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MASTERING MODERN BOARD GAME DESIGN TO BUILD NEW LEARNING EXPERIENCES:
THE MBGTOTEACH FRAMEWORK

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Abstract

Games have proven to be engaging tools for learning. Digital games dominate, but analog games are not obsolete. Modern board games provide new opportunities for teachers. This paper proposes the MBGTOTEACH framework as an introduction and on-going process for teachers to use, adapt, and develop modern board games for learning purposes. This framework aims to help teachers profit from these games to build their game-based approaches. The MBGTOTEACH framework was tested during two sessions with teachers and education researchers. It increased the awareness of the potential of game-based learning and the design characteristics of modern board games. Sessions results show that participants might need a more solid game culture and experiences to recognize how to explore games' potential. Modifying and developing new learning games based on modern board games is not achieved rapidly, although recognizing the games' potential in introducing sessions is achievable.

Keywords: *Board games; Game-based Learning; Game Design; Serious Games*

Introduction

Exploring games as tools for learning is not new. Board games from the XIX century did this deliberatively, with many of them delivering scripted moral contents (Donovan, 2017; Woods, 2012). Contemporary board games changed radically in the last 30 years due to the influence of hobby games (mechanical and narrative evolution) (Sousa & Bernardo, 2019). But can teachers use these modern analog games as teaching tools? Can teachers do this in practice during their classes? Do teachers realize the potential of contemporary board games? Providing some training can help teachers transform these games into practical game-based learning tools or serious games?

Modern Board Games (MBG) can be a fascinating new world of game opportunities to explore. Teachers might be captivated and overwhelmed at the same time. They can be eager to start using MBG, leading to hasty implementations. Teachers must have a solid game culture before dealing with MBG designs. Game design knowledge, and the specific methodologies to explore the games as serious (game-based) tools to achieve purposes, must not be ignored. These requirements can be demanding and even impossible to establish fast game approaches. One way to overcome this is to start playing and exploring the MBG with other hobbyist gamers. Learn from the literature and reflect on the existing games, using them and modding game features to match the learning contents. Finding games that match the curricula and gradually introducing these games can help teachers deal with the challenges of using games in standard formal classes. The MBGTOTEACH framework proposes a method to help teachers use the MBG as learning tools, either by using them directly, adapting existing games, or incentivizing the development of new games that follow the same design characteristics. Dealing with analog games can help teachers or other educational practitioners prototyping and develop other types of games (e.g., videogames, performative games, sports).

The MBGTOTEACH introduces newcomers to MGB and supports users with more game experience. Nevertheless, we should warn that this process might be harder for teachers without considerable motivation to play. Enjoying MBG will help have a solid game culture and know more games. The MBGTOTEACH was tested during two workshop sessions showing that teachers' game experience might bias due to previous board game experiences. Teachers recognized the potential of using the proposed games, but it was clear that additional time to explore more board games and practical applications that address specific contents was necessary.

Section 2 introduces the concept of modern board games (MBG), focusing on their distinctive design features and hobby dimension. Section 3 explores several case studies of MBG usages for teaching and training. It describes two training sessions where teachers learned the basics of MBG designs, played several games, and critically reflected on the possibilities of using these games in their classes. The fourth and last section (4) presents the MBGTOTEACH framework as a guide for teachers that intend to start using MBG designs in their classes. Section 5 presents the conclusions.

1. Game-based approaches and learning

Games are everywhere. Games are part of human history and culture. We are all *Homo Ludens* (Huizinga, 2014) that play for different purposes. Many of us have a *lusory* attitude that motivates us to play games, which is what drives us to play without a specific purpose, just for the excitement to play and the challenge games provide (Suits, 2020). Games are also art and deliver an uncertain effect that fascinates our imagination (Costikyan, 2013), but they can be "serious" work activities (Abt, 1987).

Games provide interactive activities that deliver learning experiences. Game-based approaches have been used as rituals (Huizinga, 2014) and in contemporary formal education systems (Michael & Chen, 2005). We can find many examples of game-based learning (Plass et al., 2015; Prensky, 2003), other game usages beyond learning (Randel et al., 1992; Von Ahn, 2006), and even serious games (Dörner et al., 2016; Winn, 2009).

Digital games dominate the contemporary paradigm. Although some authors avoid stating that these serious games are always digital (Dörner et al., 2016), there is a tendency in the literature to consider games designed for training, simulation, and learning as digital games. But several authors recommend learning, testing, and prototyping analog games first as a process to learn digital game design (Brathwaite & Schreiber, 2009; Fullerton, 2014; Ham, 2015). Analog and digital games are not oppositive. They are different, being complementary tools when used for specific purposes. Yet, the social interaction, the tangibility of the game components and bits, and the easiness to adapt and control the game experiences are all distinctive features of analog games (Xu et al., 2011; Zagal et al., 2006; Zhang et al., 2012). Considering the modern board game renaissance (Booth, 2015; Rogerson & Gibbs, 2018; Sousa & Bernardo, 2019; Woods, 2012) as a trend worth exploring, the range of possibilities and innovation increases substantially. These games can be played directly to achieve some learning goals (Bartolucci et al., 2019), although modding could enhance the learning experience (Castronova & Knowles, 2015; Sousa, 2021b, 2020c, 2020b; Sousa & Dias, 2020). Finding inspiration in these new board and tabletop games designs can help build new serious (learning-based) games when exploring their game mechanisms (Sousa, 2020a; Sousa et al., 2021).

