The size of these effects depended on how the game was used. Serious games taught more when they were supplemented with other instruction, played over several sessions or played in groups,(4)and in gamified learning the inclusion of game fiction and social interaction moderated the effects.(6)Such moderators are theoretical claims in disguise, because they imply that learning depends on the instructional context, the social organization of play and narrative, and not on the game alone. Garris et al. proposed an input-process-output model in which game features trigger a cycle of judgments, behavior and feedback that leads to learning outcomes.(7)Mayer asked that claims about computer games be grounded in evidence-based theories of how people learn,(8) and Plass et al. concluded that cognitive, motivational, affective and sociocultural perspectives are all needed in game design and research.(1)

Regional reviews have mapped parts of the Spanish-speaking Latin American literature. A systematic review of game-based learning in university mathematics located 19 records.(9)A bibliometric characterization of serious games in economics, finance, accounting and administration programs placed collaborative learning and gamification among the consolidated strategies.(10)A review of accounting simulators described their application in professional education as emergent.(11)The review that examined pedagogical bases concentrated on gamification and concluded that it rests on constructivism, connectivism, self-determination theory and flow.(12) Reviews of gamification in higher education, one of them restricted to Latin America, have focused on motivation,(13,14) and a review of ICT-assisted gamification in universities focused on autonomous learning.(15)The reviews retrieved did not examine how studies of game-based learning at Spanish-speaking universities use learning theory.

The construct examined here is the theoretical grounding of game-based learning. It can be read through five dimensions: whether a theory, model or principle anchors the study; which family of learning theory it belongs to; which design and evaluation frameworks accompany it; which study designs and outcome evidence follow; and how these dimensions relate. This review aimed to describe how learning theory grounds game-based learning in Spanish-speaking Latin American higher education and to appraise the correspondence between the theory invoked and the evidence reported. Games are treated as learning activities, and gamification and its motivational constructs are left aside.

METHODS

Design and scope

A narrative review was designed following the Scale for the Assessment of Narrative Review Articles.(16)The review did not aim at exhaustiveness and did not apply systematic screening. Four criteria defined the scope. Studies had to be published between 2012 and 2024, take place in a university or an equivalent higher education setting, be conducted in a Spanish-speaking country of Latin America, and use a game as the learning activity, whether students played, enacted or designed it. Studies of gamification alone, with points, badges or rankings added to ordinary tasks, were excluded. Spain was left out because the review addressed Latin America, and Brazil because its language of instruction is Portuguese. Role-play counted as a game when students enacted assigned roles under rules and goals, and game jams counted because students designed games as the learning task. Studies of faculty training and of secondary school students were excluded, since the review concerned university students.

Search, selection and coding procedure

Searches combined terms for games (serious game, educational video game, game-based learning, role-play, escape room, board game and their Spanish and Portuguese equivalents) with terms for higher education and with Latin American country names or, in Scopus, with affiliation

country filters. Scopus, OpenAlex, Crossref, Semantic Scholar and PubMed were queried in English, Spanish and Portuguese. OpenAlex and Crossref index most journals of the SciELO and Redalyc collections, which gave access to regional journals outside Scopus. Records were screened on title and abstract against the criteria, and the full text was read when an open-access copy could be retrieved. The full text was read for 31 of the 39 included studies, and the other 8 were coded from the abstract. Literature on theory and on meta-analytic evidence was searched separately and had no lower date limit.

Scopus queries were field-restricted strings that combined game terms, higher education terms and, in separate runs, country names or affiliation country filters. Spanish and Portuguese queries used juego serio, videojuego educativo, aprendizaje basado en juegos, jogo sério and aprendizagem baseada em jogos with universitario, educación superior and ensino superior. A further set of queries paired game terms with the main learning theories (constructivism, meaningful learning, sociocultural theory, experiential learning, cognitive load, cooperative learning and metacognition), so that the corpus would not favor studies that were silent about theory.

For each study the matrix recorded the year, country, game format, anchoring category, theory families, named frameworks, study design, strongest outcome evidence and, for studies naming a theory, the correspondence indicator. The matrix kept a short note naming the basis behind each anchoring decision.

Dimension 1: theoretical anchoring

The variable was the degree to which a study grounded the game-based activity in theory. Three categories were defined. Named: the study identified a learning theory, model, framework or theorist as its basis or as its interpretive lens. Principle: it invoked a pedagogical principle, such as meaningful learning or cooperative learning, as an aim or rationale without naming a framework. None: no basis of either kind was identified. The category was assigned from the abstract and, where available, from the introduction, methods and discussion. Analysis consisted of counts and percentages of the corpus.

Dimension 2: family of learning theory

Each named learning theory was assigned to one of eight families: constructivist, sociocultural, experiential, cognitive, learning styles, play and emotion, motivation, and game-based learning treated as a theory in its own right. A study could name more than one family. Frameworks that described how to design or evaluate a game, not how people learn, were not assigned to a family. Analysis consisted of the number of studies per family.

Dimension 3: design and evaluation frameworks

The variable was the presence of a named model or method used to design a game or to judge it, such as ADDIE, MEEGA+, GAMEX or design-based research. A software development method was recorded but not counted as a pedagogical framework. Analysis consisted of the number of studies naming each framework and its distribution across study designs.

Dimension 4: study design and outcome evidence

Study design was classified as randomized trial, non-randomized comparison group, single-group pre-post or post-only study, cross-sectional survey or qualitative case, design or development report, or conceptual or documentary paper. Outcome evidence was classified by the strongest type reported: an objective learning or performance measure, self-report only, qualitative, observational or documentary data only, or no outcome data. Risk of bias was not assessed, because the review was narrative and the studies were too heterogeneous for a common tool.

