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A card game for designing activities for technology-enhanced learning in higher education

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Abstract

The importance of providing mechanisms and tools that effectively support the transition from implicit to explicit representations of Learning Design has been emphasised by previous research in the field of Technology-Enhanced Learning (TEL). In addition, the benefits of Game-based learning approaches have been long documented in the educational research literature. The paper presents the design, implementation and evaluation of a card game that aims to support the design process of TEL activities in higher education. The game was tested by a group of 36 students and tutors ($n=36$) in higher education during an interactive workshop. Feedback was asked by the participants using an anonymous survey. The results reveal that the participants a) are satisfied with the game process, b) appreciate the groupwork and interaction taking place, and c) believe that they used their communication and collaboration skills. The paper includes the description of the outputs of a group (i.e., the cards selected for their TEL scenario and their actual TEL scenario) to exemplify that it is possible to use the game in order to elicit or diagnose existing LD knowledge from the game participants. The paper concludes on the usefulness of the approach suggested, limitations, and plans for future work.

Keywords Learning design · Technology-enhanced learning · Game-based learning · Higher education

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1 Introduction

Learning Design (LD) is a strand in educational research and practice that has emerged from the rationale of helping educators to demonstrate and to share their ideas about teaching and learning (Nguyen et al., 2020). According to Wasson and Kirschner (2020), "the advent of information and communication technologies for learning has moved the focus of learning design from just the learning materials and their sequences […] or a learning artefact (e.g., a content management system), to the learning environment as a whole" (p.816). LD has been defined as "a descriptive framework for teaching and learning activities" (Dalziel, 2015, p.4). However, to date much of the work on LD has been either focusing on prescriptive approaches of how LD *should* be, or on representations of LDs in formats that are interpretable by computers (Muñoz-Cristóbal et al., 2018). Recently, the emphasis has shifted away from the representation of LDs per se to the process of eliciting such representations from tutors; a shift that signifies teaching as a design practice (Mor et al., 2015; Muñoz-Cristóbal et al., 2018) that could be studied through participatory design approaches which actively involve the main stakeholders of higher education (Flynn et al., 2018). As highlighted by Viberg et al. (2018), as "the integration of digital technologies in higher education continuous to increase, there is a need to understand how to best support university teachers of Technology-Enhanced Learning (TEL) in order to support students to achieve academic success" (p.2637). Researchers also stress that empowering teachers/instructors as designers is a challenging task (Wasson & Kirschner, 2020). In the Scandinavian context, researchers underline a close association between design and use, when designing for a future use situation (Bannon & Bødker, 1991).

Considering the existing gap of knowledge about how one can effectively support university teachers as designers of TEL (Viberg et al., 2018), this study presents a participatory design approach towards LD for TEL. This approach seeks to actively engage its stakeholders (i.e., educators and students) in the TEL design process through Game-based learning (GBL), where GBL refers to the integration of gaming into learning experiences to increase engagement and motivation. Plass et al. (2015) stress that definitions of GBL mention that it is a type of learning with defined learning outcomes; and that the design process of games for learning "involves balancing the need to cover the subject matter with the desire to prioritise game play" (p.259). According to Gaydos (2015), research on educational games must develop ways to "share products and processes associated with design so that the community may reliably produce, use, and test educational games" (p. 480). This study aims to offer one of such ways.

Scholars underline that university teachers continue to strive to support the uptake and use of digital technologies in their teaching; and that design, collaboration, and sharing of TEL solutions is important for the advancement of the application of digital technologies in higher education (Lindqvist, 2019). The game presented in this study was created to support such processes as design, collaboration, and sharing of TEL solutions. Furthermore, students can take an

important role in informing how TEL activities could be designed and implemented in higher education (Gros & López, 2016). In the co-design process, it is critical to involve other people who "may be directly or indirectly affected by the outcome of a project. In TEL, co-design has proved to be useful in fostering stakeholders' [students and teachers] engagement, collaboration, and empowerment" (Durall et al., 2020, p.203). Yet, opportunities for students to contribute as co-designers of TEL activities have so far been scarce (Gros & López, 2016), with few exceptions (e.g., Garcia et al., 2018). To address this gap, we involved students and teachers in the co-design process.

