

Gamify Away: A Tool in Development for Game-based Learning Ideation

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Abstract: This paper introduces Gamify Away, a tool currently under development designed to support brainstorming sessions for the creation of game-based learning (GBL) experiences. Developed within the context of a doctoral research project, the tool aims to unlock the initial stages of GBL design, enabling participants to produce a concise game concept that can serve as the foundation for subsequent development phases. The results obtained from its experimentation indicate high levels of satisfaction regarding the tool's effectiveness, particularly in terms of defining learning outcomes to be obtained, participant engagement, and its capacity to stimulate idea generation. Participants also expressed strong recommendations for its use in future brainstorming sessions. Although further iterations are still required, Gamify Away is believed to be applicable across various contexts and domains, helping to enhance initial approaches to creating GBL experiences.

Key-Words: - Brainstorming, Divergent thinking, Formal education, Game-based Learning, Ideation process, Knowledge retention

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1 Introduction

Games have always been intrinsically linked to the extension of human activity, whether as a form of play, representation, socialization, competition, or education, amongst other modes of interaction, [1]. In the ancient Eastern Mediterranean, games discovered in archaeological sites have revealed multiple aspects of the culture and the specific historical contexts in which they were embedded, [2]. For instance, in ancient Greece, certain dimensions of games emerged as central components of religious ceremonies and social gatherings, “such as drinking parties (symposia), activities included singing and playing the lyre, competing to compose impromptu verses, and participating in word games and riddles”, as highlighted in [3, p. 294]. Considering the intersection between games and education, even Plato acknowledged that children's play could hold a positive educational dimension, suggesting an early consensus regarding the enduring pedagogical value of games throughout history, [3].

In recent decades, the introduction of games into the context of formal education, amplified by the development of digital games, has fostered significant progress in the field, [4]. This evolution consolidated

into a discipline during the 1990s, motivating the creation of numerous frameworks that examine the emotional mechanisms involved in the player experience, [5]. These interactions within formal education also stimulated research on game elements in other contexts through gamification [6], frequently associated with specific learning objectives in non-formal and/or informal educational environments. According to [4], formal education is inherently associated with the different levels and types of formal instruction (primary, secondary, post-secondary general, and specialized). Conversely, educational processes that lie outside the formal system are referred to as nonformal education and include “worker and training, functional literacy training, on-the-job and in-service training, university extension (extramural), professional refresher courses, and special youth programs”, as exemplified in [4, p. 138].

The adoption of game-based strategies enables the design of differentiated activities that foster greater engagement and, ultimately, enhance the potential for knowledge retention. Nevertheless, multiple factors influence the success or failure of a game-based experience within an educational context. Amongst these are the individual learning capacities and motivations, as

well as cognitive load, [7]. It is essential to acknowledge that “memory’s control and selection processes are not linear and do not always occur similarly for all users. Each person has unique characteristics that make them hold information differently. In case of problems, altered health conditions, or nervous and cognitive disorders that can directly influence memory structures”, [8, p. 190]. Therefore, conducting systematic evaluations is crucial for establishing reliable metrics to measure the effectiveness of such interventions. These evaluations may rely on diverse instruments, including questionnaires, interviews, satisfaction surveys, and observational data, which together provide a more comprehensive understanding of the overall experience.

The development of game-based learning (GBL) experiences arises within formal education as the integration of educational learning theories, curricular design, and digital gameplay to enhance the learning process. Although a conceptual distinction between GBL and gamification has been maintained, the boundaries between the two are often porous, [9]. When both are oriented toward learning outcomes, the differentiation lies primarily in the educational context in which the experience is implemented (formal, non-formal, or informal) and in whether a complete game structure is employed. In this paper, gamification is understood as a broader process associated with user experience design, applicable across multiple domains of life, whereas GBL tends to be confined to the realm of formal education. Nevertheless, both GBL and gamification aim to address challenges, foster participant engagement, and enhance learning by applying game-based principles and strategies, [10].

