The Challenges and Opportunities of Analogue Game-Based Learning

Raimonda Agne Medeisiene[1], Indre Sciukauske[1], Darius Karasa[1], Vicky Maratou[2], Rizos Chaliampalias[2], Jack Dylan Moore[3], Yama Abdullahi[3], Sara Hasani[3], Carla Sousa[4], Filipe Luz[5], Ivan Barroso[4], Pedro Pinto Neves[5], Micaela Fonseca[5]

[1]Vilinius University
[2]Hellenic Open University
[3]London South Bank University
[4]Lusófona University, CICANT
[5]Lusófona University, HEI-Lab

Abstract

The present white paper provides an overview of the current discussion of game-based learning (GBL) in higher education. It begins with a brief introduction to GBL, and provides a definition for games that is representative of their use in education. A systematic literature review of GBL is then given, which highlights specific areas where further work is needed to improve the effectiveness of GBL in Higher Education (HE). Interviews were then conducted with numerous educators and game designers across Europe in order to determine if the issues raised in academic research are replicated in the vies of those teaching. The resulting analysis showed a strong similarity between written and spoken opinions regarding GBL. Whilst all participants felt there were clear benefits to using GBL there were several barriers to their use. Most commonly mentioned, was a large amount of time taken to create GBL experiences. Participants also mentioned a lack of support, or understanding of the benefits of GBL, both from students and the institutions at which they teach. The report argues that there is a clear need for a simple, easy to use, framework for the creation of GBL. Such a framework would reduce the time needed by educators to create such games and would aim to increase their use across Europe.

Introduction:

Games play a central role in every culture. They help us learn how to interact, both with one another, and the culture we inhabit (Piaget, 1962). The importance of games and their centrality to culture is pointed out by Huizinga (1938) who suggests we use them as a medium used to organise our lived experience, and as an escape from their pragmatic focus (Ruckenstein, 1992). The 'playful' nature of games often hides the seriousness of their outcomes. For example, war is often viewed as a deadly sort of game, with elaborate rules, strategies, and codes of sportsmanship (Kraus, 1966). The rapid growth in the use of games as an educational tool has led to the creation of an immense number of different games, aiding learning in everything from economics to art, and numerous encyclopaedic websites of previously created games have been created (for a list of such websites see: Schaaf, 2014). Despite this rapid growth, it is not clear whether this is due to increased learning effectiveness from games, or simply the increased engagement and enjoyment observed in comparison to traditional pedagogical methods. To that end, the current paper is designed to explore the challenges and opportunities associated with GBL. This is the first phase of a four-phase study funded by Erasmus Plus K203 which aims to provide a self-assessment toolkit for game designers.

Often *gamification* - including simple game mechanics, such as points for correct answers (Hidi & Renninger, 2006; Rotgans & Schmidt, 2011; Kim, Song, Lockee, & Burton, 2018) - is used to aid learning to increase student engagement and enjoyment. However, simply adding a game mechanic into classic, lecture-based teaching, does not necessarily add anything novel to the understanding of the content in classrooms, or develop skills, such as critical thinking or resource management. To this end, more academics are seeing the benefits of *game-based learning* (Qian & Clark, 2016), in which games are specifically designed to aid learning of certain skills or content. This may involve adapting a game that is already created for use in the classroom, such as using open world-based board games to teach the interaction between geopolitical groups, or the use of Lego blocks to help improve understanding of city planning. A good game-based learning intervention will ensure that the central mechanic of a game is linked to the learning (Eng, 2020).

Definition

Despite their ubiquitous use throughout cultures, there is still debate over what is classed as a game (Salen & Zimmerman, 2003; Juuls, 2003). The multidimensional definition

of games suggested by Juul (2003) is the most beneficial for our purposes; considering games as learning tools. The definition comprises the following six dimensions:

First, fixed rules as the removal of any unclearness in the game rule to *uphold the rules*.

Second, variable and quantifiable outcome: through the rules of the game which fit the skills of the players.

Third, valorisation of the outcome: in a way that allocated higher values to the components which create useful, meaningful conflict (between players or between players and the system) with explicit goals.

Fourth, player effort - games contain a conflict: which ultimately can influence the game state and outcome due to the energy the player invests.

Fifth, attachment of the player to the outcome: The psychological attachment of the player to the outcome depends on their attitude towards the game which is part of the "game contract" agreed by all players.

Sixth, negotiable consequences: a game is characterized by *optionally* assigned real-life consequences negotiated on a play-by-play, location by location, and person to person basis.

Overall games for educational purposes educate the students *through* games rather than learning *whilst* playing a game (about things outside the game orthogonally to the game). Dimensions 1-5 exclude activities that are merely interactive or merely playful, and the educational outcomes consist solely of learning about the game. Dimension 6 implies a degree of separation from real-life and lets the game meaningful learning as opposed to the transposition of a non-game activity to game-like learning as orthogonal to the game.