The following research questions have been posed:

1. What are the perceptions of the participants about the game?
2. Can it be used for the purposes of eliciting learning design solutions in technology-enhanced learning?

The remainder of the paper is structured as follows: the background section discusses the value of GBL, other existing LD tools or approaches, and the use of cards for TEL design-related issues. Section 3 presents the game design, its cards, and its rules. The methodology section focuses on the instrument used, the profile of the participants and on processes of data collection and analysis. Next, main results from the evaluation of the designed game are presented. Finally, the paper concludes by proposing recommendations for educators who aim to adopt the card game in their teaching as well as design guidelines for LD systems, and discusses the results to spur further reflections on LD for TEL in higher education.

2 Background

2.1 Game-based learning

Currently in TEL there is a confusion between GBL, gamification and serious games. While trying to distinguish between these three is out of the scope of the paper, it should be noted that a basic difference is that GBL achieved by educational games does not need to be digital (as the case herein), in contrast to gamification and serious games (Martens & Mueller, 2016). Regarding educational games, researchers have earlier shown interest in designing and testing them (de Freitas, 2018). Boyle et al. (2016) for example, suggest that educational games can facilitate learning on behalf of the game participants by captivating their attention and engagement. Game elements that support engagement are: structural game elements that influence players' thoughts and actions (e.g., objectives, roles, and progress), elements that provide opportunities for interactivity, participation and involvement (e.g., conflicts and procedures), elements that trigger a sense of enjoyment and fun (e.g., challenges and story), and elements that attract players' attention (e.g., text, video, animation; Abdul Jabbar & Felicia, 2015).

Learning processes that can be effectively supported by educational games involve students taking an active role by applying their knowledge, making

decisions, solving problems, developing their creativity, and by communicating and collaborating with their peers (Henderson et al., 2019; Limantara et al., 2019). Yet, others suggest that rather than investigating whether educational games can be effective, one should focus on how–or under what conditions–they can be effective (Clark et al., 2015). Consequently, to increase the effectiveness of educational games, several design principles have been offered (see e.g., Gee, 2005; Schrier, 2019). First, the purpose of the game has to be made clear to the participants beforehand. Second, the participants need to have the necessary knowledge of the game rules and its content in order to relate it to their previous knowledge as well as to learn new skills and knowledge (Eberhardt, 2016). Also, when creating educational games learning materials are needed to be well integrated into the gameplay (Choi et al., 2012).

Games can be classified into different genres, such as simulation, strategy, and role-playing (Chen et al., 2017), and they often have well-defined rules and objectives (Braad et al., 2019). However, the problems that the participants face during a game are often open-ended, i.e., they rarely have a correct answer and instead, there is often a range of solutions that are 'right'. There can also be a range of solutions that are clearly 'wrong'. Participating in an educational game involves applying knowledge to the solution of a problem and analytic skills. Educational games can yield both cognitive and attitudinal benefits (Katsaliaki & Mustafee, 2015; Marfisi-Schottman et al., 2018). Yet, a systematic review (Abdul Jabbar & Felicia, 2015) examining learning in GBL exhibited that 49% of the papers included in the review aimed to support skills' acquisition; 47% aimed at knowledge acquisition, and only 4% aimed at behaviour or attitudinal change. An example of the latter involves the case of Burkey et al. (2017), in which a 'Cards Against Humanity'-style card game was tested for increasing the awareness of engineering university students on ethical issues in the profession. The results of integrating this card game in the course curriculum showed increased interest and engagement among the participating students in engineering ethical dilemmas.

2.2 Other LD tools and approaches

Over the past years, researchers have proposed several LD tools and approaches but their adoption among teachers has been low (Pozzi et al., 2020). One reason is the difficulty of charasterising the LD process as a whole on behalf of the educator who creates the LD in a unified way. For example, it can be systematic or it can be creative; it can be flexible or structured. Another challenge concerns representations or 'languages' that describe the LD process in a way that is appealing for educators (Pozzi et al., 2020).