2. Board games that are modern

Board games are a booming hobby. Despite the digital dominance, the analog game industry is far from obsolescence. Only the COVID-19 pandemic affected the tendency for the exponential growth of new MBG releases, doubling the number of new game releases every ten years (Nand, 2021). In 2020 went back to the volume of 2013 (Samarasinghe et al., 2021).

There are several possible reasons for the growth of the MBG hobby. MBG provide unique tangible and social game experiences (Booth, 2021; Kosa & Spronck, 2019; Rogerson et al., 2016; Sousa & Bernardo, 2019). MBG, on the contrary of mass-market board games, are products that aim to be innovative, especially in their mechanisms and narratives. MBG are products that express the author's creative work. Each author tries to leave their mark and build their reputation as designers that deliver creative and innovative games. Dominant marketing strategies highlight the continuous innovation of the industry

(Sousa & Bernardo, 2019). Regardless of these supposed innovations, new game releases are familiar to hobbyist players. Playing these games and participating in the MBG community forums and events is part of the enjoyment (Rogerson & Gibbs, 2018). Many new games are published by game companies or self-published by designers. Crowdfunding projects are a way to support the financial risk of these projects. MBG are among the most funded products on *Kickstarter* (Werning, 2018).

Another effect that explains the popularity of MBG is the post-digital movement because users value activities that allow them to explore the materiality of culture (Cramer, 2015). MBG gamers' demographics express a population that tends to work and deal daily with digital technologies (Rogerson & Gibbs, 2018; Woods, 2012). So, the MBG gamers do not refuse digital technologies. MBG gamers rely on these communication tools to fuel their hobby community, organizing data and events (Rogerson & Gibbs, 2018) (Fig. 1). Digital communications tools also explore the market effects of buying and selling the games. Many hobbyist players buy their games online and use platforms such as BGG to resell their games. Digital communications tools allowed this parallel market of old games that travel from player to player as a circular economic practice (Booth, 2021). On the other hand, without digital technology, it would be even more complicated to develop and produce the new MBG. The development process of an MBG is supported by different software tools, allowing simulation, balancing the game system, playtesting, high-quality components, and illustrations (Engelstein, 2020)

Hopefully, teachers can use MBG in their teaching activities, increasing available game-based learning tools. From a learning perspective, MBG games have some specific advantages. MBG (like other analog games) demand players to understand the game system and activate it for the game to function (Xu et al., 2011; Zagal et al., 2006). Player agency in an analog game is high. This obligation requires the players to dominate the game mechanisms, and these mechanisms demand specific learning skills related to the teaching objectives of a game applied to a purpose (Sousa & Dias, 2020). There is a direct relationship between learning mechanics and game mechanics or mechanisms (Arnab et al., 2015). For this paper, we will adopt the term mechanisms because it addresses the specific game design elements of MBG (Sousa et al., 2021). Although MBG can have many advantages, they also have some drawbacks. Unlike digital games, analog games require higher teaching skills due to the lack of automatic tutorials (Sato & de Haan, 2016; Sousa & Dias, 2020). This requirement can overburn teachers and make MBG usage slow, demanding more human resources to use in a regular class. But a teacher can profit from the collective learning when some students that understand the game first teach other students.

Fig. 1. Boardgamers of Leiria week public gathering (pre-COVID-19 pandemic). Source: Asteriscos Association

It will not be easy to teach how to use games and develop game-based approaches without playing and understanding how each game system works. MBGs have the advantage of their transparent systems and allow adaptations according to teaching goals (Sousa, 2021a, 2020b, 2020c). Co-design approaches are possible. The debriefing process after playing games can benefit from the easiness to be adapted and the high player agency (Crookall, 2010).

3. Analyzing case studies of MBG usages for teaching

Before proposing the MBGTOTEACH framework, we present some supporting case studies. The MBGTOTEACH framework is a flexible guide proposal inspired by empiric experimentation with MBG in several case studies.

3.1 Modding MBG

Modding games can be defined, in the serious game context, as using existent commercial games and adapting their mechanisms, narratives, rules, and components to achieve specific goals. There are several cases where this approach is applied to traditional and MBG (Abbott, 2018; Castronova & Knowles, 2015). When teachers master game mechanisms, it is easier to produce these adaptations. But it is the playtesting with students that can confirm if the modding exercise reaches the learning objectives.

Sometimes the modding exercise must go beyond simple tweaks. The complexity of the original game might be too much to use in a class due to available time and the need to play several

Fig. 2. Using ***Ikonikus*** (Palau, 2013) in teaching session for physiotherapy students

times and do debriefing (Sousa, 2020c). Games do not need to be perfect simulations. Games can be effective learning tools if they empower the students to reflect on the teaching contents. The debriefing moment fosters learning, where each player's actions and effects on the game state deliver the examples to connect to teaching contents (Sousa & Dias, 2020).

Some MBG can be used directly for teaching. Learning and training can result from the combination of several interconnected games. These minimum modding exercises can train soft skills and generate collaborative and ideation processes for teaching, institutional and corporation usage (Sousa, 2021b, 2020b). Combining several games can be more flexible according to the context of play. Many small and fast games are cheap and do not require complex setup standards nor many rules to understand. Some dice and a deck of cards can build these effects. *Ikonikus* (Palau, 2013), *Dixit* (Roubira, 2008) and *Imagidice!* (Daly, 2000) are examples of

games where storytelling occurs. These creative exercises can adapt to teaching contents or goals (Fig. 2).