Taking that into consideration, many existing frameworks can be applied transversally, and the Gamify Away tool exemplifies this potential. It is a group-based game, designed to facilitate ideation and brainstorming for the creation of future game experiences. Conceived from a gamification premise situated within non-formal education, it was initially applied to promote learning about risk management for cultural heritage preservation within a museum context. Nonetheless, this tool is envisioned as adaptable to formal education settings, such as in the development of educational games for engineering and other domains.

Most of the existing frameworks focus primarily on the relationship between game components and user motivation, [11], [12], [13], without directly addressing the preliminary stages of designing a game experience aimed at achieving specific learning objectives. The use of Gamify Away addresses this gap by enabling a

situated and goal-oriented brainstorming process that pursues balanced, collaborative ideas that are grounded in structured methodologies, [14]. Gamify Away organizes the ideation process to enhance both the quantity and quality of the generated ideas, promoting group collaboration in the creative process and encouraging the active, playful participation of all stakeholders, [15].

This paper presents the Gamify Away tool in greater detail, under development as part of a doctoral research project, following the implementation of a gamified museum prototype. Although conceived as one of the project’s final operational contributions, the tool has already been voluntarily experimented with and evaluated by participants from diverse academic backgrounds ($n = 14$), with larger sample studies planned. Preliminary results from a short survey demonstrate its potential effectiveness: 78.6% of participants agreed that using Gamify Away made the brainstorming process more fun and engaging, 57.1% reported that Gamify Away helped to generate good ideas, and 71.4% believed that the outcome could become an engaging and educational game concept.

2 Creativity, Divergent Thinking, and Brainstorming

Creativity is a broad, multidimensional, and complex concept which, according to [16], can be understood both in terms of the inherent abilities of each individual and the characteristics of the products and behaviors that each may manifest. Creative behavior may include activities such as inventing, designing, planning, composing, and projecting. Although almost all individuals possess intrinsic creative abilities, the very concept of creativity is still viewed as a standard form of individual capacity that varies according to the artistic domain of the activity itself (e.g. painter, musician, writer, etc.), [17].

One of the central aspects of creativity is generating new ideas. However, creative ideas are typically and statistically “infrequent, rare, or unexpected”, [18, p. 292]. As clarified in [16], creativity involves divergent thinking, which can be defined as the ability to generate information from any given information, focusing on the variety and quantity of outcomes that can be derived from the same source. In contrast, convergent thinking is defined as the generation of information from any given information, where the input is sufficient to determine a single correct response. So, divergent thinking deals with

the generation of logical possibilities, variety, fluency (closely linked to the number of ideas or responses), originality, appropriateness, and information retrieval.

Historically, several psychologists argued that creativity was essentially associated with a high intelligence quotient (IQ). However, this perspective has proven limited. As observed by [17], the validation of intelligence tests that primarily focus on academic performance relies very little on creative talent. Thus, from an operational point of view, creativity — which can be assessed through divergent thinking processes — differs from intelligence, which is measured based on single, objectively correct responses. Creative performance is generally evaluated through open-ended responses and analyzed by experts according to a degree of originality.

An integral part of any ideation phase is brainstorming, which is developed through multiple iterations in search of more and better ideas aimed at solving a problem. Brainstorming can be defined as a process that encourages divergent thinking and the production of many different ideas in a short period of time, [19], by suspending evaluation mechanisms and allowing ideas to develop freely around a specific theme or context, [20]. However, there are key factors that may influence the success or failure of this activity. For a brainstorming session to be facilitated effectively, as sustained in [19], four fundamental principles should be maintained:

- Critical judgment must be excluded and postponed.
- Free association of ideas must occur. It is important to recognize that, at this stage, it is better to have bold rather than conservative ideas. Bolder ideas will always be easier to refine afterwards;
- Quantity is essential. The greater the number of ideas, the higher the likelihood of producing one that is more innovative and distinctive, given that the generation of new ideas is inherently limited.
- Combination and improvement should be encouraged. Participants should suggest ways to improve others' ideas or combine two or more ideas, in addition to presenting their own.

Group brainstorming can stimulate idea association, [19]. However, numerous authors have tested and challenged this claim over the years, [21], [22], [23], [24], [25], raising critical questions such as production blocking or productivity gap, [21], [22], [23], evaluation apprehension, referring to the concern with others' evaluations that may lead to self-censorship of individual ideas, and free riding, as pointed out in [21], and the tendency of individuals to put in less effort, by relying

on others' contributions, as warned in [24].