There is an abundance of frameworks for the lifecycle the LD process. According to Muñoz-Cristóbal et al. (2018), this is due to the absence of a common vision on the conceptualization and scope of the LD. A recent example (Pozzi et al., 2020) presents a model that comprises three phases: a) conceptualization (e.g., defining learning objectives, identifying content areas to be addressed and pedagogical strategies), b) plan the flow of activities (e.g., identify tools and resources to be used),

and c) enactment of the LD ranging from a single learning activity to a whole course using some (digital) learning environment.

In addition to frameworks, research has been focusing on the creation of tools and artefacts that can be used in the various phases of creating a LD. For example, to help educators conceptualise the learning situation, some approaches suggest the use of artefacts such as sketches, notes and drawings (Muñoz-Cristóbal et al., 2018). However, despite the existence of several LD tools and artefacts, support for collaborative learning design is still scarce (Martinez-Maldonado et al., 2017). Notable exceptions include a few computer-based tools: the 'Ld-shake' tool, an environment created to facilitate team-based LD (Hernández-Leo et al., 2014) and the 'Educational Design Studio', which is an ecology of devices (e.g., multi-surface technologies, computers, cameras, microphones) and artefacts (e.g., notes) that support the co-creation of LDs (Martinez-Maldonado et al., 2017).

2.3 The use of (card) games for TEL design

The approach that closely resembles the one described herein is the GRASP (a TEL design framework) card game. It was adopted in a workshop of the Annual Conference of the Association for Learning Technology in 2018.[1] GRASP is a card-based gamified approach that aims to simplify the process of selecting tools and incorporating them into effective teaching and learning. The GRASP approach aims to: 1) conceptually link pedagogy with technology tools, 2) enable a flipped learning style for rich learning experiences, 3) focus on VLE activities and online course design, and 4) encourage participation and collaboration between students and staff.

The remainder of this section describes two card-based gamified approaches that–although their scope is different from the scope of our approach–touch upon using TEL and cards to achieve the learning objectives at stake (first case), or using cards and GBL to achieve TEL-related learning objectives (second case). The first case involves the work of Buchner and Kerres (2020) who presented Augmented Reality cards (for computer science education), which can be used by the students to learn and practice with their smartphones. Each card depicts a component of a classic computer system as a two-dimensional representation. The instructional approach adopted follows the 3C model which comprises three components: content, construction, and communication. The content facilitates the acquisition of knowledge, which is further applied via problem-based learning activities that revolve around technical issues that students need to tackle (construction). Communication takes place between learners in the case of collaborative learning activities, as well as between learners and the teacher when the latter provides support. The second case involves the work of Broos et al. (2020) and demonstrates the methodology and the results from a reusable workshop format named WETS (**W**orkshop for obtaining **E**ducational **T**echnology at **S**cale) using a card-based approach to coordinate Learning Analytics policy making and implementation

[1] https://altc.alt.ac.uk/2018/sessions/grasp-a-technology-enhanced-learning-design-framework-18-18/

at scale. The goal was to use this format as a pragmatic approach and instrument to engage stakeholders in the realization of projects aiming at implementing TEL innovation that mostly focus on learning analytics at an institutional scale, within a higher education institution. Based on preliminary empirical results, the authors argue that WETS can foster constructive discussion and improves awareness, and that its main output, i.e., a timeline of priorities, is a valuable input for the project teams.

3 The card game

3.1 The cards

The game consists of 64 cards that were created from scratch and made available in print format to the players. The cards are divided into seven categories that correspond to the components of a TEL situation: 1) Assessment, 2) Criteria, 3) Methods, 4) Personas, 5) Missions, 6) Subjects, and 7) Tools. The groups of players use these cards to suggest an idea about a TEL solution. The card categories cover a wide range of themes, approaches, and possibilities within a TEL environment. For example, the 'Tools' category comprises a series of digital e-learning tools and systems, e.g., learning management systems and classroom response systems. The 'Subject' category pertains to the subject matter taught (e.g., quantum mechanics). In the 'Methods' category, one may find examples such as mobile learning, problem-based learning, etc. The 'Missions' category involves broad goals considered from a students' viewpoint, e.g., fair and transparent assessment, help students learn from each other, promote autonomous lifelong learning. The 'Criteria' category pertains to goals that justify the use of TEL, including constructive alignment (Kandlbinder, 2014), promoting higher order thinking, and stimulating active learning. The 'Mission' category, in combination with the "Criteria" category is the basis upon which one can judge whether the TEL solution that is suggested by the players is good or not. Moreover, a blank card named 'Other' is added to the cards in case participants want to add a free choice to any of the categories. Each card comprises an illustrative figure and some accompanied brief, simplified text that aimed to explain what the card is about (see Fig. 1 for an example).