MBG modding experimentations can go online. MBG can be played through video streaming and conference tools like *Zoom* or similar software (Sousa, 2021a). Teachers can use game components and mechanisms either analogically or digitally. The hybrid approach can result from using cameras, audio, and chat tools. The interactions can occur using collaborative tools like *Google Drive*, *Microsoft Teams* and similar software. As teachers become more experienced with using these games, they can start developing new game solutions on either platform (analog or digital).

3.2 Developing MBG for purposes

Developing games is not easy. Games must engage users, and different player profiles seek different experiences (Zagalo, 2020). Players may think they do not like to play simply because they never played a game that fitted their profile. A game can trigger different experiences that users can value differently. The same game can deliver unique social, creative, and intellectual challenges to each player (Sousa, 2021b). Another challenge for those who what to explore the serious dimension of games is that games are emergent systems that deliver unpredictable experiences (Costikyan, 2013; Salen & Zimmerman, 2004). This unpredictability demand debriefing to clarify the game objectives when playing to achieve more than fun experiences (Crookall, 2010).

There are several cases in the literature where MBG design inspired the creation of serious games, although scarcer than modding. This phenomenon exposes how MBG designs are still a novelty. We consider that a game, regardless of being a game for purposes, a serious game, or an exercise of a game-based learning process, can relate to MBG design if they incorporate their design elements, like their typical mechanisms (Engelstein & Shalev, 2019). The continuous appearance of new game mechanisms, components, and narratives make MBG distinctive (Sousa et al., 2021). The novelty of the game mechanisms, and their narrative representations, generate unique game systems. We can find games to teach chemistry that assumes to be inspired by eurogames (Triboni & Weber, 2018), which are a kind of MBG (Woods, 2012). But there are other examples. The serious game played over a map that delivered a collaborative planning exercise was inspired by the mechanisms of several collaborative MBG and city building MBG (Sousa, 2020a). *Steam* board game modding simplified the game to explore network building (Sousa, 2020c), which lead to higher simplification in another session (Sousa & Dias, 2020). In a second session, the level of modification and simplification was greater than in the case of using *Steam* to teach about transport systems (Sousa, 2020c). This comparison made clear that the level of complexity should be low when using games that students will play only once. The two case studies revealed that teaching a new game to be played effectively requires reducing game complexity. It demands someone teaching and supporting the gameplay constantly. This mediation also happened in another game about collaborative urban planning. The teacher was always explaining the available actions and their effects on the game state (Sousa, 2020a). Using a digital app could help students with game tracking, bookkeeping, and accountability to lower complexity (Oliveira et al., 2020). Again, profiting from the

advantages of each digital and analog game platform for the same gam experience is a potential to explore.

3.3 Teachers' perceptions about MBG for educational purposes

MBG potential to support teaching and training sessions depends on whether teachers can play themselves and allow students to play the games with proper support. The theoretical approach suggests that playing MBG in classes for learning purposes is possible. There are examples in the literature of the application of these games in teaching activities (Sousa & Bernardo, 2019). But most of these cases are one-time exercises and academic experiences related to specific research projects. There is a lack of practical and ongoing application of MBG in everyday lectures, classes, and training sessions. Teachers usually find it hard to use the games. There is a need to prepare institutions and professionals to profit from new game experiences.

The following case studies resulted from MBG training sessions for teachers. Teachers then reflected on MBG potential and application for teaching. The two experiments followed similar methodological approaches. A pre-test and post-test collected data about the teachers' perceptions before and after the session. These questionnaires gathered answers like "yes" or "no" questions and Likert scales from 1 to 5, following Mayer et al. (2014) approach to evaluate serious game experiences. Each playing session had its debriefing with the participants to improve and amplify the game effects (Crookall, 2010; Wouters et al., 2013).

3.3.1 Face to face session with primary and secondary school teachers

This experiment was conducted by a teacher/facilitator (T/F) that presented an expositive session of 30 minutes about MBG and serious games. T/F introduced the participants to design elements like the associated mechanisms and narrative outcomes. After this, the participants played several games for two hours. The session was one of many workshops and training sessions organized by the *Regional Coordination Agency of the Oeste* (CIM-OESTE) in Portugal during the summer of 2019.

The session was attended by primary and high school teachers (n=15). The facilitator brought games like *Dixit* (Roubira, 2008), *Happy Salmon* (Gruhl & Weir, 2016), *Telestrations* (Användbart Litet Företag, 2009), *Codenames* (Chvátil, 2015) and *Just One* (Roudy & Sautter, 2018). The T/F selected simple games, with an average complexity of 1 (the lowest according to BGG). The games could be played in less than 30 minutes, including the explanation by the T/F. Most were like "party games" (Sousa & Bernardo, 2019), played by six or more players at the same time (Bartolucci et al., 2019), which is a relevant feature to use in classes. The "party game" effect delivered humorous and funny experiences to the players.