Dimension 5: relations among dimensions

Relations were examined in two ways. Anchoring was cross-tabulated with outcome evidence and with the presence of a comparison group. For studies that named a theory, an indicator of correspondence was coded: matched when an instrument or coding scheme was named after, or derived from, the invoked construct; not identified when none was; and not applicable for conceptual or interpretive studies without an outcome measure. The coding was descriptive and no inferential test was run, because the corpus was small and was not drawn as a sample.

DEVELOPMENT

The corpus comprised 39 studies from 9 countries. Colombia contributed 13 studies (33.3%) and Chile 9 (23.1%), Ecuador 5 and Mexico 5, Peru 3, and Argentina, Bolivia, the Dominican Republic and Venezuela one each (Table 1).

Publication was recent: 24 studies (61.5%) appeared between 2021 and 2024, 12 between 2017 and 2020, and 3 between 2012 and 2016. Digital serious games or educational video games formed the largest format group(14), followed by role-play(4), escape rooms(3), game jams or game-design tasks (3) and board or card games(2). The remaining 13 used other or mixed didactic games. Health-profession programs, namely medicine, nursing, dentistry, pharmacy and biochemistry, were the setting of 9 studies (23.1%).

Table 1. Characteristics of the included studies.

Characteristic	Category	Studies, n (%)
Country	Colombia	13 (33.3%)
Country	Chile	9 (23.1%)
Country	Ecuador	5 (12.8%)
Country	Mexico	5 (12.8%)
Country	Peru	3 (7.7%)
Country	Argentina, Bolivia, Dominican Republic or Venezuela	1 each (2.6% each)
Publication period	2012 to 2016	3 (7.7%)
Publication period	2017 to 2020	12 (30.8%)
Publication period	2021 to 2024	24 (61.5%)
Game format	Digital serious game or video game	14 (35.9%)
Game format	Role-play	4 (10.3%)
Game format	Escape room	3 (7.7%)
Game format	Game jam or game-design task	3 (7.7%)
Game format	Board or card game	2 (5.1%)
Game format	Other or mixed didactic games	13 (33.3%)

Note: Percentages use 39 studies as the denominator. Format categories are mutually exclusive.

Dimension 1: theoretical anchoring

In the dimension of theoretical anchoring, 20 studies (51.3%) named a theory, model or framework as their basis. A further 10 (25.6%) invoked a pedagogical principle without a framework, and 9 (23.1%) presented no identifiable basis (Table 2).

The principle group concentrated on six ideas. Meaningful learning was the aim or rationale in four studies.(37,38,42,44)Cooperative learning was invoked in two.(40,41) Experiential learning,(39) active and situated pedagogies,(43)constructivist currents applied to critical thinking(45)and autonomous learning(46)each appeared in one.

The clearest explicit grounding tied the game to a named mechanism. Sociocognitive conflict was the mechanism in a serious game for first-year pedagogy students.(19)The zone of proximal development and meaningful learning explained learning in a history role-play and in a competitive reading game,(27,34) and a socio-constructivist account supported an escape room in cell biology.(33)

Table 2. Theoretical anchoring of the included studies.

Category	Studies, n (%)	Studies
Named theory, model or framework	20 (51.3%)	(17-36)
Pedagogical principle only	10 (25.6%)	(37-46)
No basis identified	9 (23.1%)	(47-55)

Note: Named studies include those that name only a design or evaluation framework.

Nine studies presented no basis in the abstract or in the text read. Four of them still used a comparison group or a pre-post design with objective outcomes.(48-50,55)One was a pre-post test of a serious game for ICD-10 coding in 61 medical students, which found no significant difference. Its authors listed insufficient attention to pedagogical theory among the reasons.(49)

Anchoring did not equal a theory of learning, as the next dimension shows. Of the 20 studies that named a basis, 3 named only a design or evaluation framework,(20,29,31)and the remaining 17 named at least one family of learning theory.

Dimension 2: family of learning theory

For this variable, 17 studies named at least one family of learning theory, and 7 named two or more. Constructivist theory was named in 7 studies and sociocultural theory in 5. Experiential or transformative learning (3) and play and emotion (3) followed, then cognitive or neuroeducation perspectives (2) and learning styles(2). Self-determination theory and game-based learning as a theory appeared in one study each (Table 3).

Table 3. Families of learning theory named by the included studies.

Family	Theories or authors named	Studies, n	Studies
Constructivist	Constructivism, Ausubel, Vygotsky	7	(18,21,27,28,30,33,34)
Sociocultural	Sociocognitive conflict, sociocultural perspective, zone of proximal development	5	(19,26,27,33,34)
Experiential	Transformative, situated and experiential learning	3	(17,18,30)
Play and emotion	Huizinga, theories of emotion	3	(32,35,36)
Cognitive	Neuroeducation, executive function	2	(23,32)
Learning styles	Kolb	2	(24,25)
Motivation	Self-determination theory	1	(21)
Game-based learning	Game-based learning as a theory	1	(22)

Note: A study could name more than one family, so counts do not add to the number of studies naming a family.