Literature review

A literature review of 96 papers was conducted, using forward and backward search using the keywords (**See table 1).** A peer-reviewed paper will be published later to outline the details of the literature review. But for this white paper, a summary of the review is highlighted here: Overall the articles broadly reinforced the pedagogical value of GBL (Gibson & Douglas, 2013; Gil-Domenéch & Berbegal-Mirabent, 2017) in students' engagement and satisfaction (Lyford, Chen, Rhar, & Kovach, 2018; Montenegro & Greenhill, 2015; Trimm, 2008; Zeller 2018), especially in subjects that students consider boring (Juliano, 2019), abstract, or too complex (Johnson, 2019). Moreover, GBL is also discussed by the authors as a strategy that fits both the needs and the abilities of the students (Zeller, 2018), while allowing connections between different areas of learning (Lyford, Chen, Rhar, & Kovach, 2018) to promote a wide

range of skills and competences. These fields include the following acute care skills (Gibson & Douglas, 2013); personal hygiene practices (Bassey et al., 2020); religion (Zeller, 2018); probabilities and statistics (Johnson, 2019; Lyford, Chen, Rhar, & Kovach, 2018); business management skills (Sugahara & Lau, 2018); mathematic skills (Gil-Domenéch & Berbegal-Mirabent, 2017; Ku et al., 2014); geography (Sardone & Devlin-Scherer, 2016); law (Juliano, 2019); history (Larkin, 2017); human rights (Montenegro & Greenhill, 2015); engineering (Li, Huang, Jiang, & Chang, 2016); and global economy (Takahashi & Saito, 2011). Moreover, analogue games and approaches were also discussed as engaging, considering the usage of tangible materials, such as Lego blocks (Li, Huang, Jiang, & Chang, 2016), that enhance concept visualization.

Table No. 1. The criteria of the literature review

Database	Search mode (Boolean/Phrase)	Limits (criteria)	Found:
EBSCO (Business Source Complete)	game-based learning OR "game-based teaching" OR "serious gam*" OR "game-based teaching and assessment" OR "board gam*" OR "conceptual gam*" OR "educational gam*" AND "higher education" NOT SU gamification NOT SU digital games NOT SU video games NOT SU medical	Full text Scholarly (Peer Reviewed) Journals Published date: 2010-2020 Document type: article, case study Language: English Publication type: academic journal/case study	92
EBSCO (Academic Search Complete)	game-based learning OR "game-based teaching" OR "serious gam*" OR "game-based teaching and assessment" OR "board gam*" OR "conceptual gam*" OR "educational gam*" AND "higher education" NOT SU gamification NOT SU digital games NOT SU video games NOT SU medical	Full text Scholarly (Peer Reviewed) Journals Published date: 2010-2020 Document type: article, case study Language: English	406
Science direct	game-based learning OR "game-based teaching" OR "serious games" OR	Year: 2010-2020	375

	"game-based teaching and assessment" OR "board game" OR "conceptual game" OR "educational game" AND "higher education" Title, abstract or author-specified keywords: NOT (gamification AND digital game AND video games AND medical) Note: Limited to 8 Boolean operators	Article type: research article Subject areas (Filter): Arts and humanities; business, management, and accounting	
SCOPUS	ALL ("game-based learning" OR "game-based teaching" OR "serious gam*" OR "game-based teaching and assessment" OR "board gam*" OR "conceptual gam*" OR "educational gam*") AND "higher education" AND PUBYEAR > 2010 AND SUBJAREA(BUSI) OR SUBJAREA(ARTS) OR SUBJAREA(ECON) AND DOCTYPE (ar) AND NOT gamification AND NOT digital AND NOT online AND NOT video		122
PubMed	ALL ("game-based learning" OR "game-based teaching" OR "serious gam*" OR "game-based teaching and assessment" OR "board gam*" OR "conceptual gam*" OR "educational gam*") AND "higher education" AND PUBYEAR > 2010 AND SUBJAREA(BUSI) OR SUBJAREA(ARTS) OR SUBJAREA(ECON) AND DOCTYPE (ar) AND NOT gamification AND NOT digital AND NOT online AND NOT video		3

The review allowed the formulation of several suggestions. Firstly, GBL is a potential answer to promote learners' involvement, comprehension, cooperation, and motivation as crucial areas for the current teaching practices (Gil-Domenéch & Berbegal-Mirabent, 2017). Aligned with this, board games particularly are seen as a feasible approach to deal with current issues with traditional/instructional pedagogical methods (Sardone & Devlin-Scherer, 2016). Secondly, games seem to teach through an experiential framework, by establishing constant parallels between the game dynamics and the formal contents to be taught. For example, the relationship between Civil Procedure and inner game rules (Juliano, 2019) is explored by experiencing the game. This allows the knowledge to be built on a practical basis which is considered fundamental for learning. Sugahara & Lau (2018) even formalized the centrality of experiential learning paradigms, by testing the fitting of the Matsuo's Framework of

Experiential Learning (Matsuo, 2015) to GBL as an optimal structure for the successful GBL. The model is based on five main factors: critical reflection; seek challenging task; enjoyment of work; developmental network; and learning goal orientation. Besides this, GBL was also hypothesized as a relevant strategy to enhance students' confidence towards the subjects they typically struggle with (Ku et al., 2014).