The games were slightly modified to achieve the session's goals, following the same modding methodology done by Sousa (2020c, 2020b). The T/F set the words, concepts, and themes explored in each game to be about "teaching" and "environment". The approach allowed the participants to explore the ones they found more relevant. *Dixit* and *Happy Salmon* delivered "ice-breaking" activities for the attendants to meet

each other. *Telestrations* was played without the original cards. Players choose a word to represent what could improve the teaching methods. During *Codenames*, the players picked words related to environmental issues and concepts they would approach in their classes. The selected words from the *Codenames* game were also used to play the *Just One* game. The use of the same words, from game to game, delivered a flow of reflection and continuous learning about the environmental thematic. This interconnected use of different games regarding the same issues can solve knowledge gaps and allow players to explore the same subjects from different perspectives.

Attendants had low game habits. They played, on average, only once per month games, and the least preferred games are digital ones (Table 1). But when asking the attendants if they like to play MBG, despite showing several popular examples like *Catan*, *Carcassonne,* and many others, only one participant knew the games and stated that they enjoyed playing them.

Table 1. Session' attendants preferences per type of game (face-to-face session).

Type of games	Preferences (Likert scale results 1 to 5)	
	Average (Av)	Standard Deviation (SD)
Sports	3.67	0.95
Analog	3.47	1.62
Digital	2.67	1.01

The post-test allowed us to compare some of the effects of the game session, including group reflections during the debriefing. In the pre-test, only three attendants stated to have had a serious game or game-based experience in the past. This value increased to five in the post-test, which might mean that after playing the games and doing the debriefing, it was clear what the serious game and game-based approaches were and meant for the participants. More participants recognized that serious games activities can appear in many forms.

Attendants' perceptions about generic games and MBG as tools to support teaching increased (Table 2). Although the general perception of generic game potentials increased slightly (+.020), the perception of the potentials of MBG as teaching tools increased considerably (+1.07), mainly because it departed from a low initial perception. Only the potential of the MBG dimension has statistical significance.

It is possible to collect data about the effects of the MBG modding methodology during the playable sessions. Attendants considered that the played games achieved the intended initial purposes. The games delivered new teaching methods and ludic ways to explore environmental issues in classes (4.67). These results with a score of 4.67 were near the maximum of 5 according to the used Likert scale. Participants stated that analog games could deliver new experiences, even when compared to digital games. This perception had an average classification of 4.60. Despite these apparent positive effects for MBG, playing habits were not high and digital games were among the least preferred game types. These characteristics of the attendants are prone to bias.

Table 2. Changes in the perception of attendants (face to face session)

Affirmations/statements	Perception Results in Average (Likert scale results 1 to 5)			
	Before	After	Variation	P (T-test)
Can games support teaching as a serious tool?	4.40	4.60	+0.20	0.262
MBG have the potential to be teaching tools?	3.47	4.40	+1.07	0.008

Considering the game complexity, the attendants stated that the games have medium complexity (2.73), which is much lower than the values at BGG (near the minimum of 1).

3.3.2 Online session with teachers and researchers

This experiment was conducted by a T/F that presented an expositive session of two hours about MBG. Design elements like the mechanisms and narratives were approached and framed by game examples. The expositive session included playing games to support the participants' presentations and debating ideas as a group. The session also ended with a debriefing process about the contents and the group work.

Eleven teachers from primary school to universities and academic researchers participated in the second workshop (n=11). The workshop took place during the biannual gathering about games and mobile learning of the *Faculty of Psychology and Sciences of Education of the University of Coimbra* in May 2020. The workshop was adapted to be online since the COVID-19 pandemic led to a lockdown in Portugal at that time.

The game habits of the attendants are medium-high because, on average, they play between one to two times per week. The attendants had some knowledge about MBG because they all knew what these games were. Nine attendants stated they liked to play them a lot, one enjoyed playing them, and another stated that playing these games was a source of enjoyment.

The attendants' game preferences reveal a higher tendency for analog and digital games, with a similar value. Sports is much lower, near the medium score (Table 3).

Table 3. Session' attendents preferences per type of game (online session).

Type of games	Preferences (Likert scale results 1 to 5)	
	Average (Av)	Standard Deviation (SD)
Sports	2.73	1.13
Analog	4.09	0.81
Digital	4.03	1.11

As with the first session experience, the post-test allowed us to gather data about the effect and results of the session. We can say that the session attendants had no doubts about their

Table 4. Changes in the perception of attendants (online session)

Affirmations/statements	Perception Results in Average (Likert scale results 1 to 5)			
	Before	After	Variation	P (T-test)
Can games support teaching as a serious tool?	4.74	4.74	0.00	-
MBG have the potential to be teaching tools?	4.09	4.74	+0.69	3.508x10-6

previous experiences with serious games. The same eight attendants stated they had that experience in the pre-test and post-test.

The perception of the potential to use games as teaching tools stayed the same before and after the session (4.74). Although this value did not change, it is a very high value, near the maximum of 5 from the adopted Likert scale. What changed was the perception of the potential of using MBG as teaching and training tools (Table 4). This perception increased by +0.69 (statistically significant), reaching the same level of perception from attendants to the potential of generic games as teaching tools.

The post-test highlighted the perception that analog games could deliver new experiences when compared to digital games (an average classification of 3.83).

3.3.3 Comparing the two experiences

Comparing the two experiences with different attendants can provide some meaningful insight into the use of MBG for teaching and training purposes. Despite being attended mainly by teachers, the two sessions revealed two different publics. The participants of the face-to-face session (FTF) had low game habits, playing games on average only once per month. The attendants of the online session had much higher player habits, playing on average once or twice a week in some game types. The knowledge about MBG in the TFT session was minimum because only one attendant knew and played these games. In the online session, it was the opposite. All the attendants stated they knew MBG. In this online session, all participants seemed to enjoy playing MBG. Only one person stated that it could play MBG if in the mood for it. All the others consider it always a pleasure to play these games.