Constructivist grounding appeared in two ways. Ausubel's meaningful learning and Vygotsky's zone of proximal development explained learning in role-play in history teacher education, in a competitive reading game and in an escape room.(27,33,34)Constructivism was named as the paradigm, or as one of the perspectives that explain the benefits of games, in a role-play with video recording, a virtual-reality law game, online serious games in nursing and a game jam.(18,21,28,30)

Sociocultural grounding took the form of sociocognitive conflict in a game for pedagogy students(19)and of a cooperative water-awareness game designed from a sociocultural perspective.(26)Kolb's learning styles profiled students in the Dominican Republic and guided the design of a game for Chilean design students.(24,25) Neuroeducation framed a Bolivian paper on educational video games and an attention-training game for dental students in Peru.(23,32)

Play as a concept drew on Huizinga in a Mexican life-story study, a Peruvian attention study and a Colombian review of theories of emotion.(32,35,36)Self-determination theory entered only in the discussion of a Chilean nursing study.(21) Game-based learning itself was called a theory in a board game for the teaching of pre-Hispanic architecture.(22)No coded material named connectivism or flow.

Findings were reported at different levels within these families. In the sociocognitive study, exploratory interactions predominated among 15 first-year pedagogy students in three groups, with differences between the groups.(19)The history role-play was associated with better learning, and it also exposed the students' scant familiarity with the strategy and a heavy workload for teachers and students.(27)Students in the Argentine reading game valued the game as a learning occasion and reported motivation to read in a sustained and comprehensive way.(34)An eight-hour game jam led 268 medical students in 48 groups to design prototypes with learning objectives and pedagogical strategies, and its authors linked the experience to transformative learning and constructivism.(18)

Next to the design frameworks, the families describe how students learn, whereas the frameworks of the next dimension describe how games are built and judged. Both levels were combined in 3 studies: Kolb's styles with Bartle's player taxonomy,(25)socio-constructivism with the GAMEX scale,(33)and constructivism with the SCRUM development method.(30)

Dimension 3: design and evaluation frameworks

Within this component, 6 studies (15.4%) named a design or evaluation framework (Table 4). Each framework appeared in one study only.

Table 4. Design and evaluation frameworks named by the included studies.

Framework	Purpose in the study	Study
ADDIE	Instructional design process for a serious game	(29)
MEEGA+	Evaluation of student experience and usability	(29)
6i methodology	Design of a serious game for first-year induction	(31)
Design-based research	Research design for a video game on entrepreneurship	(20)
Innovator DNA	Competence framework for innovation skills	(20)
GAMEX	Measurement of gameful experience in an escape room	(33)
Bartle taxonomy	Player types used with Kolb's inventory	(25)
SCRUM	Development method for a virtual-reality law game	(30)

Note: ADDIE = analysis, design, development, implementation, evaluation; MEEGA+ = model for the evaluation of educational games; GAMEX = gameful experience scale. SCRUM is a software development method and was not counted as a pedagogical framework.

ADDIE structured the construction of a serious game for algorithm comprehension at a Venezuelan university, and MEEGA+ evaluated the students' experience and the usability of the game.(29)The 6i methodology for serious games guided a mobile game for first-year induction at the Universidad Nacional de Colombia.(31)Design-based research and the Innovator DNA framework underpinned a video game for entrepreneurship teaching in Colombia.(20)

The evaluation results attached to these frameworks were moderate. The ad hoc test showed that the algorithm game helped students solve the easiest algorithm correctly, and MEEGA+ indicated that the game met the requirements of an educational game to a moderate degree.(29)In the induction game, most of the 75 students from 20 programs agreed with the playability features and found the game useful to internalize four aspects of university life.(31)

Frameworks were most frequent in development work: 3 of the 8 design or development reports named one, as did 2 of 16 surveys or cases and 1 of 7 non-randomized comparisons. None of the 2 randomized trials, the 4 single-group studies or the 2 conceptual papers named one. Development reports without a named framework described their own procedures, such as a mission-sheet tool for mapping the levels of a psychology video game.(43)

Frameworks and objective outcome data coincided in a minority of the studies that named a framework. Of the 6 studies naming a framework, 2 reported objective learning measures,(29,30) and 4 relied on self-report.(20,25,31,33)

Dimension 4: study design and outcome evidence

For this variable, cross-sectional surveys or qualitative cases were the most frequent design (16; 41.0%). Design or development reports followed(8), then non-randomized comparisons(7), single-group pre-post or post-only studies(4), randomized trials (2) and conceptual or documentary papers(2). Outcome evidence was distributed unevenly: 13 studies (33.3%) reported an objective learning or performance measure, 12 (30.8%) relied on self-report only, 10 (25.6%) on qualitative, observational or documentary data, and 4 (10.3%) reported none (Table 5).

Randomized trials produced mixed results. A game jam trial in Colombian medical education found no difference from an interactive workshop in intentions of culturally safe behavior, since both arms improved, and it obtained higher transcultural self-efficacy in the game jam arm (OR 2.03; 95% CI 1.25 to 3.30).(17)A randomized trial of role-play in nursing pharmacology reported higher academic performance in the role-play group.(40)

Non-randomized comparisons favored the game group on at least one outcome. Genially games were associated with better grammar and vocabulary knowledge in English as a foreign language,(38) and a digital serious game was followed by significant differences in job-interview performance and behavioral anxiety.(48)The video game Ethikós was associated with a 36% improvement in academic performance relative to the control group.(50) Games were also associated with higher probability learning and selective attention.(32,55) Self-reported innovation skills(20) and observed behavior in a cariology escape room(44)also favored the game groups.

Table 5. Study design and strongest outcome evidence in the included studies.

Study design	Studies, n	Objective measure	Self-report only	Qualitative or documentary	No outcome data
Randomized trial	2	1	1	0	0
Non-randomized comparison group	7	5	1	1	0
Single-group pre-post or post-only	4	4	0	0	0
Cross-sectional survey or qualitative case	16	1	9	6	0
Design or development report	8	2	1	1	4
Conceptual or documentary	2	0	0	2	0

Note: Objective = test, grades or performance measure; self-report = perception, acceptance, usability or self-efficacy only; qualitative = qualitative, observational or documentary data only. Rows are mutually exclusive.