The main conclusion that emerges from analyzing papers is the great heterogeneity between studies, not only in the field of studies, but also in the adopted methodology and, mainly, the data reported by authors. Another issue is the lack of uniformity in the adopted concept of game, with studies using different tools labeled as games, but with very different characteristics. Besides the results discussed above, papers also reported several outcomes that are not directly connected with measurable learning improvements. This included the promotion of hands-on experience (Lyford, Chen, Rhar, & Kovach, 2018), which can also be connected with experiential learning, the potential of analogical games to raise awareness to socially relevant themes and induce attitudes changing (Bassey et al, 2020; Montenegro & Greenhill, 2015, the promotion of problem-solving skills as transversal in the field of GBL (Li, Huang, Jiang, & Chang, 2016), and the promotion of interaction between peers through GBL (Takahashi & Saito, 2011), as a strategy to enhance participatory and collaborative knowledge building.

However, the studies the reasons why, considering the many advantages of the games, they are only used by a minority of educators. The main reasons are the overall restructuring of the class to play the game and significant preparation time and supply of (educational) game material (cards etc). Moreover, it is difficult to integrate a game into the curriculum in groups of less than 300. The papers indicate the effectiveness of games in small groups which can be managed by the facilitators, however, it can be done in several small groups at the same time with many tutors. The studies that applied GBL to HE shows that there is a lack of clear descriptions of the participants in these studies. Broadly, the authors do not discuss the limitations of the studies in detail. Nevertheless, this is also due to the low frequency of collection and analysis of quantitative data on the effectiveness of the GBL approach. In this sample, only five studies reported quantitative data (Bassey et al., 2020; Li, Huang, Jiang, & Chang, 2016; Montenegro & Greenhill, 2015; Sugahara & Lau, 2018; Takahashi & Saito, 2011). From this five, only two studies involved Randomized Controlled Trials (RCT) (Bassey et al., 2020; Li, Huang, Jiang, & Chang, 2016), and none of them were developed in the field of HE. Even if the authors detail the overall approach, including the game, the number of sessions, among other aspects, the lack of quantitative data and, mainly, uniforms ways of

reporting effectiveness can negatively affect the impact of the studies in policy-making, since their external validity and replicability is frequently seen as challenging (Bamberger, 2019). The result of this review will be published in a peer-reviewed paper. However, for this white paper, we can summarise the result of that in the following points: There is ample research on game mechanics, game designs, and characteristics of the games. However limited research is done on the post-game assessment through quantitative analysis, mapping of the learning outcome, and inclusivity measures within the game. Also, the majority of the articles are focused on the learning process of the students and little is documented on the educators' learning process within GBL. Also, the time commitment associated with developing games leads to limited practice of that within classrooms.

To that end, in addition to the research questions, the following propositions have been introduced:

A. There is a lack of a robust assessment framework for game-based learning.
B. There is a limited number of inclusivity measures for game-based learning.
C. There are limited criteria for the educator learning process within game-based learning.

Interview with educators

Method:

Participants:

Interviews were conducted at 4 universities from across Europe: London Southbank University (LSBU) in the United Kingdom; Hellenic Open University (HOU) in Greece, Vilnius University (VU) in Lithuania; and Lusofana University (LU) in Portugal. 3 Interviews were conducted in each country; 12 one-hour-long interviews were conducted in total.

Before conducting each interview, participants gave informed written consent in accordance with the internal approval by the ethical boards of the university conducting the interview.

The general composition of the interviewees and their background is presented in Table No. 2.

Table No.2. Demographic information about interviewees

Questions	Options	Answers
1. What is your Role?	Teacher	10

	GBL expert	4
	Game creator	4
2. Age group of the interviewee	20-30	1
	30-40	3
	40-50	4
	Above 50	4
3. Gender	Male	7
	Female	5
	Other	0
	Decline to answer	0
4. Years in practicing game-based learning	Average, year	9.3
5. Type of the game you are using/creating	Board Game	9
	Puzzle	6
	Card Game	4
	Role Play	10
	Other	2
** Participants could give multiple responses to questions 1 & 5*		

Design:

The final design of the semi-structured interviews containing 8 closed and 13 open-ended questions is listed below. Audio recordings of the online interviews were made and later transcribed.

Interview questions:

A set of interviews is designed to explore the challenges and opportunities associated with game-based learning. This overall research question is addressed through the following interview questions:

1. What skills will be created through game-based learning for students?
2. What skills will be created through game-based learning for educators?
3. What are the challenges associated with game-based learning?
4. What is the significance of game-based learning over other types of classrooms?

Also, to explore the propositions A-C, the following questions are formulated:

5. What assessment techniques are used post-session game-based?
6. What measures of inclusivity are being practiced within game-based learning classes?
7. What were the costs of developing/playing the game (financial/time-based / human-based costs)?
8. What alterations your game might need in the face of the new pandemic and general interest in online teaching?

Results:

Responses to each of the open questions will be considered in turn, followed by an overall summary of the interview responses. Some include the follow-up question by the moderator which was not included in the original design, to accommodate the novel points raised by the experts.

1a. What students/audience's skills or behaviours are aimed at?