The two experiences revealed the impact of exploring MBG. The lack of game experience and habits confused the FTF participants. FTF participants had doubts about what game-based and serious games sessions. Some could not say if they already participated in game-based and serious game approaches. These FTF attendants had low preferences for digital games (2.67), and a lack of experience with MBG reveals reduced knowledge about games in general. These experiences can explain the reduced perception of games as tools for teaching.

In the online experience, attendants stated they knew and enjoyed MBG. The preference for digital games was also high (4.03). But what might be surprising is that the perception of games in general to support learning activities stayed the same before and after the session (4.74) while the perception of MBG uses increased (+0.69) to reach the same perception for games in general (4.74). This occurrence might make us question how well the attendants knew what MBG were in the first place.

The experiments, following different approaches, revealed that these kinds of training sessions can improve the perception of using MBG as tools for learning. Even when the participants cannot play the games from start to finish, having a real face-to-face experience, the impact on the attendants can still be relevant. Nevertheless, the game habits and game culture affect the perception of the potential of game usage for serious purposes. For teachers to start using MBG, they need to improve their playing habits first. Then teachers can which games to start exploring.

4. Proposing a framework to build game experiences from Modern Board Games

This section introduces the MBGTOTEACH framework, departing from the principles that teachers enter a self-learning and exploration process to use MBG to engage students and deliver new learning experiences.

4.1 Reframing MBG

The massive quantity of new MBG releases every year (Nand, 2021) might frighten teachers and educators that what to explore these game designs. But entering this global trend can be done step-by-step, like any pastime and a hobby (Rogerson & Gibbs, 2018; Woods, 2012). It does not need to be a solitary exploration. Teachers can profit from the many local and national communities of gamers, always eager to receive new players and share their love for the hobby. Most information is available online. The primary source is BGG (www.boardgamegeek.com). By using BGG, users can access a crowdsourcing system that collects data about MBG for more than 20 years. BGG allows users to build game profiles, create content and interact with the online community in specific forums, including for educational purposes. The scores and ranking result from users' evaluation in a Bayesian average system that tries to control the effects of marketing strategies and other sources of bias or data manipulations.

We argued that MBG could help teachers use games directly and inspire them to build their game-based learning creations. Though game designing is difficult, MBG development is no exception. But using and designing an MBG can be simpler and less resource-demanding than developing digital games. Nevertheless, it is never easy to develop games that provide meaningful and engaging experiences (Salen & Zimmerman, 2004; Zagalo, 2020). Even if the games have no flaws, experiences can vary for different player profiles and contexts of play (Sousa, 2021b). Teachers that use game-based approaches should learn game design. Then explore game-based learning (e.g., serious games and gamification specifications) in practice. One requirement is to have facilitation skills and deliver debriefing. Only then do teachers have the maximum effect on players (Crookall, 2010; Wouters et al., 2013).