Self-report data mostly described favorable perceptions. In the Chilean nursing study 90.8% of 108 students considered that serious games improved learning.(21)Ninety-nine students in Puebla appreciated video games as a didactic tool,(39)and 40 software engineering students perceived that designing games gave them human-computer interaction skills.(53)A social work game obtained favorable usability ratings.(52)Students in a human resources course preferred collaborative board games of medium complexity and no more than 90 minutes.(51)

Samples were small in places, with 13 versus 11 students in the attention study(32)and 13 students in a role-play study with a single post measurement.(28)Single-group designs diverged. Pre-post increases were reported after three game formats in Chile(37)and after an engineering video game in Colombia,(42)whereas the ICD-10 game produced no significant pre-post difference.(49)

Designs changed over time. Of the studies with a comparison group, 7 were published between 2021 and 2024, 2 between 2017 and 2020 and 0 between 2012 and 2016. Objective measures followed a similar course, since 8 of 24 recent studies reported them, against 5 of 12 from 2017 to 2020 and 0 of 3 from 2012 to 2016.

Only 9 of 39 studies had a comparison group, and the three anchoring categories were equally represented among them: 3 named a theory, 3 a principle and 3 none (Table 6).

Dimension 5: relations among dimensions

Among the 20 studies that named a theory, an objective measure appeared in 5, self-report only in 7 and qualitative or documentary data in 8. Among the 9 studies with no basis, 4 reported objective measures, 3 self-report only and 2 no outcome data. Objective measures therefore concentrated in 4 of 9 unanchored studies, against 5 of 20 named ones (Table 6).

Table 6. Theoretical anchoring by outcome evidence and comparison group.

Anchoring	Studies, n	Objective measure	Self-report only	Qualitative or documentary	No outcome data	Comparison group
Named theory, model or framework	20	5	7	8	0	3
Pedagogical principle only	10	4	2	2	2	3
No basis identified	9	4	3	0	2	3

Note: Comparison group includes randomized and non-randomized comparisons. Rows add to the 39 included studies.

An instrument or coding scheme matched to the invoked construct was identified in 7 of the 20 named studies (35.0%). No matched instrument was identified in 10, and 3 were conceptual or interpretive studies without an outcome measure. Interaction categories derived from sociocognitive conflict were applied in the Chilean pedagogy study,(19)and a meaningful learning scale in the role-play with video recording.(28)

The remaining matched cases were Kolb's inventory,(24,25) an attention test for neuroeducation,(32)MEEGA+ for the ADDIE-built game(29)and GAMEX for the escape room.(33)Unmatched cases included the game jam trial, whose outcomes were intentions and self-efficacy and not indicators of transformative learning.(17)The Chilean nursing study named constructivism and self-determination theory, and its instrument was a 15-item perception survey.(21)The board game for architecture history named game-based learning as a theory and was assessed with achievement scores and interviews.(22)

Anchoring changed with publication period. A named theory, model or framework was present in 14 of 24 studies from 2021 to 2024 (58.3%), against 5 of 12 from 2017 to 2020 (41.7%), while the share with no basis fell from 33.3% to 16.7%. Anchoring varied less with format. Role-play studies split evenly between a named theory (2) and a principle(2), escape rooms named a theory in 1 of 3, and digital serious games named a theory in 6 of 14, with 5 presenting no basis.

DISCUSSION

This review aimed to describe how learning theory grounds game-based learning at Spanish-speaking Latin American universities and to appraise whether the theory invoked corresponds to the evidence reported. The coded corpus indicates that theory is present in most studies but seldom carries weight: it frames the activity and only occasionally determines what is measured. The reading that follows takes the dimensions in the same order and closes with a joint interpretation.

Dimension 1: theoretical anchoring

Anchoring was explicit in about half of the studies and absent in nearly a quarter, which differs from the pedagogical grounding reported for gamification, although the two bodies of work were not coded with the same scheme. The review of pedagogical bases in higher education concluded that gamification rests on constructivism, connectivism, self-determination theory and flow,(12) and regional reviews of gamification centered on motivation.(13,14,56)Studies of games as learning activities justified the activity in some cases with a principle alone, mostly meaningful learning, which names a goal without saying what the game does to reach it. A plausible reason is that part of the corpus consists of teaching-innovation reports, where theoretical sections are short; this explanation was not tested. Autonomous learning, the aim of one study in the corpus,(46)is also the focus of a mixed systematic review of ICT-assisted gamification at universities, which again concerns gamification and not games.(15)

The four perspectives that Plass et al. identified were unequally represented.(1)Sociocultural and constructivist families were named most often, motivation once, cognitive perspectives twice, through neuroeducation and attention, and affect through theories of play and emotion in three studies. The coded material did not mention cognitive load or multimedia design principles, so it remains open whether choices such as the amount of on-screen information were guided by a theory of cognitive processing.