Even so, group interaction may prove particularly effective in the phase of combining and refining ideas, if certain conditions are met. The group should consist of no more than 5 to 10 participants, and each session should ideally last between 30 and 40 minutes, after which participants may take a break and continue for a similar period, if necessary, [19]. Subsequently, the group should clarify potential solutions and eliminate redundant ideas.

Another important element in a well-planned brainstorming session is the formulation of a concise problem statement. This statement should not be too broad, because it would only generate vague ideas, nor too specific, as it might restrict idea generation, [26].

In the case of brainstorming for GBL, both problem and context should be defined, along with the intended learning objectives. While this approach may appear to constrain idea generation, redirecting brainstorming towards GBL seems to strengthen creativity in the outcome of the GBL experience. Nevertheless, it is important to consider five assumptions that mark different brainstorming steps, as indicated in [22]: Initial instructions are essential, as they influence idea production.

A specific goal must be shared and established.

Individuals, rather than groups, should generate the first ideas.

Group interaction should then be used to refine and improve these ideas.

The final selection of ideas should be made through individual voting.

Two main actions can be identified along the divergent–convergent continuum. On the one hand, the free generation of ideas is closely linked to divergent thinking; on the other, the discussion and final selection - serving as inspiration for new proposals until the most suitable creative solution is reached - are directly associated with convergent thinking, [15]. Despite the use of initial instructions as a way of ensuring the generation of a larger number of relevant ideas, idea generation is not solely self-motivated but grounded in the human tendency to respond to a challenging and complex initial statement, searching for better solutions, [22].

Each brainstorming session should be regarded as a kind of a game, involving a degree of competition but unfolding into a friendly and relaxed atmosphere, [19]. As underlined in [26], the physical setting of the session may also influence its outcome, as spacious environments with flexible furniture tend to be more

playful and interactive. However, a session can only be considered complete when at least some of the ideas can be effectively put into action.

A final underlying assumption of brainstorming sessions is that group members naturally possess original ideas and creative thoughts about the topics under discussion, and that it is only necessary to create conditions that enable their burst. Yet this is not always the case; participants who remain bound by the logic of “we’ve always done it this way” may develop perceptual blockage that hinders the adoption of new perspectives. When this occurs, a brainstorming session may result in an extensive list of proposals, none of which differ significantly from those previously presented, [26].

3 Gamify Away: a brainstorming tool with potential for unlocking game-based learning activities

3.1 Structure and dynamics

Gamify Away is a tool in development that emerged within the scope of a doctoral project, which identified the need for tools that facilitate the initial brainstorming of GBL or gamified experiences in the field of cultural heritage.

Gamify Away is designed to unlock divergent thinking and enhance collaborative problem-solving in teams of up to five participants, [14]. It is a board game with specific rules and spaces that encourage individual ideation and subsequent selection of promising ideas in pursuit of a common goal or problem, which is defined by the group at the start of the activity. By the end of the session, participants produce a concise and concrete concept of a potential GBL experience, which later can be refined and iterated in follow-up sessions until the most suitable version is reached.

With an average gameplay duration of 35 to 45 minutes, the board (Figure 1) is divided into category spaces (Figure 2) and special spaces (Figure 3), where each player moves across the board using a pawn and a die.

Grounded in a collaborative construction session, the activity begins with participants concisely defining their statement regarding the learning problem they intend to solve, identifying the agreement they reached in terms of context, learning outcomes, and target audience. In this preparatory phase, each participant also personalizes their pawn.

Although the model is based on teamwork, it maintains an individual dimension, as each participant

has their own pawn and generates ideas independently. Time management is ensured throughout the session and between turns using hourglasses.