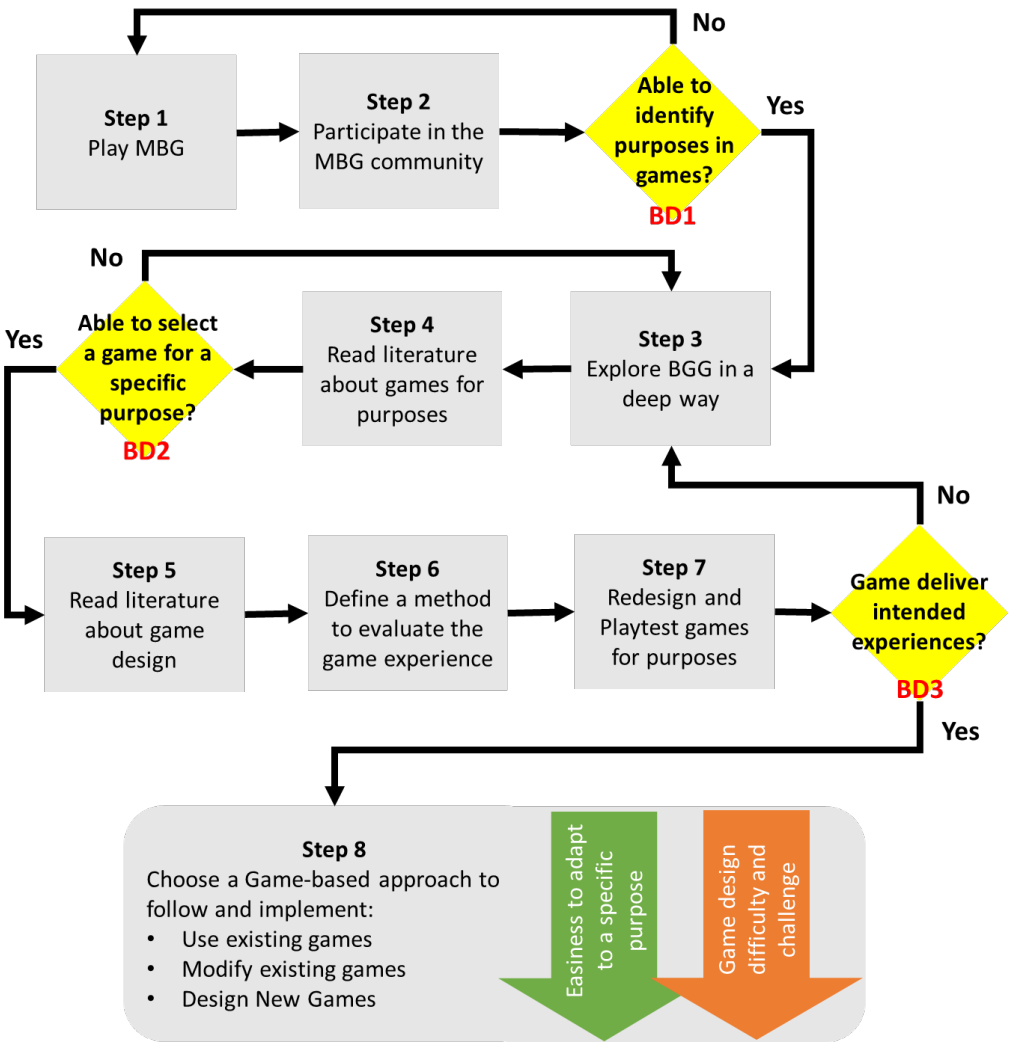

Fig. 3. The MBGTOTEACH framework.

To profit from MBG designs, teachers need some guide or framework to start.

4.2 The Modern Board Game as a tool teaching framework (MBGTOTEACH)

The proposed framework aims to be a guide to support teachers to learn about MBG gradually. The MBGTOTEACH depart from the principle that it is necessary to play the games to understand their dimensions and potential. After teachers play enough MBG (different types and genders), they can start using them in their classes. The direct use of games can lead teachers to modify the games and then create new products departing from the MBG mechanisms and aesthetics.

The MBGTOTEACH framework is not a rigid sequence. Although it proposes eight defined steps (S#), it is a guide to highlight the need to play many games and read literature about game design (including games for purposes approaches). The several Decision Boxes (DB#) strengthen the need for restarting the process when necessary.

The overwhelming quantity of different games and their design traits demand several iterations and restarts. It will be harder to follow this guide if the teachers do not like to play games. Teachers need time and resources to play games systematically by themselves and with their students. The COVID-19 pandemic can affect the first steps of the MBGTOTEACH. Using online communications tools can be a solution when playing face-to-face is not an option.

Fig. 3 shows an overall approach to the MBGTOTEACH framework. Detailing each Step and Decision Box clarifies the challenges teachers face. It is not an easy process to apply due to traditional classes constraints. The rigid school programs, lack of time, unavailable games, and the size of the classes are some examples. Despite these challenges, transforming MBG into teaching tools is possible. Adopting game-based learning projects with MBG demands liking to deal with games and working in institutions that foster these game-based approaches. The level of implementation and weight that the games have in each class can vary. Starting with a few simple games will be a more secure endeavor.

4.2.1 Step 1: Playing MBG

Playing is mandatory to understand how games work but is not enough. Games are emergent systems (Salen & Zimmerman, 2004). The experiences games provide can be immensely different, and the effects of player profiles are not neglectable (Zagalo, 2020). The simplest way to deal with this is to play many games, observe, and reflect upon the gameplay. Teachers will understand that games are not all the same by playing them. Each game can deliver a different learning experience. This preparation process of gathering knowledge can be anecdotally at the start, but it will build up the teacher game culture. The many MBG types and releases can be tremendous (Nand, 2021; Sousa & Bernardo, 2019). But starting to play the games is the first step to reducing the barrier of profiting from MBG to teaching activities.

4.2.2 Step 2: Being part of the hobby

MBG tend to foster group activities. Though many solo gamers exist (Sousa & Silva, 2021), most players will state that they play MBG because of social interactions (Kosa & Spronck, 2019; Woods, 2012). Playing with other players, the uncertainty of human behavior and the metagame emergence fascinate MBG players. Teachers need to experiment and watch others play. Alternately, playing solo is a way to learn and experiment with the games before using them with students. But all these efforts might not be enough. There will be no available time to know all existing games. Exploring the shared knowledge of the community of MBG players is a way to access information. There are organized communities of players in cities all over the world. The community gathers in shops, board game cafes, and events like conventions. BGG is the primary online platform. But a simple online survey will reveal local communities. These gamers tend to be open to newcomers, introducing them to the MBG hobby. Although many of these MBG hobbyists play with their family and friends, most gamers prefer to play with other hobbyists because they can play the more complex and demanding games (Rogerson & Gibbs, 2018).

Being part of the hobby MBG community makes learning games easy. Newcomers can play an enormous quantity of games without buying them. Experienced gamers can teach them. From a teaching perspective, it also provides opportunities to learn how to teach games to other players. There is not a single right way to teach a game. Although there are some guidelines experienced gamers and designers identify. Explain the game goals first (Engelstein, 2020; Sato & de Haan, 2016) and then do an introduction to the narrative context of the game is an option. These and other anecdotical knowledge identify techniques each teacher can experiment with. Teachers should find their method, supported by the feedback and outcomes and students' reactions.

4.2.3 Decision Box 1: Able to select a game for a purpose

We should not forget the objective of using MBG for teaching. It is not realistic to start playing MBG and immediately use them as tools for learning activities. Crossing teachers playing experiences with their teaching expertise would gradually help them see in each game the learning potential. It can be the mechanisms, how to present the narrative, or even the whole game with the proper facilitation and debriefing.