Mayer's call for evidence-based theories of how people learn(8)and the multiple perspectives that Plass et al. regard as necessary(1)set a standard that the unanchored studies do not meet. The clearest cautionary case is the ICD-10 coding game, whose authors attributed the absence of a pre-post difference partly to insufficient attention to pedagogical theory.(49)One study cannot establish that missing theory causes null effects, but the authors' own diagnosis shows how design decisions made without a stated mechanism can surface later as unexplained results. Landers' theory of gamified learning, although written for gamification, shows what an explicit mechanism looks like: game attributes affect behaviors or attitudes, which then moderate or mediate the effect of instructional design on learning.(2)

Dimension 2: family of learning theory

The prominence of constructivist and sociocultural families agrees with the moderators found in meta-analyses. Serious games taught more when they were played in groups and supplemented with other instruction,(4)and social interaction moderated the effect of gamified learning.(6) A systematic review of cooperative learning with gamification and game-based learning concluded that the combination strengthened academic, personal and social skills.(57)The studies that grounded games in sociocognitive conflict or in the zone of proximal development locate learning in interaction, which is the mechanism these moderators imply.(19,34)

Self-determination theory appeared once, and connectivism and flow did not appear, a pattern that differs from the gamification review of pedagogical bases(12)and from the reviews centered on motivation.(13,14) The difference is consistent with the effort of a conceptual mapping to separate gamification, serious games and game-based learning.(3)It also means that conclusions about motivation drawn from gamification cannot be transferred to the games studied here without testing. The learning-style studies call for a separate caution, since Kolb's inventory was used to profile students and design games, and the reports read did not compare outcomes across styles.(24,25)

The formats in the corpus have different theoretical affinities. Role-play places students in assigned positions and requires exchange between them, and role-playing appears among the implementation options in the review of cooperative learning with games.(57)In the corpus these affinities were mostly implicit, since two of the four role-play studies and one of the three escape rooms named a theory, which suggests that the format carried the justification.(27,28,33)

Dimension 3: design and evaluation frameworks

Garris et al. described a game cycle of user judgments, behavior and feedback and the learning outcomes it can produce,(7)and a review of nine serious-game design methodologies concluded that requirements elicitation, role assignment and pedagogical definition should be incorporated.(58)Few studies in the corpus named a design or evaluation framework. Among the frameworks named here, ADDIE and 6i organize the design process, MEEGA+ and GAMEX judge the result, and design-based research is a research design. None of them states by itself which learning mechanism the game rules are meant to carry, which is the gap between a process model and a theory of learning. Five of the eight development reports named no framework at all.

Dimension 4: study design and outcome evidence

The evidence base is smaller than the meta-analytic base against which it is usually read. Meta-analyses synthesized 77 comparisons of serious games with conventional instruction for learning(4)and 57 media comparisons of digital games with non-game conditions,(5)whereas this corpus holds nine studies with a comparison group. Regional reviews report small or early-stage bodies of work in some areas, namely 19 records on university mathematics(9)and an emergent use of simulators in accounting,(11)while a bibliometric review identified consolidated strategies in economics programs.(10)

Zabala-Vargas et al. found that the 19 records in their review were oriented to cognitive, emotional, affective, soft-skill and behavioral development.(9)The present corpus shows a similar breadth in the outcomes studied, from knowledge and attention to interview anxiety and self-efficacy, but the breadth was not matched by a stated mechanism for each outcome.

Every controlled study reported an advantage for the game group on at least one outcome. In the game jam trial the advantage was limited to self-efficacy, because intentions improved in both arms.(17)Such uniformity contrasts with the small effects of the meta-analyses(4,5) and with the finding that serious games were not more motivating than conventional instruction.(4)Small samples and the publication of favorable teaching innovations could contribute, but the present data cannot separate these explanations. Mayer distinguished value-added, cognitive-consequences and media-comparison research.(8) The controlled studies here were media comparisons, and none compared versions of the same game as far as the abstracts and methods read allow.

Designs and anchoring both became stronger over time in this corpus, with comparison groups, objective measures and named theories concentrated in the most recent period. The change may reflect maturation of the field, wider publication in indexed journals or the shift to online teaching during the pandemic, which three studies gave as their context.(21,38,55)The data do not allow these explanations to be told apart.

Dimension 5: relations among dimensions

The weak correspondence between theory and measurement is the central finding. Mayer asked for claims grounded in theory and tested rigorously,(8)and Garris et al. placed learning outcomes at the end of a model that begins with game features.(7)Where a match existed, it relied on instruments already available, such as Kolb's inventory, a standardized attention test or the MEEGA+ model. For constructs such as transformative learning or the zone of proximal development, the studies read did not apply an equivalent instrument, and authors used the theory to interpret results while measuring intentions, satisfaction or achievement.

Meaningful learning shows how a construct can lose its definition. It was an aim or rationale in the principle group, and one anchored study measured it with a validated scale.(28)In two others it entered as an item of a perception questionnaire, one on an engineering video game and one on serious games in online nursing teaching.(21,42) Ausubel's idea concerns the relation between new content and the learner's prior cognitive structure,(27,34) which a satisfaction item cannot capture, so the same word covered different things.

Two small studies in the corpus show that the chain from theory to game to measurement is feasible in a classroom. The Chilean pedagogy study designed a game to promote reflection and sociocognitive conflict and then classified the players' interactions as disputational, cumulative

or exploratory, so that the construct that justified the game was also the object of analysis.(19) The role-play with video recording stated meaningful learning as an aim and measured it with a published scale next to a competence rubric.(28)Both studies were small, with 15 and 13 students, and neither had a comparison group. Alignment and a comparison design coincided in only one matched study, the attention test with dental students.(32)

That objective measures appeared as often in unanchored studies as in those naming a theory can be read in two ways. Either theoretical grounding is unrelated to the rigor of outcome measurement, or the studies that most need a mechanism, those testing effects, are the ones that omit it. The descriptive data cannot decide between these readings. The ICD-10 study gives the second reading some support.(49)The escape room built on socio-constructivism and measured with GAMEX shows grounding and measurement aligned, although the outcome was gameful experience and not learning.(33)

Read together, the five dimensions describe a literature in which games are justified by familiar pedagogical ideas, evaluated mostly through perception, and rarely tested against the mechanism that the idea implies. The pattern is not specific to Latin America, since Mayer and Plass et al. made similar demands of the international literature.(1,8) The regional corpus covers formats from digital games to role-play and escape rooms under a shared set of justifications, which suggests that the format is chosen before the mechanism is specified.

