Playing at the School Table: Systematic Literature Review of Board, Tabletop, and other Analogue Game-Based Learning Approaches

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Abstract

The unique characteristics of games have led scientific research to increasingly focus on their potential role in learning processes. Currently, their effectiveness in fostering experiential learning and skill acquisition in several areas is already supported by the existing evidence, mainly about the potential of digital games. Paradoxically, the current post-digital era seems to have led to a growing popularity of analogue games. The present Systematic Literature Review aimed to map the existing literature on the potential of board, tabletop, or other analogue games in learning processes. It intended to systematize the contemporary state of the art (2012-2022) around the pedagogical role of these games, their effectiveness, the promoted learning outcomes, the methodological aspects of the interventions, the used games – including mechanics and other characteristics – and the current discussions around inclusion and accessibility in analogue game-based learning. Adopting the PRISMA methodology, we searched ACM Digital Library, EBSCO, ERIC, Scopus - Elsevier, and Web of Science databases, as well as other peer-reviewed "grey literature" sources. The search resulted in an initial sample of 2741 articles that was then screened by inclusion and exclusion criteria previously defined according to the research objectives. We obtained a final sample of 45 articles. To formulate the mapping of existing research, these studies were analyzed using a combination of statistical, content, and critical analysis procedures. The obtained results support the role of board, tabletop, and other analogue games in educational contexts – based on their educational potential – with a broad range of knowledge, cognitive, and psychological outcomes. The study also emphasized the relevance of these games in the promotion of soft skills and other aspects typically associated with meaningful learning, such as engagement, satisfaction, flexibility, and freedom of experimentation.However, important limitations were found in a fair amount of the pedagogical

approaches studied, which can be mostly attributed to the low prevalence of modern board games that relate what is intended to be learned to aspects of game design and have little to no consideration of accessibility and inclusion aspects in these studies.

1 Introduction

Digitalization has globally dominated most of the northern countries/continents, and large efforts are being undertaken for the southern countries/continents to follow the same path (Reis et al., 2020). Arguably, digitalization is considered synonymous to modernization, development, and high standards for production, culture, and well-being (Kwilinski et al., 2020). Despite global trends, consequences of digitalization seem to be occurring. In fact, although they might be labelled as obsolete still, according to modern technological standards, analogue technologies seem to be popular. Are people suffering from over-digitalization? Are we living in a post-digital age (Cramer, 2015)? Effects of the reactions against digitalization were identified prior to the COVID-19 pandemic that eventually forced millions to go digital.

Aligned with this trend of reactions to over-digitization, board games, tabletop games, card games, and many other analogue games are as popular as ever (Konieczny, 2019; Booth, 2021), especially due to new types of games like modern tabletop and board games (Arnaudo, 2018; Rogerson and Gibbs, 2018; Woods, 2012).

These factors lead us to question what analogies this medium has with the mechanisms inherent in human learning, and what its' potential for innovation in the educational field is.

1.1 Games and Learning

Playing and learning are almost interchangeable concepts and one of the most studied relationships since the early days of developmental psychology, by authors such as Jean Piaget or Lev Vygotsky. Playful activities have been studied as pillars for healthy minds in all ages, considering their ability to allow experimentation, often at a higher level of complexity than the "real world". Thus, as scientific research has advanced, there has been an understanding of the potential of play to capitalize on brain plasticity to enhance human development (Hodent, 2021).

Games are one of the many playful activities humans can perform and, in this case, endowed with very specific characteristics. This includes interactivity, goal orientation (Costikyan, 2002), motivation through failure, or immediate feedback (Boyle et al., 2016). According to Errity et al. (2016), when a person plays a game, three types of consequences occur: (a) psychological gratifications; (b) altered states of consciousness – based on phenomena such as presence (Lombard and Ditton, 1997), immersion (Slater, 1999), and flow (Csikszentmihalyi, 1990); or (c) learning processes and enhanced adaptive skills.

Game-based learning (GBL) can be defined as using games to facilitate a learning experience. GBL takes the social experience of playing a game to a learning environment, allowing educators to use game mechanics for promoting specific activities to attain defined learning outcomes (Plass et al., 2015). Research has been able to support the potential of digital games to foster consistent learning gains in a broad range of areas of implementation, and as transversal approaches, effective in educational settings (Sousa and Costa, 2018).