If, after playing several games and actively discussing them with other gamers, the teachers could not find any elements that can support their lectures, teachers should play even more MBG. The process should restart in Step 1.1.

4.2.4 Step 3: Explore Board Game Geek

As stated before, BGG is the primary database for analog games, including MBG. It might seem strange to suggest exploring BGG only in Step 3. BGG is not easy to navigate. Its open-source nature, where users can create and share content, makes it not a friendly-user platform. There are numerous forums and subforums with names like "Guilds" and "Geeklists". The game publishers can submit games, and the users add/change information by editing/voting about the game traits and adding content (discussion trends, pictures, videos).

BGG establish several classifications about the games, like the "Type", "Categories", and "Mechanisms". These classifications introduce many concepts and features. The best way to understand them is by playing games and discussing them among other hobbyists. Unlike videogame gamers, MBG gamers usually talk about the game systems and mechanisms (Woods, 2012). Although these discussions might be anecdotic, participating in the debates and the hobbyist culture is one path to entering game systemic design analyses and experience games for purposes effects. BGG provides explanations through links and related keywords about MBG concepts and the related games. BGG also allows finding other hobbyist players by geographical localization. BGG supports a prolific market for used games among gamers.

4.2.5 Step 4: Read literature about games for purposes

After having some solid knowledge about the state of the art of MBG, we propose to deepen the systemic approach of using games for purposes. The field of games for purposes, game-based learning, gamification, and serious games are growing (Boyle et al., 2016; Subhash & Cudney, 2018). However, there is a lack of systematization, guides, and frameworks to support the use of games for purposes to evaluate and introduce games for formal teaching activities (Arnab et al., 2015; Mayer et al., 2014; Sousa & Dias, 2020; Toquero et al., 2021)Some experts suggest going beyond the "points, badges, and leaderboards" features to deliver better gamification (Chou, 2019; Werbach & Hunter, 2015). In the case of serious games, there is the 8LLE (Dörner et al., 2016) and the "Design, Play, Experience" (DPE) framework (Winn, 2009). The cited gamification and serious game approaches tend to highlight the importance of game mechanisms to deliver the purposes of each game. If gamification introduces game elements in activities that are not games, the serious game approach proposes something different because it delivers complete game experiences (Deterding et al., 2011). Considering that the game mechanisms are the building blocks of games for building experiences (Engelstein & Shalev, 2019; Salen & Zimmerman, 2004), games can achieve entertainment and educational goals simultaneously when combining the correct game mechanisms with educational content.

4.2.6 Decision Box 2: Identify possible game purposes

At this stage of the process, teachers should recognize what games to use in their classes or projects. It is expected that they can select some games to use directly, without much adaptation. The available games might not exactly match the contents teachers need to address. But teachers should be capable of using games to approach a simple topic or train generic skills like generic "soft skills". If teachers cannot find and establish these processes, they should restart the process in Step 3.

4.2.7 Step 5: Read literature about games design

It is unlikely to do effective gamification or serious game approaches without knowing basic game design. Using existing MBG helps teachers use games without demanding design skills. After having some experience, teachers can enter the design process. Designing games could appear sooner

in the MBGTOTEACH framework. It is a conscient option because modding games (Sousa, 2021b, 2021a, 2020c) deliver unique opportunities to train with tested games before entering the challenges of designing games from scratch. Learning to develop a game is both a creative and systemic process dependent on the designer's knowledge and experience. Playing many games and modding them is a safer and incremental option.

Having the experience from previous steps, teachers can safely experience the challenges of game designing, starting by reading game design literature (Adams, 2014; Fullerton, 2014; Salen & Zimmerman, 2004). There they would encounter examples like the "Mechanics, Dynamics and Aesthetics" (MDA) framework (Hunicke et al., 2004) and subsequent variations (Zubek, 2020). Most approaches depart from the principle that combining game mechanisms (or mechanics) is the way to build effective games. In the case of MBG, that is even more evident (Engelstein & Shalev, 2019). Knowing many mechanisms will help teachers build their game systems. Despite the importance of the mechanisms in MBG, we should never forget the narratives and how they connect to the mechanisms (Arnaudo, 2018). Mechanisms should support metaphors also.

4.2.8 Step 6: Define a method to evaluate the experience

In this stage, teachers have experience with MBG, with the basics of game design and serious games. They should be able to define suitable ways to evaluate the game experience. Mayer et al. (2014) recommend assessing the student's experiences with games, the ludic experience, the contents, and what students learn after playing the games. Arnab et al. (2015) focus on the relationship between the learning mechanics and the game mechanics, explored as game mechanisms for MBG (Sousa & Dias, 2020). These recommendations can be vague and subjective. Nevertheless, they are flexible and allow teachers to adapt them to their courses and curricula.

The learning outcomes result from the whole process: learning the game, playing for objectives, and reflecting upon the game experience itself. This game-based process is adaptable to fit standard existing evaluation systems. Teachers can do tests before and after playing the games, challenging the player to discuss the game experience. The gameplay can be video recorded for further evaluation. Playing the games without recording the effects will jeopardize assessment. Each teacher must find the best way to use the game benefits coherently, following the standards and requirements of each institution. Doing these game-based processes without institutional collaboration is constraining. The evaluation must be as flexible as possible. Evaluating students must follow the same principles of the player-centric approach that contemporary game designs tend to follow. If the game does not work for its purposes, it is the game that must change according to the players' experiences.