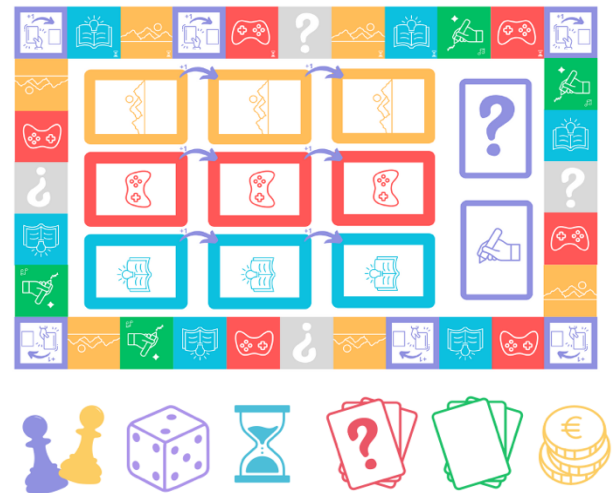


Fig. 1: Gamify Away. Board game and external components that include customizable pawns, die, hourglass, surprise cards, blank cards, plus markers and coins.

Source: created by the authors.



Fig. 2: Gamify Away. Category spaces on the board include learning outcomes, game mechanics and scenarios.

Source: created by the authors.

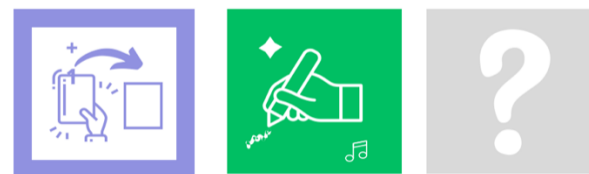


Fig. 3: Gamify Away. Special spaces on the board include move cards, improvement, and surprise cards.

Source: created by the authors.

The game board is organized into three main

categories — learning outcomes, game mechanics, and scenario — around which brainstorming activities are developed, taking into account the previously defined statement (Figure 2). Additionally, special spaces (Figure 3) — move card, card improvement, and surprise card — introduce playful and interactive moments, including read-aloud activities, thereby enhancing participant engagement.

This gamified approach aims to record, explore, and iterate on ideas within each category using blank cards and markers, allowing participants to select the most relevant proposals at the end. Progression on the board is determined by rolling a die, and for each interaction completed within the time limit, participants receive a coin as a reward.

The game is structured into three progressive tiers, corresponding to different stages of idea development (Figure 4). In the first tier, each category must contain at least five distinct ideas. Once this threshold is reached, whenever a participant lands on the “move cards” special space, they must either select the most relevant card within a category or combine two or more cards into a new idea, placing the resulting choice in the second level. In the second tier, the process continues until at least three cards per category are collected; at this point, the game may be formally concluded. The participant with the highest number of coins selects one card from each category, initiating the final iteration phase of the third tier.

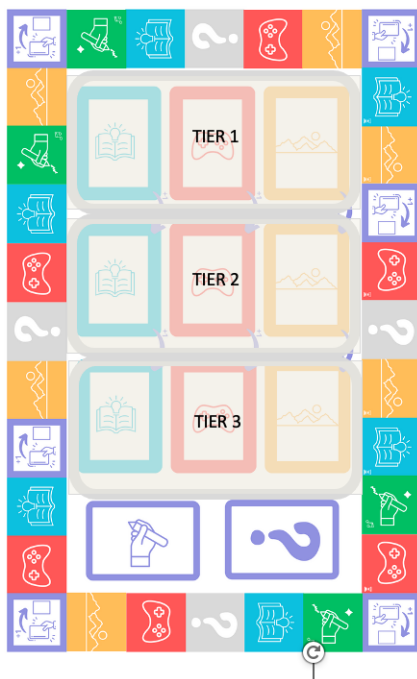


Fig. 4: Gamify Away. Tiers architecture.

Source: created by the authors.

This sequence was designed to foster conceptual articulation across categories, promoting the integration and refinement of ideas and contributing to a more coherent and substantiated creative synthesis. The game ends with a 5-minute time mark for the group to write a game proposal based on the 3 chosen cards (Figure 5).

Gamify Away seeks to simplify a traditionally complex process, offering new methodological perspectives on how and why to begin designing game-based learning activities. By articulating the specific application context with the educational vision of the group, the tool aims to structure, energize, and enhance brainstorming outcomes in heterogeneous teams — including teachers, designers, educators, and mediators — who may subsequently develop, test, and evaluate the effectiveness of the resulting game concept.