So, we can say that the state of the art is already cohesive enough to support the potential of games in learning processes (Abdul Jabbar and Felicia, 2015; Arnab et al., 2014; Qian and Clark, 2016),

although the supremacy of digital games is also an aspect to be considered (Naik, 2014) and tackled. The present Systematic Literature Review (SLR) aims to map the existing literature on the potential of board, tabletop, or other analogue games in learning processes through the operationalization of the following specific objectives:

- To explore the effectiveness of analogue GBL;
- To analyze the adopted research designs and other methodological aspects of the existing approaches to analogue GBL;
- To explore the main outcomes of analogue GBL, including learning outcomes, psychological, and cognitive outcomes;
- To explore the used games and mechanics;
- To explore how research in the field of analogue GBL has been operationalizing inclusion and accessibility measures.

2 Method

2.1 Eligibility Criteria

The search strategy of the present SLR was developed considering the PRISMA 2020 statement guidelines for the reporting of systematic reviews (Page et al., 2021). Considering the research objectives described above, inclusion and exclusion criteria were formulated to support the selection process of the scientific articles. These criteria also considered the increased quality of systematic reviews that are based only on the most recent evidence (Schlosser, 2007).

The present SLR includes peer-reviewed empirical research published between 2012 and 2022, that approaches the potential of analogue games for learning purposes. It is important to clarify that "analogue games" are used in this SLR as a broad notion that can contain categories such as "board games", "tabletop games", "card games", "dice games", or any other that does not imply the usage of digital technologies. Consequently, all secondary studies – e.g. other literature reviews or meta-analyses – were excluded from the sample, as well as theoretical or position papers. Studies approaching the learning potential of digital, or hybrid games were also excluded.

2.2 Information Sources

The systematic search was conducted in the scientific databases defined by the research team. This included ACM Digital Library, EBSCO, ERIC, Scopus - Elsevier, and Web of Science. Considering the nature of the study, and the potential of evidence emerging from other sources besides the exclusively academic ones, ResearchGate was also included as an information source and data was also requested from networks of academics in the field of GBL. This intended to broaden the scope of the review while providing a more comprehensive notion of the available evidence (Mahood et al., 2013).

2.3 Search Strategy

In terms of the search strategy, the search equation was composed as follows: (analog OR analogue OR board OR card OR dice OR tabletop) AND (game OR gaming OR games) AND (learning OR education). Subsequently, some filters were applied, according to the possibilities offered by each database, namely: "peer-reviewed research only"; "English only" or "search in abstract and title". The time interval for the publications was also applied, in this case between 2012 and 2022. The systematic searches were conducted on September 11, 2022.

2.4 Selection Process

The selection process throughout the final sample is represented in the flowchart in Figure 1.