Responses to this question primarily focused on soft skills. Interview's from universities in all countries mentioned the use of games to aid in teaching social skills, such as collaboration and communication. The use of game-based learning to aid creativity was also mentioned by at least one participant at each university. Generally, soft skills were a common theme, with other abilities, such as problem-solving and decision making, were highlighted by participants at LSBU and HOU.

Participants at LSBU differed slightly from other institutions when discussing skills, with two participants arguing that game-based learning can be adapted to the requirements of any specific classroom. However, few specific examples of skills or learning outcomes (beyond social skills and creativity) were given.

Another commonality was the opinion that game-based learning would allow for a deeper (HOU), and more theoretical (VU) understanding of the subject matter. Many considered it a good addition, but not a replacement, for traditional pedagogical methods.

In sum, social skills and soft skills were primarily discussed as learning outcomes. Many participants also mentioned, in different ways, that there was a sense of adaptability to game-based learning methods.

1b. How are they assessed after playing the game? If not, why?

Broadly, there was little attempt at assessing learning, with only particpant at LU indicating the use of formal assessment methods. Some participants did attempt to assess the effectiveness of their game-based learning method, though primarily this was done with self-report from students (LSBU, LU, VU), and often related more to engagement than learning. It was also argued that assessment is hard due to the small timeframe in which a game-based learning intervention takes place (LSBU3), generally only lasting the length of a typical lecture (1<2 hours).

2. Which teaching skills/competencies are gained by the tutors using games in a teaching process?

Various topics were discussed by participants at each university. The most widely discussed, was the increased creativity and imagination in pedagogy gained by educators who decide to use a game-based approach in their classroom (HOU, LU, VU). With VU2 stating that such educators are more "flexible, recognizes the positive role of games, become more familiarized with game concepts and vocabulary, creates closer relationships with students" and are better able to "observes how students/participants interact in a more relaxed setting and can assess their behaviour".

The idea of game-based approaches making teachers *active trainers* was also mentioned (HOU2), in which teachers understand "the real learning needs of their students by leaving them free to learn, through playing "as well as "understanding of students' real skills and personalized development of students' skills", "connection of the theoretical principles with the practical applications", which leads to " differentiated learning". LSBU1 used the term active trainer to describe a similar idea. On a similar theme, LU1 suggested that using the novel pedagogical approach allows for lifelong learning in educators. Taken together, our interview participants considered using game-based approaches improved the teaching skills of educators.

Along with improving the teaching skills of educators, participants from LU and VU mentioned benefits to organisational and management skills. Organising and implementing a game-based intervention requires a fair amount of planning, and leadership from educators. Otherwise, the learning aspect of a game can be lost.

3. What is the significance of game-based learning over other pedagogical approaches?

Game-based learning techniques were viewed as more fun and engaging than other pedagogical methods. Each participant made some comment to this effect either asserting that

students were more engaged, or enjoying the class more. As commented by HOU3, “people learn without realizing it, by playing and having fun”.

Numerous participants suggested the reason for this increased enjoyment, as well as an advantage of GBL, was due to the visceral (LSBU), real-world (HOU), learning experience that GBL provides. It provides a realistic scenario to students to understand the stakes, though nothing is at stake, students can assess the realistic aspects created by games and simulations. Participants at LU echoed this, arguing that the methods can provide more *active learning experiences* compared to traditional pedagogical approaches.

Finally, as was mentioned in response to Q1, participants at VU and LU highlighted that GBL can teach soft skills that are difficult to teach using more classical methods.

4a. What are the challenges you face in your game-based teaching?

The biggest challenge participants faced in creating educational games was a lack of time. All participants from LSBU and VU mentioned that educators often do not have enough time to create useful games for their classrooms. Similarly, creating games that can be easily adapted for the specific need of each classroom was also a common challenge (HOU1, LSBU1, VU3). A game may take a year to create due to the various other tasks required of HE educators. If the game is designed for one classroom how easily can it be adapted to another, which may have twice the number of students? This lack of ability to adapt a game to different size classrooms, or different topes, can put educators of from using GBL.

Ensuring that students are learning *through* gameplay, rather than simply being additive to their learning, was another common concern (HOU3, LSBU2, VU3). Impactful GBL methods involve learning via the core mechanic of a game. This can be seen when games such as Diplomacy are used to teach risk management in Business classes. Participants mentioned difficulty in ensuring that students are learning "through gameplay" (HOU3). Whilst others discussed balancing the learning with gameplay (LSBU2) - that students are learning *via* playing the game, not just playing a game in a classroom.

Participants also discussed a lack of institutional support (LSBU, VU, LU), or a way to assess the effectiveness of GBL methods (LSBU2, VU3).

4b. How did you solve it?

Participants at LSBU suggested that offering training sessions for staff in order to develop the skills need to create and run GBL may reduce the time needed for games to be created, and make them better able to oversee the learning in such sessions. Similarly, HOU2 expressed that

educators need more time to organise and prepare for GBL sessions compared to traditional lecture-style learning sessions.