Limitations and implications

The review has limitations that bear on how far the findings extend. Selection was non-systematic, so the corpus may omit eligible studies, and a registered protocol with dual screening would allow a systematic review to estimate coverage.

Authors of future studies can state, before the intervention, which mechanism the game is meant to activate and which observable change it predicts. They can choose outcome measures that correspond to it, compare versions of a game in value-added designs, and report game rules, feedback and group size, because these are the features through which the moderators operate.(4,6) The corpus already holds templates for pairing a mechanism with a measure: interaction coding for sociocognitive conflict,(19)a meaningful learning scale,(28) Kolb's inventory for learning styles,(24)a selective attention test for games aimed at attention(32)and MEEGA+ for the quality of an educational game.(29)Journals can ask for a statement of the theoretical mechanism and the matched instrument. Teachers who adopt games can ask of any study which mechanism it tested and how, before treating a favorable perception survey as evidence of learning.

CONCLUSIONS

Theoretical anchoring was explicit in roughly half of the studies, and the rest rested on a pedagogical principle or on no stated basis. Constructivist and sociocultural theories were the families named most often, while motivational theory, connectivism and flow were rare or absent. Design and evaluation frameworks were named in a small share of studies, and they organized the process and the experience more than the learning mechanism. Study designs were mostly surveys, cases and development reports, and objective learning evidence came from a minority of studies. Theory and evidence corresponded in only a minority of the studies that named a theory, so theory worked mainly as a rationale.

REFERENCES

1. Plass JL, Homer BD, Kinzer CK. Foundations of Game-Based Learning. Educational Psychologist. 2015;50(4):258-283. doi: 10.1080/00461520.2015.1122533
2. Landers RN. Developing a Theory of Gamified Learning. Simulation & Gaming. 2014;45(6):752-768. doi: 10.1177/1046878114563660
3. Torres García CE, Romero González RM, Chavero Basaldúa L, Paulín Martínez FJ. "Gamificación en la enseñanza en la educación superior para su correcta implementación: cartografía conceptual". S F J of Dev. 2022;3(2):2468-2483. doi: 10.46932/sfjdv3n2-070
4. Wouters P, van Nimwegen C, van Oostendorp H, van der Spek ED. A meta-analysis of the cognitive and motivational effects of serious games. Journal of Educational Psychology. 2013;105(2):249-265. doi: 10.1037/a0031311
5. Clark DB, Tanner-Smith EE, Killingsworth SS. Digital Games, Design, and Learning. Review of Educational Research. 2016;86(1):79-122. doi: 10.3102/0034654315582065
6. Sailer M, Homner L. The Gamification of Learning: a Meta-analysis. Educ Psychol Rev. 2020;32(1):77-112. doi: 10.1007/s10648-019-09498-w
7. Garris R, Ahlers R, Driskell JE. Games, Motivation, and Learning: A Research and Practice Model. Simulation & Gaming. 2002;33(4):441-467. doi: 10.1177/1046878102238607
8. Mayer RE. Computer Games in Education. Annu Rev Psychol. 2019;70(1):531-549. doi: 10.1146/annurev-psych-010418-102744
9. Zabala-Vargas SA, Ardila-Segovia DA, García-Mora LH, Benito-Crosetti BLD. Aprendizaje Basado en Juegos (GBL) aplicado a la enseñanza de la matemática en educación superior. Una revisión sistemática de literatura. Form Univ. 2020;13(1):13-26. doi: 10.4067/s0718-50062020000100013
10. Morales ME, Cardona-Valencia D, Castañeda-Gómez E, Uribe-Ortiz AM, Ríos-Gallego PA. APLICACIÓN DEL JUEGO SERIO EN PROGRAMAS DE CIENCIAS ECONÓMICAS: TENDENCIAS Y DESAFÍOS. pnrm. 2020;14(27):131-145. doi: 10.15765/pnrm.v14i27.1526