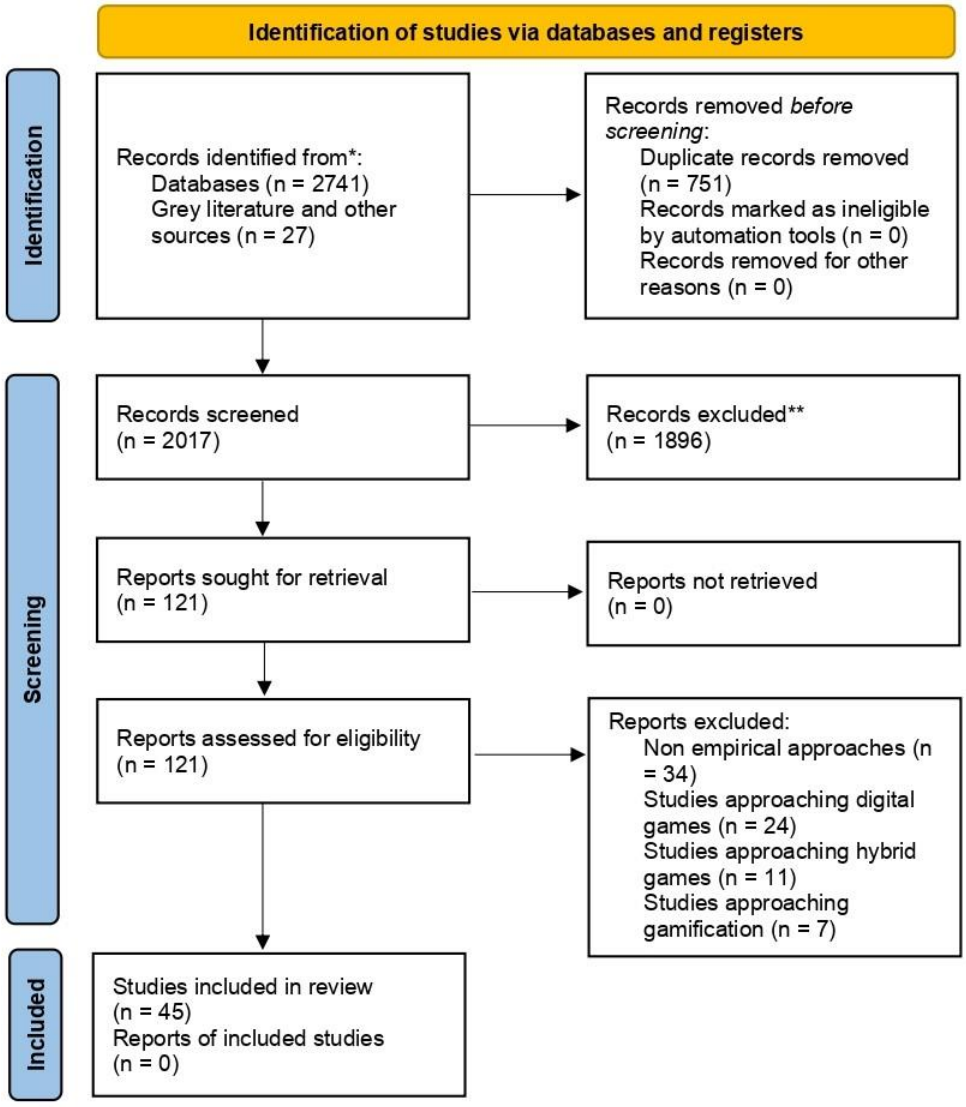

Figure 1. PRISMA (Page et al., 2021) flowchart of the selection process.

The identification phase was developed by applying the search strategy to the information sources and retrieving the obtained data. The screening phase was developed by applying the inclusion and exclusion criteria to the initial sample of studies (N = 2017), only by reading title and abstract. The eligibility phase was developed by applying the same procedure but by thoroughly analyzing the full paper of each study in that stage of the sample (N = 121). Through this procedure, the final sample of 45 studies was reached, as represented in Table 1.

Table 1. Final sample of studies and citations (N = 45)

Study	In-text citation	Study	In-text citation	Study	In-text citation

1	(Wangenheim et al., 2012)	16	(Armstrong, 2020)	31	(Vasconcelos and Seingyai, 2021)
2	(Denning et al., 2013)	17	(Casey et al., 2020)	32	(Vázquez-Vílchez et al., 2021)
3	(Liu and Chen, 2013)	18	(Hart et al., 2020)	33	(Bressler et al., 2022)
4	(Paris and Yussof, 2013)	19	(Martindale and Weiss, 2020)	34	(Chang et al., 2022a)
5	(Kobzeva, 2015)	20	(Severengiz et al., 2020)	35	(Chang et al., 2022b)
6	(Gilliam et al., 2016)	21	(Bernardo and González, 2021)	36	(Mavroudi et al., 2022)
7	(Sardone and Devlin-Scherer, 2016)	22	(Ezezika et al., 2021)	37	(Niedderer et al., 2022)
8	(Carreira et al., 2017)	23	(Ghiga et al., 2021)	38	(Veldthuis et al., 2022)
9	(Chappin et al., 2017)	24	(Hsu et al., 2021)	39	(Sousa, 2020a)
10	(Azizan et al., 2018)	25	(Kurisu et al., 2021)	40	(Sousa, 2020b)
11	(Despeisse, 2018)	26	(Lew and Saville, 2021)	41	(Sousa, 2020c)
12	(Giles et al., 2019)	27	(Mildenhall et al., 2021)	42	(Rosa et al.,2021a)
13	(Lavender et al., 2019)	28	(Minato et al., 2021)	43	(Rosa et al.,2021b)
14	(Luchi et al., 2019)	29	(Parrondo et al., 2021)	44	(Sousa et al., 2022)

15	(Sarinho, 2019)	30	(Rahimi and Kim, 2021)	45	(Vasconcelos et al., 2022)

2.5 Analysis and Synthesis of Results

To analyze the obtained sample of studies (N = 45), their information was coded, considering the most relevant categories to the research aims defined above. This included: subject area of the publication; sample size and characteristics; main goal; aimed learning, cognitive, and psychological outcomes; used games and mechanics; research design; assessment procedures; inclusion and accessibility features; and effectiveness in the learning process. Board Game Geek (BGG) database and Scimago Journal & Country Rank were adopted as additional sources to support the coding of game mechanics and subject area of the publication, respectively. After coding the 45 papers for each specific category, data was analyzed through descriptive statistical analysis procedures, supported by Statistical Package for the Social Sciences (SPSS), version 26. Risk of bias was addressed through a two-coders system, with a junior researcher and senior research coding similar materials.

Due to their nature, the results categories "Impact and Effectiveness" and "Inclusion and Accessibility" were summarized through critical analysis.