4.2.9 Step 7: Redesign, design, and playtest games for purposes

Step 7 is the most important stage and the most challenging one for teachers. This step is always an interactive cycle

of going back and front. Developing a game demands many playtest sessions (Brathwaite & Schreiber, 2009; Engelstein, 2020; Fullerton, 2014), and the results are not guaranteed. At the end of many playtest sessions, the game designers might fail to deliver the game. They might not like what they created. The game might not be engaging or approach serious game goals, and the debriefing processes might be unfeasible. Also, the traditional teaching methods can be better or provide the same level of learning. This possibility is why teachers should also consider other effects. Fun, engagement, and other positive behaviors should be taken into account.

As stated before, the game modification to deliver specific purposes have the advantage of departing from solid gameplay. The game balance was previously tested. But when trying to create new games, teachers need to learn how to build balanced game systems. Playtesting, observing gameplay, collecting gameplay data, and talking and reflecting with other designers and experienced players are part of the playtesting process. After settling the game system and the objectives through the first part of the playtest process, teachers can start testing the game with students to measure engagement and learning outcomes.

4.2.10 Decision Box 3: games deliver intended experiences

Game development can be a fascinating process but a very frustrating one also. After spending much time studying, modding, and playtesting a new game, teachers may realize their games do not deliver what they need for their classes. This drawback happen often but going back to Step 3 can help teachers learn more about modding and developing new MBG. After defining a game solution and the process to evaluate the learning outcomes of the game-based proposal, teachers might step back. They may realize that they need to learn more about game design and game for purposes methodologies. Going back to Step 3 allows teachers to consolidate their knowledge and experience. We depart from the principle that teachers continue to play, search for games, and interact with the community to find game novelties.

If teachers feel confident and have gathered data that confirm that their game approach can deliver the learning purposes (DB3) they defined, they are ready to do Step 8.

4.2.11 Step 8: Choose a game-based approach to follow and implement

All the previous Steps and Decisions Boxes are a learning process for teachers after all. When reaching Step 8, they should be ready to start systemically using MBG designs to deliver game-based learning approaches with some confidence. This process is never deterministic. It is not possible to apply a recipe that generates successful games. Even the best and renowned game designs sometimes fail to do successful games. Games are creative products, provide emergent experiences, and their outcomes are uncertain (Costikyan, 2013). Multiplayer games are even more unpredictable. But following guides like the MBGTOTEACH can help deal with these challenges through continuous experimentation.

Step 8 highlights available options. Teachers can either use existing games, modify existing games to better adapt to

their learning objectives, or design new games. The more the teachers can act as game designers, the more they will be able to develop games for their specific learning objectives. The scheme arrows express these challenges and opportunities, those practical realities that teachers must do every time they wish to implement a game-based approach departing from MBG designs (Fig. 3). The previous steps act as a preparation for the implementation of step 8.

5. Conclusion

Because games are a continuous part of human history and it is unlikely that a person never played a game, it is not easy to develop and deal with game emergent experiences.

The MBGTOTEACH was tested during two workshop sessions that showed how teachers' previous game experiences might bias the perception related to new games. It can hinder game usage perceptions of game usage and potential. Learning more about game design and serious game methodologies is mandatory to surpass initial difficulties. Having the time and the place to test the game approaches is necessary to initiate the process. Working with educational institutions that are open to game-based learning helps implement the final stages of the MBGTOTEACH framework.

The MBGTOTEACH framework is not a straightforward guide for transforming MBG into teaching tools. It is an interconnected step-by-step set of recommendations that worked in several case studies (Sousa, 2020a, 2021b, 2021a, 2020c, 2020b; Sousa & Dias, 2020). When following the MBGTOTEACH framework, each teacher should reflect on the suggestions and adapt them to their realities. This framework was developed to help teachers benefit from MBG continuously. The MBGTOTEACH demands different levels of commitment from teachers. Teachers can use it to learn games and apply them directly, but if they want the framework traces paths into game design, from modding to developing new games. When involved in game design, teachers can develop more specific learning experiences through games.

We should not expect that doing introduction workshops like those described is enough for teachers to use MBG for learning purposes. Collected data reveals that building a solid game culture is necessary, but these sessions can bring awareness to new game-based approaches. These analog games can support fast learning experiences, but a solid background is necessary for deeper usage.

Several dimensions of the MBGTOTEACH framework can be improved. Future research should focus on delivering more quantifiable outcomes. How many games and what types of MBG are required to have a solid set of knowledge. Disciplines like Mathematics, Physics, History, and Literature could have some recommended MBG. Identifying games for specific courses is another option. Having databases to show what games would be more probable to be effective with certain student ages and duration of classes could be valuable. One example would be sorting games to teach "soft skills", environmental education, and many other topics. The evaluation approaches are also one of the weaknesses of these game-based methods. Ongoing research is trying to deal with this challenge.

In summary, the MBGTOTEACH framework can be advantageous for teachers to start exploring MBG. It gives a starting point to those teachers that feel lost and overwhelmed when exploring MBG. The MBGTOTEACH framework can help teachers build approaches where they are in control of the game-based learning process. Simultaneously, it fosters students' empowerment due to analog player agency.

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