11. Rincón Soto CA, Solano Rodríguez OJ, Lemos de la Cruz JE. El uso de los juegos digitales de simulación en la enseñanza-aprendizaje de la contabilidad. Academia y Virtualidad. 2021;14(1):117-131. doi: 10.18359/ravi.5173
12. Villamar Gavilanes AM, Sánchez Casanova R. Explorando las bases pedagógicas de la gamificación como enfoque metodológico en la enseñanza superior. EDUCA. 2024;33(65):166-188. doi: 10.18800/educacion.202402.e001
13. Laca Olivos Chang LJM, Díaz García MDL, Piscoche Botello CA. Gamificación como estrategia para mejorar la motivación en estudiantes universitarios: Revisión sistemática. revistahorizontes. 2024;8(35):2596-2609. doi: 10.33996/revistahorizontes.v8i35.890
14. Torres-Toukoumidis A, Carrera P, Balcazar I, Balcazar G. Descriptive Study of Motivation in Gamification Experiences from Higher Education: Systematic Review of Scientific Literature. ujer. 2021;9(4):727-733. doi: 10.13189/ujer.2021.090403
15. Medina Escobar D. Ludificación mediada por las TIC para el aprendizaje autónomo de los estudiantes universitarios. REVISTA DE INVESTIGACIÓN. 2023;47(111):66-84. doi: 10.56219/revistadeinvestigacin.v47i111.2629
16. Baethge C, Goldbeck-Wood S, Mertens S. SANRA—a scale for the quality assessment of narrative review articles. Res Integr Peer Rev. 2019;4(1):5. doi: 10.1186/s41073-019-0064-8
17. Pimentel J, Cockcroft A, Andersson N. Impact of game jam learning about cultural safety in Colombian medical education: a randomised controlled trial. BMC Med Educ. 2021;21(1):132. doi: 10.1186/s12909-021-02545-7
18. Pimentel J, López P, Correal C, Cockcroft A, Andersson N. Educational games created by medical students in a cultural safety training game jam: a qualitative descriptive study. BMC Med Educ. 2022;22(1):805. doi: 10.1186/s12909-022-03875-w
19. Guerra Zamora P, Grau Cárdenas V, Balmaceda CS, Galdames Riquelme A. Análisis de las interacciones entre estudiantes de pedagogía durante un juego serio. RevPsicología. 2018;27(1):1. doi: 10.5354/0719-0581.2018.50750
20. Solarte HA, Tobar HF, Mesa JH, Trefftz H, Osorio DM. Changing perceptions about entrepreneurship and industry-related aspects and fostering innovation skills using a video game. Interactive Technology and Smart Education. 2021;18(1):104-118. doi: 10.1108/itse-10-2020-0220
21. Arias-Calderón M, Castro J, Gayol S. Serious Games as a Method for Enhancing Learning Engagement: Student Perception on Online Higher Education During COVID-19. Front Psychol. 2022;13:889975. doi: 10.3389/fpsyg.2022.889975
22. Real Ramos YA, Guillermo Yunda J. Aprendizaje basado en el juego aplicado a la enseñanza de la historia de la arquitectura prehispánica. est. 2021;10(19):67-75. doi: 10.18537/est.v010.n019.a06
23. Sánchez Almanza L. Neuroeducación y videojuegos en la educación superior. merito. 2023;5(14):33-48. doi: 10.33996/merito.v5i14.1121
24. Rojas Bello R, Martínez Cruz F, De Jesús González T. Estilos de aprendizaje y videojuegos educativos como refuerzo en el aprendizaje de Metodología de la Investigación en estudiantes de pedagogía. Collectivus. 2024;11(1). doi: 10.15648/collectivus.vol11num1.2024.3956
25. Echavarría Echavarría P, Leigh González C. Estrategias de gamificación para el aprendizaje en una carrera de formación artística en educación superior. RIIED. 2023;(7). doi: 10.58663/riied.vi7.86
26. Marlés-Betancourt C, Hermosa-Guzmán D, Correa-Cruz L. Fomento de la conciencia hídrica en estudiantes universitarios mediante un juego como estrategia didáctica. rev investig desarro innov. 2021;11(2):361-372. doi: 10.19053/20278306.v11.n2.2021.12655
27. Álvarez Sepúlveda H. Promoviendo aprendizajes significativos en la enseñanza universitaria de la Historia a través de un juego de roles. Estud pedagóg. 2020;46(2):97-121. doi: 10.4067/s0718-07052020000200097