3 Results

3.1 Publication Characteristics

To draw a general panorama of research in the area in terms of its chronological dimension and scientific domains, the years and areas of publication of the respective journals were analyzed, as shown in Figure 2.

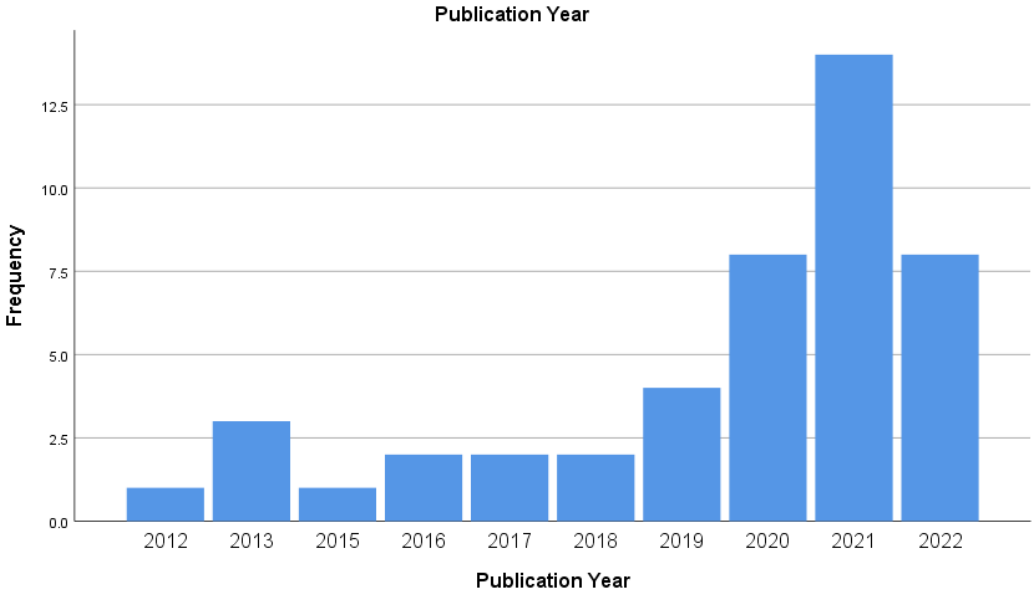

Figure 2. Publication year of the studies in the sample (N = 45)

This data shows that 2021 was the year with a higher number of published studies in the sample (*N* = 14; 31.10%), followed by 2020 and 2022, with 8 studies (17.80%) each. The years of 2012 and 2015 were the years with less scientific production in the sample (*N* = 1; 2.20%), apart from 2014, which, of this range, was the year that did not record any publication in the sample. It is important to highlight that the systematic database search was performed in September 2022, which may leave out some publications made in this interval.

Regarding the scientific domains of each publication, two levels of analysis were adopted. First, each article was classified according to the main scientific area of the journal in which it was published. Second, the articles whose journals had a quartile (*N* = 34) were classified considering the category/sub-area of its highest quartile, enabling a greater level of detail in the analysis. Both procedures were conducted in December 2022, according to the Scimago Journal & Country Rank data.

In the first level of analysis, a total of 10 scientific areas was coded, with the following results: social sciences (*N* = 23; 51.10%); computer sciences (*N* = 8; 17.80%); business, management and accounting (*N* = 3; 6.70); engineering (*N* = 3; 6.70); environmental science (*N* = 2; 4.40%); nursing (*N* = 2; 4.40%); biochemistry, genetics and molecular biology (*N* = 1; 2.20%); chemical engineering (N = 1; 2.20%); medicine (*N* = 1; 2.20%); and Psychology (*N* = 1; 2.20%). In the second level of analysis, a total of 17 categories or sub-areas were coded, according to the quartiles, resulting in the data presented in Table 2.

Table 2. Categories/sub-areas of the journals, according to higher quartile (*N* = 34)

Category/Sub-area of the higher quartile	***N***	**%**
Education	10	29.40
Social Science (miscellaneous)	7	20.60
Communication	2	5.90
Computer Science (miscellaneous)	2	5.90
Computer Science Applications	1	2.90
Computer Networks and Communications	1	2.90
Pediatrics, Perinatology and Child Health	1	2.90
Renewable Energy, Sustainability and the Environment	1	2.90
Chemical Engineering (miscellaneous)	1	2.90
Library and Information Sciences	1	2.90
Maternity and Midwifery	1	2.90
Developmental and Educational Psychology	1	2.90
Artificial Intelligence	1	2.90

Molecular Medicine	1	2.90
Safety, Risk, Reliability and Quality	1	2.90
Human-Computer Interaction	1	2.90
Issues, Ethics and Legal Aspects	1	2.90
Total	34	100.00

It is possible to highlight education in these sub-areas (*N* = 10; 29.40%), followed by the general or multidisciplinary areas of the social sciences (*N* = 7; 20.60). In the remaining data, it is possible to verify quite dispersion, highlighting that only communication and general fields of computer science present more than one study (5.90%).