Another solution discussed was the implementation of collaborative efforts, either with students (LSBU) or colleagues (VU). For example, this could involve one teaching session in which the educator and the students work together to create a game that would aid the teaching of module content and skills. This would be followed by a testing session, and finally a gameplay session.

Such a method may also aid in highlighting the benefits of GBL, which participants at LU considered important to change perception. This was a need for both educators, who can have an outdated notion of what a game is (e.g. that is something kids to when playing), and students, who can be too focused on the end of their grades compare to their learning.

5. Are there any measures you take to ensure the inclusivity of different players in your game(s)?

Each participant had a different way to answer this question. Some did not see inclusivity as a problem (LU2) or had not needed to consider it before (LU1). Others had to deal with very specific problems faced by students (LSBU1), and yet others described cultural and language differences as the biggest issue (VU2). As mentioned by LSBU2, "one size does not fit all". As such, each participant had to consider inclusivity from a different angle, depending on their specific classroom.

For example, HOU3 discussed using symbols, rather than letters, to be more inclusive of students with dyslexia. This differs from the approach taken by participants from VU, whose main issue was related to cultural differences. They advocated that educators must be flexible and creative in order to solve these issues. One would imagine reducing the reliance on words by using symbols could be a pragmatic example of this and may also help with the issue they mention.

The overall picture from interviewees shows how every classroom is different, and each will face its particular inclusivity issues. LU2 and LU3 mention that GBL itself is a good inclusivity measure, reducing the barriers between people and allowing increased collaboration. "[G]ames are our inclusivity measure" (LU3).

6. What other areas of teaching you might suggest for your game(s)?

"[A]nalogue games can be applied to any area, and to teach anything" (LU1). This is a statement echoed in the words of all interviewees. Depending on the classroom an analogue

game can be found to aid learning of any specific subject or skill. The important issue is choosing the right game, though due to the wide variety of board games available, a game can be found to teach any specific module (LSBU3).

7. What were the costs of developing/playing the game (financial/time-based / human-based costs)?

The most common theme from answers to this question was that costs can vary greatly depending on the game being played. To give an example of the difference, LSBU1 described a Lego-based game. This required 60 hours to create an overall financial cost of roughly £5000. In contrast, LSBU2 described the creation of numerous minigames. This took four to six months with an overall cost of £40,000, in which 35 minigames were developed. (I2)

LSBU3 explains how the financial and human costs vary during the different stages of game creation. The costs are high during the initial stages of practice because a lot of preparation is required but they keep on decreasing once the tutors are confident enough. The development cost of the game depends upon the intended objectives, learning outcomes, and the type of games developed.

As has been highlighted in answers to previous questions, the biggest reported cost is the time taken to create educational games.

8. What alterations your game might need in the face of the new pandemic and general interest towards online teaching?

Most participants cited adapting their games for online learning by using webcams and online platforms (e.g. zoom). Other specific virtual platforms such as virtual escape rooms (LSBU2), Miro (LSBU3), and online collaborative tools (Discord, Roll20, Watch2gether, Boardgamearena, Tabletopia) were also mentioned (LU3). One notable exception came from HOU1 who used "the open space, with gloves, antiseptics, etc. which became parts (mechanics) of the game".

Despite attempts by many to adapt, many of the participants stated that contact learning was much preferred. Though games can be played virtually, via webcam, or using a virtual platform, getting the same level of excitement and engagement was considered difficult.

Discussion:

The presented interviews provide a first-hand account of how educators and game designers view the use of educational games. Although the coding of the interview questions will be

analysed and published in a peer-reviewed paper, the thematic analysis of the interviews yields some useful insight as is described here. An example of this is outlined in table 3.

Table3- The sample of an interview sheet

Question number	**Task**	**Responses**
	Respondent Background	
3	What is your Role (Teacher, GBL experts, Game creator?)	Teacher GBL expert Game creator
4	Age group of the interviewee (20-30, 30-40, 40-50, above 50)	20-30 30-40 40-50 Above 50
5	Your Gender (Male, Female, Others (), prefer not to disclose)	Male Female Other Decline to answer
6	Years in practicing game-based learning	15
7	Type of the game you are using/creating ()	Board Game Puzzle Card Game Role Play Others
8	Field of expertise of the interviewee	Management of Human Resources, International Management of Human Resources
9	Field of the study(ies) of the target audience	Students in the field of social sciences Direction: business and management (Business and Administrative Studies)
	Open questions	
1	What students/audience's skills or behaviors are aimed and how are they assessed after playing the game? If not, why?	<...> Yes, these competencies would probably be *communication, mutual understanding, such as empathy, analytical thinking*. Because during those <...> games... it needs to solve various situations and perform tasks in any way, and I think that those competencies mentioned, they are developing at that time <...>. <...> *I do not* … Because <...>it is *quite different*. Well, it happens sometimes, if something bigger, well, a task or it is a game, say, a or a situation, it