28. Suárez-Cretton X, Castro-Méndez N, Muñoz-Vilches CG. Uso de juego de roles con grabación de video para el desarrollo de la competencia de entrevistar en estudiantes de psicología. Rev Electr Educare. 2020;24(2):1-18. doi: 10.15359/ree.24-2.2
29. Pérez Angulo JA, Castro Rosales JA. JUSECA: UN JUEGO SERIO PARA LA COMPRENSIÓN DE ALGORITMOS. IJTEI. 2022;8(1):5-16. doi: 10.24310/innoeduca.2022.v8i1.8465
30. Carrazco Delgado MO, Mendoza Pérez MA, Juárez Landín C, García Ibarra JRS. Videojuegos educativos como herramienta didáctica y su implementación en la enseñanza-aprendizaje del derecho. Ciencia Latina. 2024;8(5):7770-7787. doi: 10.37811/cl_rcm.v8i5.14193
31. Moreno J, Álvarez JA. Videojuego móvil como estrategia didáctica para facilitar la adaptación a la vida universitaria. Form Univ. 2020;13(1):55-62. doi: 10.4067/s0718-50062020000100055
32. Carpio Lozada B. Desarrollo de la atención selectiva a través del juego en estudiantes de educación superior. Comuni@cción. 2020;11(2):131-141. doi: 10.33595/2226-1478.11.2.425
33. Vélez-Zamora LA, Jadán-Guerrero JL, Cisneros-Quintanilla PF. Escape room para el aprendizaje de biología celular en la carrera de bioquímica y farmacia. EK. 2022;5(1):903. doi: 10.35381/e.k.v5i1.1980
34. Clerici C, Eckerdt MC, Naef EF. Leer para ganar: el juego como dispositivo didáctico en la educación superior. Diálogos Pedag. 2021;19(37):1-13. doi: 10.22529/dp.2021.19(37)01
35. Nieves Chávez MA, Pérez Castillo P. Del gozo a la competencia. El juego en las y los universitarios. Emergentes. 2024;4(3):550-565. doi: 10.60112/erc.v4.i3.236
36. Ramírez Tarazona JV. Las emociones, el juego y la educación universitaria / Emotions, play and high education. Tercio Creciente. 2016. doi: 10.17561/rtc.n10.6
37. Ormazábal Valladares V, Hernández Montes L, Zúñiga Arbalti F. El juego como herramienta de aprendizaje en educación superior. REDIE. 2023;25:1-11. doi: 10.24320/redie.2023.25.e28.4952
38. Cabrera-Solano P. Game-Based Learning in Higher Education: The Pedagogical Effect of Genially Games in English as a Foreign Language Instruction. INT J EDUC METHODOL. 2022;8(4):719-729. doi: 10.12973/ijem.8.4.719
39. Urcid Puga R. Game-based Learning. A tool that enhances the collaborative work. Case study: undergraduate students. ECGBL. 2022;16(1):570-577. doi: 10.34190/ecgbl.16.1.419
40. Ormazábal Valladares V, Almuna Salgado F, Hernández Montes L, Zúñiga Arbalti F. Juego de roles como método de enseñanza de Farmacología para estudiantes de la carrera de enfermería. Educación Médica. 2019;20(4):206-212. doi: 10.1016/j.edumed.2018.07.001
41. Palomeque-Forero L. El juego de rol: aportes de la educación universitaria a la cultura de la paz. Revista Mutis. 2016;6(1):64. doi: 10.21789/22561498.1113
42. Martínez Villalobos G, Ríos Herrera JF. Gamificación como estrategia de aprendizaje en la formación de estudiantes de Ingeniería. Estud pedagóg. 2019;45(3):115-125. doi: 10.4067/s0718-07052019000300115
43. Garcia-Pinilla JI, Rodríguez Jiménez OR. Una guía para el desarrollo de un videojuego educativo en educación superior. Cult Edu Soc. 2020;11(2):73-86. doi: 10.17981/culteduSoc.11.2.2020.05
44. Saquisili-Suquitana SP, Erazo-Álvarez CA. Escape Room como estratégica didáctica para la enseñanza de Cariología. EK. 2022;5(1):702. doi: 10.35381/e.k.v5i1.1921
45. Palta-Valladares NI, Sotaminga-Cinilin MJ, Mena-Clerque SE. Escape room como estrategia didáctica para el desarrollo del pensamiento crítico. Koinonia. 2022;7(2):491. doi: 10.35381/r.k.v7i2.1968
46. Bula-Bula TC, Pacheco Osorio LC, Ramos Villadiego ZI. Diseño de juegos: estrategia didáctica para el aprendizaje autónomo en los estudiantes de primer semestre de Contaduría. Lúdica pedagog. 2023;1(37):55-66. doi: 10.17227/ludica.num37-17969
47. Vélez OA, Palacio López SM, Hernández Fernández YL, Ortiz Rendón PA, Gaviria Martínez LF. Aprendizaje basado en juegos formativos: caso Universidad en Colombia. REDIE. 2019;21:1-10. doi: 10.24320/redie.2019.21.e12.2024
48. Stolzenbach Ramírez R, Domic Siede M, Adaos Orrego R. Impacto del juego serio digital para preparar a estudiantes universitarios de ingeniería para la entrevista de selección laboral. TD. 2024;5(10):e385. doi: 10.56162/transdigital385
49. Agudelo-Londoño S, Gorbanev I, Delgadillo V, Muñoz Ó, Cortes A, González RA, et al. Development and Evaluation of a Serious Game for Teaching ICD-10 Diagnosis Coding to Medical Students. Games for Health Journal. 2019;8(5):349-356. doi: 10.1089/g4h.2018.0101
50. Verdezoto A, Panchi LA. Análisis microeconométrico de la aplicación de juegos pedagógicos. CUESTIONES ECONOMICAS. 2021;31(Volumen 31). doi: 10.47550/rce/31.1.5
51. Araya-Pizarro S. Preferencias y actitud discente hacia los juegos de mesa. Análisis multivariante. PE. 2021;14(1):73-93. doi: 10.22235/pe.v14i1.2433
52. Santana-Mancilla P, Rodríguez-Ortiz M, Gaytán-Lugo L, Garcia-Ruiz M. User Experience Evaluation to El Encanto: a Serious Game for Learning Community Intervention. RCS. 2015;108(1):81-88. doi: 10.13053/rcs-108-1-9
53. Santana-Mancilla PC, Rodriguez-Ortiz MA, Garcia-Ruiz MA, Gaytan-Lugo LS, Fajardo-Flores SB, Contreras-Castillo J. Teaching HCI Skills in Higher Education through Game Design: A Study of Students' Perceptions. Informatics. 2019;6(2):22. doi: 10.3390/informatics6020022
54. Rodríguez Carranza YV. Diseño de Serious Game para la enseñanza de la Responsabilidad Social en la Educación Superior. Docencia univ. 2018:156-175. doi: 10.19083/ridu.12.719
55. Gómez Robles LA. Aplicación de juegos como estrategia didáctica y su influencia en el aprendizaje de probabilidades. rev peru investig innov educ. 2022;2(3):e23660. doi: 10.15381/rpiiedu.v2i3.23660
56. García López E. Una gamificación para la mejora de la motivación en el aprendizaje de los estudiantes universitarios: el uso didáctico del modelo RAMP. epsir. 2024;9:1-18. doi: 10.31637/epsir-2024-943

57. Fonseca I, Caviedes M, Chantré J, Bernate J. Gamification and Game-Based Learning as Cooperative Learning Tools: A Systematic Review. Int J Emerg Technol Learn. 2023;18(21):4-23. doi: 10.3991/ijet.v18i21.40035
58. Sandí Delgado JC, Bazán PA. Diseño de juegos serios: Análisis de metodologías. e-Ciencias de la Información. 2021. doi: 10.15517/eci.v11i2.45505

FUNDING

No financing

CONFLICT OF INTEREST

None

AUTHORSHIP CONTRIBUTIONS

Drafting – original draft: Francis Feldick.
Writing–review and editing: Francis Feldick.