3.2 Study Participants

The present SLR had a total sample size of 3550 subjects, with each article's sample ranging from six to 760 participants (*M* = 80.68; *SD* = 143.88). Subsequently, studies were categorized considering their sample of participants, to understand the most widely covered players in the analogue game-based learning field, as shown in Table 3.

Table 3. Approached sample of each study (*N* = 45)

Approached sample	***N***	**%**
Higher Education Students	24	53.30
Elementary Education Students	5	11.10
Secondary School Students	4	8.90
General population (anyone or not specified)	3	6.70
Teachers and/or Lecturers	2	4.40
Mixed (higher education students and lecturers)	2	4.40
Mixed (higher education students and qualified professionals)	2	4.40
Mixed (higher education and secondary students)	1	2.20
People with dementia	1	2.20
People working in business	1	2.20
Total	45	100.0

When observing the data, it is possible to highlight that most studies adopt as sample higher education students (*N* = 24; 53.30%). This result becomes even more significant if we consider

samples that combine students in higher education with other population groups - lecturers, qualified professionals, and secondary students - in which case it becomes 64.44% (N = 29) of all studies.

3.3 Games and Learning

According to the content analysis methodology defined above, three possible types of outcomes of the game-based approaches described in the articles were specified: (a) learning; (b) cognitive; and (c) psychological. While recognizing the clear intersection between these outcomes, this methodological decision was intended to ensure a better understanding of the practical possibilities of these pedagogical strategies.

For each article, the main learning outcome was coded, considering the information provided by the authors. Then, up to two additional outcomes were coded if they were explicitly mentioned or described in the article. The same process was carried out for cognitive and psychological outcomes. The result of the total number of coded learning outcomes is shown in Table 4.

Table 4. Total coded learning outcomes (N = 62)

Learning outcome	***N***	**%**
Collaboration	10	16.14
Communication	9	14.52
Science	8	12.90
Sustainability	8	12.90
Computer Science	4	6.45
Engineering	3	4.84
Language	3	4.84
Mathematics	2	3.23
STEM	2	3.23
Planning	2	3.23
Sexuality Education	1	1.61
Management	1	1.62
Digital Literacy	1	1.61
Paleontology	1	1.61
Organizational Skills	1	1.61
Finance	1	1.61
21st Century Skills	1	1.61
Critical Thinking	1	1.61
Medicine	1	1.61
Soft Skills (in general)	1	1.61

Storytelling	1	1.61
Total	62	100

As in the data for the scientific areas, also for the learning outcomes we can find significant dispersion, with board games being used to promote a range of different learning experiences. Nevertheless, it is possible to highlight the relevance of the so-called soft skills, particularly communication (*N* = 10; 16.14%) and collaboration (*N* = 9; 14.52%), with one paper (1.61%) also mentioning the promotion of soft skills in general. The interventions targeted to science learning (*N* = 8; 12.90%) and to the promotion of sustainability-driven attitudes (*N* = 8; 12.90%) were also expressive in the total of coded learning outcomes.

Two different types of cognitive outcomes were coded, with a total of four mentions in the sample of articles. The most prevalent was memory (*N* = 3; 75.00%), followed by problem solving (*N* = 1; 25.00%). Psychological outcomes were mentioned in the sample in eight different occasions, and it was possible to obtain the following results in this field: creativity (*N* = 4; 50.00%); empathy (*N* = 2; 25.00%) self-confidence (*N* = 1; 12.50%); well-being (*N* = 1; 12.50%).

Regarding the games adopted in the studies, it is possible to mention that most of them used games that were specifically created for research purposes (*N* = 32; 71.10%), while the remaining 13 (28.90%) used commercial games, which can easily be purchased in shops. The used commercial games included: Telestrations (*N* = 3); Catan (*N* = 2); Dixit (*N* = 2); Codenames (*N* = 1); Control-Alt-Hack (*N* = 1); Dungeons & Dragons (*N* = 1); Just One (*N* = 1); Magic Maze (*N* = 1); Monopoly (*N* = 1); Scrabble (*N* = 1); Spyfall (*N* = 1); Steam (*N* = 1); and Town Center (*N* = 1).

For each game, the main game mechanic was coded, according to the author's descriptions and the Board Game Geek (BGG) database of mechanisms. Then, up to two additional mechanics were coded per game. In the studies that used more than one game, the most mentioned was considered as the main one. However, in the total number of mechanics, all games were considered. Table 5 illustrates the 38 coded mechanics, with a total of 101 mentions.