3.2 The game rules

Succinctly, the rules of the game pertain to each group performing the following steps: i) shuffle and select cards that together set the broader context of the TEL solution i.e., three cards in the categories of 'Persona', 'Subject', and 'Mission', ii) shuffle and select cards that together set the approach of the TEL solution i.e., four cards in total from the deck in the categories of 'Methods', 'Tools', and 'Assessment', and iii) select a 'Criteria' card (in addition to that of 'Active Learning', which was selected by default for all groups). Picking up the cards themselves involves a

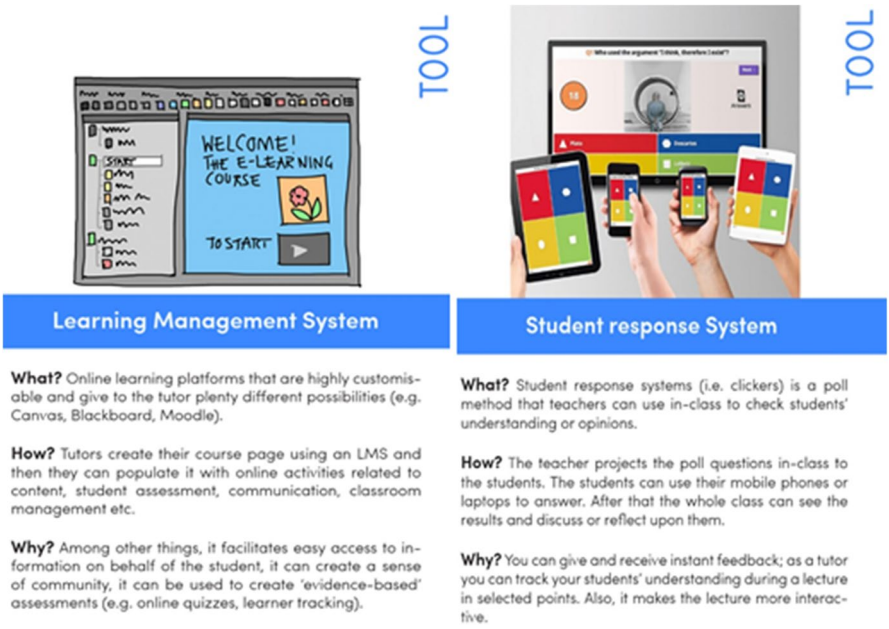

Fig. 1 Example: two cards of the 'Tools' category

random selection as the cards–similar to most games of cards–are one-side only and facing down.

Playing the card game involves exploring in a joyful manner various ways of teaching and learning with technology. The game itself focuses on two rounds of hands-on activities that consist of: 1) creating a worst-case scenario, and 2) the best possible scenario of a TEL solution. The worst-case scenario is each time a scenario that creates a 'bad' (or undesirable) TEL solution with respect to the mission and the criteria at stake. The aim of the game is to explore and establish relationships between these several components of a TEL solution and thereafter, to explain how they fit together in a learning activity, as well as to reflect and explain why a TEL activity is bad in the first round and good in the second round. This is achieved by comparing and contrasting the different solutions and exploring how they fit together in a learning activity, while reflecting on the possibilities and the challenges of technology. The cards are licensed under an open license (Creative Commons license) and they are freely available online.[2] Fig. 2 depicts a scene of the gameplay during the workshop where a group is trying to combine the cards into a coherent TEL solution.

[2] https://www.dropbox.com/s/abumknc1aroalsp/ALL_CARDS_CC.pdf?dl=0

Fig. 2 Game play during the workshop of a group in the process of making a TEL scenario

4 Method

The study adopts a case study research design with non-probability sampling (purposive sampling) intended to examine the effect of the game and answer the research questions.