		happens during a seminar and such, smaller <…> it is like even during a lecture <...>. <...> That's not what I am assessing, although I am... well ... I have heard from other colleagues that let us say they are assessing it, *but I'd say there might be a lot of that kind of work out there, and here's what I got as part of the lecture*, let's say. <...>.
2	Which teaching skills/competencies are gained by the tutors through the use of games in a teaching process?	<...> Well, I would *think the creativity* of a teacher is very much developed. Because it really takes a lot of time to think. How? Well, let's say you know something… Do you have an idea for something or just read somewhere... <...> and how exactly to adapt it to those students or to <...> *Well, I would think the creativity of a teacher is very much developed.* Because it really takes a lot of time to think. How? Well, let us say you know something... Do you have an idea for something or just read somewhere… <….> and how exactly to adapt it to those students or to adapt it to the topic. And I think <...> *creativity manifests itself*. <....> *That creativity, I think, is exceptionally good.* <...> well, and again, maybe just as much as that *analytical* <...> *thinking*, because sometimes you are creating something from some few examples. Well, *you plan and put together*, what is after, what parts. It is here that this competence, I think, also yes, also the benefits are manifested. Well, at the same time I mentioned *that planning*, it is also such a competence of *planning, organizing*, because if you give during the lecture, you need to plan at what point, how long it will take, to divide it into groups<...>.
3	What is the significance of game-based learning over other pedagogical approaches?	*Significant*, well, I think *it excites the thoughts of the learners, the listeners* <...>. And here, there are *inclusions* <...> ... Well, a little bit of *going outside the lecture*, like that ... and the activity *evokes thoughts*, and ... and, *perhaps, those thoughts continue to develop*. <...> and *they kind of feel, well, the part of it* <...>. *they seem to be in that role* <...>.
6	What are the challenges you face in your game-based teaching? How did you solve it?	<...> the *organizational work* is… well, I would say that there is a certain challenge, because you are just like going through it, so that everything goes smoothly <...>. <...> this is a challenge *because it takes a lot of time* <...>
7	Are there any measures you take to ensure inclusivity of	<...> I somehow try, to say, to get, well, *feedback* <...>.

	different players in your game(s)?	<...> there are such students, but, namely, that is related to the fact that they somehow… well, *to involve them in the performance of those tasks, games....* well, *they did well, they normally participated. It did not happen to me that, let us say, that there was a need for it somehow ... I cannot answer this question exactly here because I did not have much experience like that.* <...> Although, the truth is that now when we are talking about foreign students .... some do not know how to work in a team and the team <...> does not want to accept ... Then, somehow you try to get around it. You say he alone cannot be on the team; you must share thereafter. But he still cannot, well, he cannot reconcile... well I do not know here, maybe *cultural thing* here, of course, maybe, those *differences come out.* It is, it is difficult for me every time <...> it's very difficult to get rid of it all.
10	What other areas of teaching you might suggest for your game(s)?	<...> the principles themselves could perhaps be applied, well, in any maybe specialty.
11	What were the costs of developing/playing the game (financial/time-based / human-based costs)	<...> in the first place, probably, I would say *time*… Well, that thought revolves around you everywhere, and well, I think it takes time for reflection, then for the whole realization of how something must happen. Well, *human resources* are, well, *yourself ... you are like that human resource*. <...> it was for such measures it was necessary to spend *some of my money there* <...> But basically *it takes time* for me.
12	What alterations your game might need in the face of the new pandemic and general interest towards online teaching?	Well, me, *I tried to keep the same games, but had to think about how to do it. Maybe which I gave up there*. <...> when they are alive, it is different, somehow when you see them, and well... well, that *connection is different*, and there would be *too much work here.* <...> for example, we also played the selection of employees there <...> well, we *did it virtually <…> now they are thrown in separate rooms there too, so they do not hear anything about each other there*. Well, yes, but you also must think a lot about it.
13	Any other points you would like to discuss?	Suggestions and discussions... Well, I do not know ... any. Maybe ... *it would be interesting to hear the experiences of others.* <...>.

The advantages of game-based learning benefit both educators and students. The respondents confirmed that game-based learning promotes a variety of soft skills that otherwise are hard to induce using traditional methods of teaching. These skills could include collaboration and communication, creativity, problem-solving, and decision-making. It also gives the flexibility to be adapted to the requirements of any specific classroom. The specific dynamics of the classroom also help to bring the educator and the students closer and facilitate to observe the interaction leading to a better assessment of behaviour and personalising the skill development. In the case of educators, games allow lifelong learning as well as improve teaching skills, and organisational and management skills. On top of that, the GBL provides a fun and engaging environment as well as a visceral and real-world learning experience.

The challenges facing GBL include the lack of time in creating educational games was the lack of time, as well as adaptation to the specific need of each classroom from the size of the cohort to the caliber and the subject studied. The design may also take from 60 hours to 1 year for a game and financial cost of £5000 for a 60-hour development of an average game (83 pounds an hour or 5000 £ a game) or 6 months and £40,000, for 35 minigames (1142 pounds for each mini-game). However financial and human costs vary during the different stages of game creation which decreases as the experience of the game-designer increases. In an educational game the highest cost that of time to the educator who develops the game. The costs of game development depend upon the intended objectives, learning outcomes, and type of games developed, along with the available time to develop games. The process of learning also ensures that students are learning *through* gameplay, where the learning involves the core game-mechanic whilst balancing the learning with gameplay.