Table 5. Total coded game mechanics (*N* = 101)

Game mechanic	***N***	**%**
Dice Rolling	13	12.87
Events	11	10.89
Cooperative Game	8	7.92
Team-Based Game	8	7.92
Roll/Spin and Move	6	5.94
Hand Management	5	4.95
Role Playing	4	3.96
Grid movement	3	2.97
Income	3	2.97
Simulation	3	2.97

Communication Limits	3	2.97
Drawing	3	2.97
Square Grid	2	1.98
Auction/Bidding	2	1.98
Memory	2	1.98
Hexagon Grid	2	1.98
Questions and Answers	2	1.98
Pick-up and Deliver	1	0.99
End game bonuses	1	0.99
Semi-Cooperative Game	1	0.99
Action Points	1	0.99
Player Judge	1	0.99
Simultaneous Action Selection	1	0.99
Deduction	1	0.99
Secret Unit Deployment	1	0.99
Pattern Building	1	0.99
Tile Placement	1	0.99
Acting	1	0.99
Area Majority / Influence	1	0.99
Storytelling	1	0.99
Elapsed Real Time Ending	1	0.99
Paper-and-Pencil	1	0.99
Action Selection Restriction	1	0.99
Exchanging	1	0.99
Negotiation	1	0.99
Card Play Conflict Resolution	1	0.99
Pattern Recognition	1	0.99
Variable Player Powers	1	0.99
Total	101	100

Dice rolling was the most common mechanic in the used games (N = 13; 12.87), followed by events (N = 11; 10.89), i.e., actions that happen outside of the player's control causing immediate effect on the gameplay. Cooperative game and team-based game were also prevalent mechanics, with eight games each (7.92%).

Thereafter, crosstabulation was used to understand the cross-prevalence between the main mechanics of each game and the study's main learning outcome. Most results were equal to zero or one, except for:

- Three studies aimed at the promotion of sustainability used one or more games with dice rolling as a mechanic;
- Two studies in the field of computer sciences used one or more games with events as a mechanic;
- Two studies aimed at the promotion of scientific knowledge used one or more games with roll/spin and move as a mechanic;
- Two studies aimed at the promotion of sustainability were cooperative games.

A similar procedure was developed for cognitive and psychological outcomes. The specific game mechanics involved in the promotion of these variables are expressed in Table 6.

Table 6. Crosstabulation of cognitive and psychological outcomes with game mechanics

	Memory	Problem solving	Self confidence	Creativity	Empathy	Well-being	Total
Dice rolling	2	0	0	0	0	1	3
Grid movement	0	0	1	0	0	0	1
Hand management	1	0	0	0	0	0	1
Communication limits	0	1	0	0	1	0	2
Role playing	0	0	0	1	0	0	1
Action points	0	0	0	1	0	0	1
Storytelling	0	0	0	1	0	0	1
Drawing	0	0	0	1	0	0	1
Total	3	1	1	4	1	1	11

3.4 Adopted Research Approaches

From the analysis of the methodological approach of each study, it is possible to highlight a predominance of quantitative studies (N = 24; 53.30%) in the field of board games and learning. Nevertheless, it is also possible to highlight a large number of mixed methods studies (N = 18; 40.00%), in which quantitative and qualitative approaches were integrated. The exclusive use of qualitative methods appeared as less expressive in the sample (N = 3; 6.70%).

With regard to the type of evaluation adopted in each research design, namely the moment or moments in which it was implemented, the results are shown in Table 7.

Table 7. Assessment models implemented in each study (N = 45)

Assessment implemented in study	*N*	%
Post intervention	19	42.20
Pre and Post Intervention	7	15.60
Pre and Post Intervention with Performance Assessment	6	13.30
Performance (during intervention)	5	11.10
Performance and Post intervention	4	8.90
Pre and post with control group (experimental)	4	8.90
Total	45	100.00

From these results, it is possible to highlight that most studies (*N* = 19; 42.20%) assessed learning through a post intervention approach, i.e., after playing the game. Studies applying pre and post intervention assessments – i.e., before and after playing the game or games – were also very prevalent. This was done either exclusively (*N* = 7; 15.60%) or integrated with in-game performance assessment (*N* = 6; 13.60%). Moreover, there were also four studies (8.90%) where pre and post assessment was conducted in the context of experimental randomized controlled trials.

3.5 Impact and effectiveness

Most studies in the sample reported analogue GBL as an effective pedagogical tool with an impact on the learning, cognitive, and psychological levels. These include the learning outcomes systematized in Table 4, cognitive outcomes – such as memory and problem solving – and psychological outcomes, such as creativity, empathy, self-confidence, and well-being.