Acknowledging the inherent subjectivity of designing GBL and/or gamified experiences, it is believed that this game can serve as a fruitful starting point for idea generation and organization. Furthermore, the tool may encourage teams to identify and involve additional contributors whose expertise aligns with the outlined proposal, spanning areas such as engineering, design, pedagogy, psychology, storytelling, and technical development, particularly in the case of digital experiences. It is assumed that collaboration, iteration, and a willingness to experiment are key ingredients in transforming initial concepts into engaging and impactful GBL experiences.



Fig. 5: Gamify Away. Endgame state.
Source: created by the authors.

In short, Gamify Away was designed based on research on brainstorming dynamics. Drawing on

the five principles outlined by [22], and several of foundational guidelines, [19], the tool incorporates initial rules of play and a dedicated moment for crafting a considered initial statement, aimed at enhancing the team's shared vision. At the beginning of the game, the group is required to reach consensus on three essential aspects: the context of the activity (e.g., civil engineering and curriculum or topic to be applied), one to three learning objectives, and the intended target audience. Although idea generation and selection are carried out individually, the inclusion of special spaces encourages continuous collective refinement.

It is further believed that the game's design inherently facilitates group engagement, creating a relaxed and welcoming atmosphere even amongst participants who are unfamiliar with one another, [19]. The number and type of board spaces requiring participants to write or reformulate ideas were designed to promote fluency, leading to a higher number of possible ideas within a short timeframe. As a game, Gamify Away supports free association without critical judgment, and it is expected that the quantity and diversity of ideas will surpass those of a traditional brainstorming session without a game component. The presence of timed writing moments creates a sense of urgency that encourages spontaneous participation and reduces self-censorship. Finally, the tiered architecture of the tool contributes to the effective combination and improvement of ideas throughout the process.

3.2 Experimentation and participants

Gamify Away has been iteratively developed over the final two years of the doctoral project, as a result of interventions with several participants — namely during two classes within the Master's Program in Museology at the Faculty of Arts and Humanities of the University of Porto, specially oriented to risk management for museum collections, involving students with different scientific backgrounds. The latest interaction took place at the END – International Conference on Education and New Developments (END 2025), [14], where the tool was experimented with in the context of other disciplines, revealing its applicability across various domains. It was perceived as a powerful instrument capable of structuring the brainstorming process in GBL projects, including the field of engineering.

During the last two interactions, participants were voluntarily and anonymously invited to complete a short online questionnaire, disseminated via Quick Response (QR) code through Google Forms. A total of 14 complete

responses were obtained and processed using Google tools, with results presented in percentage terms.

These respondents also presented diverse academic backgrounds across different scientific domains. The majority (71.4%) were between 18 and 30 years old, with 85.7% identifying as female and 14.3% as male.

In terms of academic qualifications, 57.1% held a Master's degree, 35.7% a Bachelor's degree, and 7.1% a PhD.

The questionnaire was structured into three sections. The first part consisted of three multiple-choice questions designed to identify participant characteristics. The second section included 10 simple Likert-scale questions (with values from 1 to 5, with 1 as "Strongly Disagree" and 5 as "Strongly Agree," allowing for a neutral midpoint "Neither Agree nor Disagree") designed to assess the perceived importance and effectiveness of the tool:

1. Gamify Away was easy to understand and use during the session.
2. Using Gamify Away made the brainstorming process more fun and engaging.
3. Gamify Away helped to generate good ideas.
4. The game structure facilitated collaboration amongst participants.
5. The tool was very useful for organizing and improving generated ideas.
6. The tool's instructions were clear and easy to follow.
7. It didn't take me long to learn the rules and game dynamics.
8. The outcome could become an engaging and educational game concept.
9. I would recommend using Gamify Away for other brainstorming sessions.
10. Overall, Gamify Away exceeded the initial expectations.

Finally, the third section consisted of a single open-ended question, intended to gather qualitative input in the form of improvement suggestions and additional comments. All questions, except the final one, were mandatory.