Due to the low usage of games in teaching, participants suggested few solutions. These included offering training sessions for staff to develop the skills need to create and run GBL; allocating more time to organise and prepare for GBL sessions compared to traditional lecture-style learning sessions; collaborating with students and/or colleagues to develop games, followed by a testing session and a final a gameplay session.

Considering inclusivity, some participants suggest that GBL itself is a good inclusivity measure, reducing the barriers between people and allowing increased collaboration. Regarding how to make GBL itself more inclusive, participants suggested several solutions dealing with a wide range of inclusivity issues. For example, participants suggested reducing the reliance on words by using symbols to be more inclusive of students with dyslexia. Others also argue that creative thinking is needed when considering cultural barriers to understanding and inclusion in GBL. Spoken simply, educators must be flexible and creative to ensure the

inclusivity of all in their classroom, which can be taught and practiced in the training sessions stated above.

Finally, due to the pandemic, most participants adapted using webcams and online platforms (e.g. zoom, virtual escape rooms, Miro), and online collaborative tools (Discord, Roll20, Watch2gether, Boardgamearena, Tabletopia) as well as physical precautionary measures of physical distancing. Whilst all agreed that such measures were needed, all also agreed that contact learning ensured much higher engagement from students.

Conclusion and limitations:

The current paper aimed to answer one overarching question: "What are the challenges and opportunities associated with analogue game-based learning". To that end, the presented literature review gave rise to a set of four sub-questions as well as four propositions to be addressed. The first and second questions were "What skills will be created through game-based learning for students and tutors". The responders highlighted a variety of skills such as soft skills that are difficult to promote in traditional teaching, as well as the flexibility to measure the engagement of students in real-time and observe their reactions towards different game mechanics. In addition, the specific experiential setting of game development and game-play allows the educators to also gain life-long skills, as well as reduce the cost and time required for developing games.

The third question was "what are the challenges associated to game-based learning?" As mentioned in the literature review the time and cost associated with the games are high, this was confirmed by respondents to the first and second questions. They also estimated the cost for developing a full game as £5000 over a year (60 hours) and £1140 over 6 months for a set of mini-games. Although there is a large difference between these two responses, it is indicative of the large time and financial investment required for analogue class-based games.

The fourth question was "what is the significance of GBL over other pedagogical approaches". As suspected from the literature review GBL has advantages for developing skills untouched by traditional methods. Responses, to this question, as well as those to others, indicated GBL as being a superb way to teach soft skills which are often harder to teach within traditional rote-style pedagogical methods. This includes 21st-century skills, such as decision-making, collaboration, and communication. Moreover, the dynamic, and experiential aspect of GBL methods allow for the mutual development of skills in both teachers and students, leading to life-long learning for the prior. Also, the proximity of the teacher to the students allows real-

time observation which leads to a real-time adjustment in the process to fit the requirements of each specific classroom.

In addition, four propositions were also explored. The first proposition was “Limited assessment techniques are used in post-session game-based learning". The lack of quantitative assessment, pointed out in the literature review, was confirmed by interview respondents who indicated limited use of formative assessment techniques. Instead, due to the lack of time during teaching sessions, assessment mainly involved observation or student-reported engagement measures.

The second proposition was “Limited measures of inclusivity being practiced within game-based learning classes”. This gap in research, pointed out by our literature review, was confirmed by participants. Whilst some participants considered the actual game as the measure of inclusivity, the majority did not use any measures. A small minority suggested replacing words word with symbols to aid the dyslexic students. Others also casually mentioned the teacher-led adjustment in the classroom towards cultural inclusivity. Overall there is a large gap in research and existing literature regarding how to ensure inclusivity and measures that to ensure inclusivity of all students in GBL.

The third proposition was “The higher cost of developing the game (financial/time-based / human-based costs) leads to limited practice of games in the classroom”. This was also confirmed as the cost of game development associated with intended objectives, learning outcomes, and the type of games developed.

The last proposition was that, due to the pandemic, along with increased interest in online teaching platforms, alterations are required to change face-to-face game-based learning. This was also confirmed as almost all participants named different digital platforms to move their practice online, even though they all considered them less effective than the physical games.

To conclude, considering the gaps highlighted above, a framework that addresses the assessment and inclusivity measures within game-based learning is missing. In addition, a design framework that saves time and costs for new designers with less experience could be useful. Utilisation of such a framework may also benefit by offering training sessions to educators upon delivery. This would ensure that educators are familiar with how to apply GBL practices and reduce the perceptual barriers that some educators may feel towards using GBL methods. Such training and top-down application of GBL methods will ensure that educators feel that their use is supported at the institution in which they teach. Increased acceptance and use may also allow for increased collaboration between faculty members in their creation and use, leading to an exponential increase in their usage.

Finally, it is important to mention some limitations with the current report. Firstly, it is based on a non-exhaustive literature review. As such, the gaps highlighted lack the rigour of more formative review methods, such as those based on the PRISMA systematic review method (McKenzie, et al., 2021). Despite this, the gaps highlighted were supported by analysis of our interviews with educators across Europe.