The studies included in the sample also addressed how board games can promote changes in learning processes in other aspects, including how these media tends to promote increased learners' engagement (Bressler et al., 2022; Ezezika et al., 2021; Ghiga et al., 2021; Sousa, 2020a, 2020c; Sousa et al., 2022), satisfaction (Sarinho, 2019; Sousa, 2020a), and overall facilitating the learning process (Bernardo and González, 2021; Sarinho, 2019). According to Gilles et al. (2019, p. 9), board games tend to create learning opportunities that are described as "fun, social, flexible, and inexpensive". This notion might also explain their role in the elimination of barriers identified in the learning process (Despeisse, 2018), as well as in fostering not only knowledge acquisition, but also behavioral change (Chappin et al., 2017).

Furthermore, the possibility to include learners in the building of their own knowledge is also pointed as a pillar of analogue GBL by the different studies (Gilliam et al, 2016; Sousa, 2020b, 2020c; Vasconcelos et al., 2022), which will address such crucial aspects of this premise as freedom of experimentation (Rosa et al., 2021b). More positive attitudes towards the learning process as a whole also seem to result from the use of board games in the educational context (Liu and Chen, 2013; Sardone and Devlin-Scherer, 2016).

Authors like Bartolucci et al. (2019) questioned the possibility of people becoming smarter by playing these games. This is something we should approach carefully considering the effect of several impeding variables, although the results of analogue game usage point to this. To underpin evidence-based interventions in this field,a meta-analysis of the synthetized data is revelant. However, only four studies (Armstrong, 2020; Chang et al., 2022a; Ezezika et al., 2021; Luchi et al., 2019) had adequate methodological characteristics and given their disparities in terms of research design, it was not possible.

3.6 Impact and effectiveness

According to Booth (2021, p. 189), the board game communities tend to be characterized by their "overall friendliness and welcoming nature", aligned with an industry that is mostly willing to receive players' feedback and hear their needs. In the present SLR, it seemed relevant to study how research in the area has followed this premise, by operationalizing principles of inclusion and accessibility. So, even though analogue GBL itself may be linked to a view of simplifying learning and therefore promoting inclusion, we checked how often and how these aspects were mentioned in the studies.

A total of six studies (13.33%) specifically mentioned accessibility or inclusion concerns, approaching either literacy issues (Denning et al., 2013; Hart et al., 2020), specific audiences (Chang et al., 2022b; Niedderer et al., 2022), or inclusive learning in general (Sousa, 2020c; Veldthuis et al., 2022).

Both Denning et al. (2013) and Hart et al. (2020) applied computer security awareness board games, promoting inclusion through a continuous effort to make them accessible to individuals with low digital literacy. Chang et al. (2022b) made their study with blind learners as a main audience, while Niedderer et al. (2022) did the same but with older adults with dementia. In the second study, inclusive principles were also considered a pillar for the game design, since these individuals were considered as co-designers, and dementia was a creative trigger instead of a barrier (Niedderer et al., 2022). Considering the results of Sousa (2020c) and Veldthuis et al. (2022), board games can foster a sense of inclusion in the learning process in general, either because they promote a broad set of soft skills, or because they can support people who do not necessarily have a specific disability or condition – such as someone who is shy or a divergent thinker.

4 Discussion

The present study aimed to systematize the existing literature on the potential of board or other analogue games in learning processes, with the overall results pointing toward the evidence of their relevant role in educational processes. Beyond the quantitative aspects of the knowledge that was acquired, this research corroborates the role of board games in promoting aspects typically associated with meaningful learning, such as engagement, satisfaction, flexibility, or freedom of experimentation.

In a more detailed manner, and regarding the publication year and research landscape of analogue GBL, it should be noted that it seems to accompany the previously approached growing popularity of modern tabletop and board games (Arnaudo, 2018; Rogerson and Gibbs, 2018; Woods, 2012). In the scientific domain, the obtained results seem to align with the diversity previously described for game studies or ludology in general. It is essential to underline that subjects like social sciences/education, computer sciences or a specific field of knowledge might be prioritized depending on the study and

the way the game was framed. Thus, this relationship seems to be ideologically framed, depending on how one analyzes the relationship between game and play (Frasca, 2007).