3.3 Results and domains of applicability

The results point to the effectiveness of the proposed tool, with 71.4% of participants fully agreeing that "The outcome could become an engaging and educational game concept", and 78.6% reiterating that "Using Gamify Away made the brainstorming process more fun and engaging", while 71.4% "totally recommend the use of Gamify Away for other brainstorming sessions". Furthermore, 57.1% of respondents believed that

“Overall, Gamify Away exceeded the initial expectations”, and 42.9% fully agreed with this statement.

However, fewer positive aspects were identified, particularly regarding the perception of the game’s initial rules. A total of 42.9% of respondents maintained a neutral position in response to the statement “It didn’t take me long to learn the rules and game dynamics”, which is quite representative. Although the sample was generally satisfied, this result suggests that there may have been some confusion in understanding the rules, which is also reflected in the 50% neutral response to the statement “The tool’s instructions were clear and easy to follow”. Although there were no negative values (1-2), this highlights the need to adjust how the game’s rules are presented and communicated to participants at the onset of the activity. Therefore, based on these results, a further iteration of the tool is deemed necessary to improve this aspect. When comparing the number of respondents who have indicated no agreement values (1-2) and neutral (3) to the respondents who have signalled 4 and 5 (positive), most of the statements show statistically significant differences, with a clear predominance of positive responses. Although some observed cells contained zero counts, all expected frequencies were equal to 7, satisfying the assumptions of the chi-square goodness-of-fit test. Only two items (“Instructions clear” and “Easy to learn rules”) do not show any difference, as they received exactly seven positive and seven neutral responses.

Overall, the results indicate a positive evaluation of Gamify Away. The chi-square goodness-of-fit tests indicated that, for most statements, the distribution of responses differed significantly from a uniform distribution ($p < 0.05$), revealing a statistically significant predominance of positive responses (4 and 5) towards Gamify Away.

Although these findings are based on a limited sample, they already reveal the potential effectiveness of Gamify Away beyond the domain of cultural heritage, the context for which it was originally designed. It is believed that the possible application domains of this tool may be diverse, particularly in the initial sessions of multidisciplinary teams seeking to implement brainstorming activities aimed at integrating any form of GBL or gamified experience, from engineering to the social sciences and humanities, management, and many other areas.

Since the tool distinguishes learning objectives and outcomes, as well as potential game mechanics, context, and experience scenarios, this approach is considered

fundamental for taking the first steps in the creative construction of ideas and in identifying the most and/or least appropriate ones, thereby fostering divergent thinking across the entire team, regardless of their domain.

4 Final considerations

It is important to perceive the digital transition as a point of convergence between various technologies and pedagogical approaches, [10]. In an era mediated by multiple digital devices, it is essential to recognize that the design of GBL experiences is complex and should be grounded in an organized methodology, beginning with the promotion of brainstorming sessions involving the project team as key stakeholders.

In this context, it is believed that Gamify Away can play a relevant role, as it was designed to unlock both individual and collective divergent thinking, fostering the continuous generation of ideas through game mechanisms that encourage active participation and a sense of urgency amongst participants. Ultimately, as assessed by those who experimented with the tool, it became evident that it facilitates the emergence of results that may evolve into engaging educational game concepts, supporting the decision-making process in team-based ideation.

Although the tool still requires further improvement — particularly regarding how the rules are presented, communicated, and explained to participants — the results obtained from different groups demonstrate a clear creative unlocking effect, even amongst individuals who were previously unfamiliar with one another. This process promotes both individual and collective creativity, as well as a more collaborative and enjoyable atmosphere throughout the session.

In summary, the results to date suggest that Gamify Away is a promising resource for developing ideation sessions within the field of game-based learning, contributing to the integration of creative and collaborative methodologies in the design process of GBL experiences. Future work should focus on conducting new iterations of the tool, expanding the sample, and testing it across different disciplinary contexts, in order to validate its effectiveness and further explore its potential as a facilitator of creativity and educational innovation.

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Contribution of individual authors to the creation of a scientific article (ghostwriting policy)

Bárbara Andrez has conducted the research process, namely the design of the tool, data collection, and analysis, and written a draft. Paula Menino Homem has supervised the research process, reviewed the tool content, and prepared and reviewed the draft for publication. Maria Manuela Pinto has supervised the research process and prepared and reviewed the draft for publication.

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Conflict of Interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.

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