Second, systematic coding of our interview data is still being conducted. Thus, reported results are based on inductive thematic analysis of the text. Using software and statistical tool might shed a better light on the result.

Finally, the current white paper only summarises the result for confirmation of the structure required for starting the next phase of the TEGA project and thus did not undergo the same review process of formal academic journal papers. Despite these limitations, the reported literature review suggests the need for a framework, as proposed above. Many of the reasons for this were further confirmed by reports of our interviewees across Europe. Thus, due to the congruency in literature review and interview data, it is probable that the creation of a GBL framework that addresses the above gaps in the field (Assessment measures, inclusivity measures, time constraints) which includes would be an effective way to increase the use GBL in higher education.

References

Bamberger, P. (2019). On the Replicability of Abductive Research in Management and Organizations: Internal Replication and Its Alternatives. *Academy of Management Discoveries, 5*(2), 103-108. https://doi.org/10.5465/amd.2019.0121

Bassey, D., Mogaji, H., Dedeke, G., Akeredolu-Ale, B., Abe, E., & Oluwole, A. et al. (2020). The impact of Worms and Ladders, an innovative health educational board game on Soil-Transmitted Helminthiasis control in Abeokuta, Southwest Nigeria. *PLOS Neglected Tropical Diseases, 14*(9), e0008486. https://doi.org/10.1371/journal.pntd.0008486

Gibson, V. and Douglas, M. (2013). Criticality: The experience of developing an interactive educational tool based on board games. *Nurse Education Today, 33*(12), 1612-1616. https://doi.org/10.1016/j.nedt.2013.01.022

Gil-Doménech, D., & Berbegal-Mirabent, J. (2017). Stimulating students' engagement in mathematics courses in non-STEM academic programmes: A game-based learning. *Innovations in Education and Teaching International, 56*(1), 57-65. https://doi.org/10.1080/14703297.2017.1330159

Johnson, R. W. (2019). Using the board game Borel to illustrate probability. *Teaching Statistics, 41*(3), 106-109. http://dx.doi.org/10.1111/test.12201

Juliano, A. C. (2019). The Games We Play. *Law School Teaching Methos, 63*(3), 453-464.

Ku, O., Chen, S. Y., Wu, D. H., Lao, A. C., C., & Chan, T. W. (2013). The Effects of Game-Based Learning on Mathematical Confidence and Performance: High Ability vs. Low Ability. *Educational Technology & Society, 17*(3), 65-78.

Larkin, K. (2017). Queue Tips: Teaching Socialist Consumer Culture with "Kolejka". *The History Teacher, 50*(4), 501-516.

Li., Y., Huang, Z., Jiang, M., & Chang, T. W. (2016). The Effect on Pupils' Science Performance and Problem-Solving Ability through Lego: An Engineering Design-based Modeling Approach. *Journal of Science Education and Technology, 19*(3), 143-156.

Lyford, A., Rahr, T., Chen, T., & Kovach, B. (2018). Using camels to teach probability and expected value. *Teaching Statistics, 41*(1), 18-24. https://doi.org/10.1111/test.12167

Matsuo, M. (2015). A Framework for Facilitating Experiential Learning. *Human Resource Development Review, 14*(4), 442-461. https://doi.org/10.1177/1534484315598087

Page, M., McKenzie, J., Bossuyt, P., Boutron, I., Hoffmann, T., & Mulrow, C. et al. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ, n71*. https://doi:10.1136/bmj.n71

Montenegro, M., & Greenhill, B. (2014). Evaluating 'FREDA Challenge': A Coproduced Human Rights Board Game in Services for People with Intellectual Disabilities. *Journal of Applied Research In Intellectual Disabilities, 28*(3), 223-237. https://doi.org/10.1111/jar.12124

Roozeboom, M. B., Visschedijk, G., & Oprins, E. (2015). The effectiveness of three serious games measuring generic learning features. *British Journal of Educational Technology, 48*(1), 83-100. https://doi.org/10.1111/bjet.12342

Ruckenstein, M., (1992). Homo Ludens: A Study of the Play Element in Culture. In C. Sylvester. Leisure and Ethics: Reflections on the philosophy of leisure.

Sardone, N., & Devlin-Scherer, R. (2016). Let the (Board) Games Begin: Creative Ways to Enhance Teaching and Learning. *The Clearing House: A Journal of Educational Strategies, Issues, and Ideas, 89*(6), 215-222. https://doi.org/10.1080/00098655.2016.1214473

Sugahara, S. & Lau, D. (2018). The effect of game-based learning as the experiential learning tool for business and accounting training: A study of Management Game. *Journal of Education for Business, 94*(5), 297-305. https://doi.org/10.1080/08832323.2018.1527751

Takahashi, S. & Saito, E. (2011). Changing pedagogical styles: a case study of The Trading Game in a Japanese university. Teaching in Higher Education, 16(4), 401-412. https://doi.org/10.1080/13562517.2011.560377

Zeller, B. (2018). "Make your own religion": The fictive religion assignment as an educational game. *Teaching Theology & Religion, 21*(4), 321-335. https://doi.org/10.1111/teth.12461