At a methodological level, the sample of articles collected presents a gap that should be highlighted. Most participants included in the different studies are higher education students, which, although comprehensible for feasibility, raises two types of issues: (a) a lack of representation of voices in research on board games and learning; and (b) some homogeneity in the complexity of the proposed in-game pedagogical objectives. The approaches are characterized by their diversity – although there is a predominance of quantitative approaches, there is a high frequency of mixed approaches. Regarding research design, two main aspects were noted: (a) the existing difficulty in studying the effectiveness of board GBL approaches given the low prevalence of experimental studies with standards that allow the conduction of a meta-analysis; and (b) the expressiveness of post-assessment in the studies, which is in line with the importance of debriefing in GBL.

The present study also corroborates the potential of analogue game-based approaches in learning a multitude of specific content or skills. This aligns with findings from previous studies on the potential of digital games (Sousa and Costa, 2018). However, in the case of analogue games, their potential in promoting soft skills, with a particular focus on communication and collaboration, seems to stand out. It is relevant to emphasize its potential in stimulating psychological and cognitive variables that underlie teaching and learning processes, including creativity, memory, empathy, problem-solving, self-confidence, and well-being.

Regarding the games used, this sample showed that most of the games were created for the project at stake. This dominance might be problematic and says little about the potential of these games considering that their design dimensions are unknown. Using dice-rolling mechanics is not enough to classify the type of game involved. Even when considering the BGG databases, once again the most common game mechanic/mechanism is dice-rolling (Samarasinghe et al., 2021). This feature includes many older games, like the classic role and moves games that have been unaltered since the XIX century from a game design perspective (Woods, 2012). So, the games from the sample might not deliver the same experiences as the most modern analogue ones.

It was notorious that the game approaches from the sample were complemented with other auxiliary activities. This was expected because we are dealing with games developed and played to deliver more than entertainment, cases of GBL, and overall serious games. The most well-known literature in the field of serious games argues that these games have a higher impact when combined with other activities (Wouters et al., 2013) and that they demand facilitation and debriefing to assure that the serious of the objectives of the game are met (Crookall, 2010).

This aspect seems to extend to a certain arbitrariness between game mechanics and learning. In other words, the results of this study emphasize a lack of congruence between game systems and what is intended to be taught, with these contents being much more associated with the game theme than with its mechanisms and dynamics. In this sense, more studies are needed to establish clear parallels between game mechanics and the aspects of learning they are intended to promote. The study developed by Vita-Barrull et al. (2022) – in which some board game mechanics and cognitive processes were mapped – is an example of the kind of results that are intended to be achieved, also in the educational field.

Although the board game community and industry are seen as particularly inclusive (Booth, 2021), inclusion and accessibility appear to be a minor concern of analogue GBL research. Nevertheless,

from the results obtained, the potential in promoting a sense of inclusion in the learning process, which can be provided by board games, is also highlighted.

5 Conclusion

The results obtained in this study support the role of analogue games in educational processes, highlighting this area as increasingly popular in scientific research and widely multidisciplinary. This study also systematized evidence on the potential of these games in promoting different skills and knowledge, with a particular focus on soft skills. In a broader sense, board games seem to have a relevant role in the promotion of several aspects that are transversal to the success of the learning process, both at a psychological and cognitive level.

The sample of articles analyzed allowed us to verify the existence of some particularities and limitations in this area of research. These limitations include some heterogeneity of research designs, which hinders the statistical summarization of effectiveness data, still relevant in the context of policymaking. In addition, the analogue GBL approaches seem to use mainly games produced in research contexts, making it difficult to analyze their game design and hampering their wide dissemination among educational stakeholders. There appear to be limited connections between the learning contents and specific aspects of gameplay such as game mechanics, thus restricting the potential of game design in learning.

Future studies should include non-academic approaches to analogue GBL and its potential social impact, ensuring a broader coverage of the state-of-the-art that bridges the gap between academia and civil society in this area. It will also be crucial to reflect on the potential of games for inclusion and exclusion from the learning process, depending on the degree of representation, diversity, and accessibility that is implemented in each approach.

6 Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

7 Author Contributions

Conceptualization: C.S., S.R. and M.S.; Data curation: C.S. and S.A.; Formal analysis: P.J.T. and C.S.; Funding acquisition: S.R. and C.S.; Investigation: C.S., S.R., M.S. and P.J.T.; Methodology: C.S. and S.R.; Project administration: S.R. and C.S.; Resources: C.S., P.J.T.,C.P. and F.E.; Software: C.S. and S.A.; Supervision: C.S. and S.R.; Validation: C.S. and M.S.; Visualization: C.S. and M.S.; Writing–original draft: C.S., M.S., C.P., S.R. and F.E.; Writing–review and editing: All authors. All authors have read and agreed to the published version of the manuscript.

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10 Data Availability Statement

The datasets generated for this study – based on the gathered literature – can be found on FigShare at https://doi.org/10.6084/m9.figshare.22005305.v1.