4.1 Participants

Participants that attended the workshop were the university teachers and students that were interested in the topic e.g., a playful approach towards the conceptualization and the design of TEL activities. In their vast majority, they were either master students or university educators from various countries (For more information about them, see Section 5).

4.2 Data collection

To understand participants' attitudes towards the designed card game and the process of playing it, a written evaluation form that included a questionnaire was disseminated to the participants at the end of the workshop. The questionnaire was novel designed (i.e. it was not an adopted scale), since the papers that are mentioned in the background section did not include any research instrument that could be reused or modified for the purpose of this research. The questionnaire

was validated in a pilot with a small number of faculty members. It included questions concerning:

(1) basic demographics (age and occupation)
(2) whether the purpose, the goal and the rules of the game were clear to the players (in a 5-point Likert scale, ranging from "not at all" to "very much")
(3) a description of the set of cards, a description of their TEL solutions, and a justification from them of why the 'bad' TEL solution that they came up with was bad and why the 'good' TEL solution was good (open-ended question)
(4) what they liked and what they did not like about the game (open-ended question), and (5) any comments they might had about the game (open-ended question).

Filling in the survey was not mandatory, and the data collected were handled by the researchers in line with the new EU General Data Protection Regulation (GDPR).

4.3 Processes

The game was tested empirically in a three-hour interactive workshop that took place in the International Conference on Interactive Mobile Communication, Technologies and Learning (IMCL)which took place in Greece in 2019. The workshop was held in English and the cards' content was also designed in English. The workshop was not compulsory for the conference participants. The structure of the workshop resembles the one described in Broos et al. (2020). At the beginning of the workshop, the workshop organisers introduced the game to the participants (purpose, materials, and rules) and explained the workshop format. Next, the participants were grouped randomly into groups of five-six persons to play the card-game. While they were playing the game, the workshop's organisers (two of the authors of this paper) were answering questions if something was unclear to the participants. At the end of each of the two rounds (i.e., the worst-case scenario and the best-case scenario), the results of the groups were discussed. In total, the two rounds lasted around two hours. The winner of the first round was the group that had thought of the worst TEL solution with respect to the criteria cards that the group had selected, and the opposite was true for the second round. The winners were decided by the participants through voting. At the end of the game, a small closing session took place, and the participants were asked to fill in the survey instrument in a paper format, individually and anonymously.

The quantitative data (points 1 and 2 described in the previous section) were analysed using basic descriptive statistics. The qualitative data (points 3 to 5) were analysed manually using Grounded Theory having no pre-conceived dimensions or conceptual categories in mind. That is, the analysis was performed in a deductive manner allowing the main codes to emerge from the data, following the steps of the process described in Allan (2003).

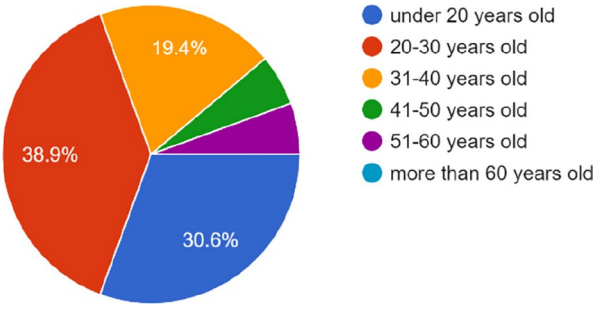

Fig. 3 The distribution of the participants across age groups

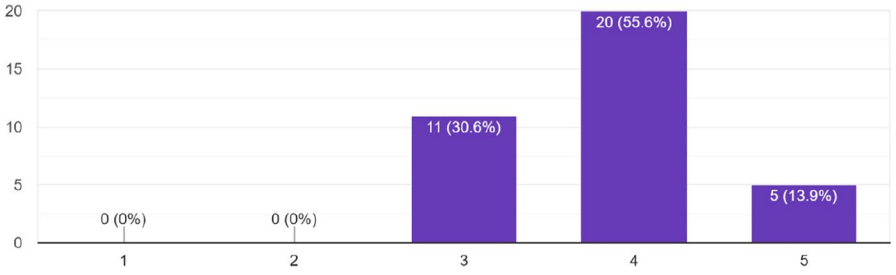

Fig. 4 The distribution of the participants' answers regarding the goal of the game

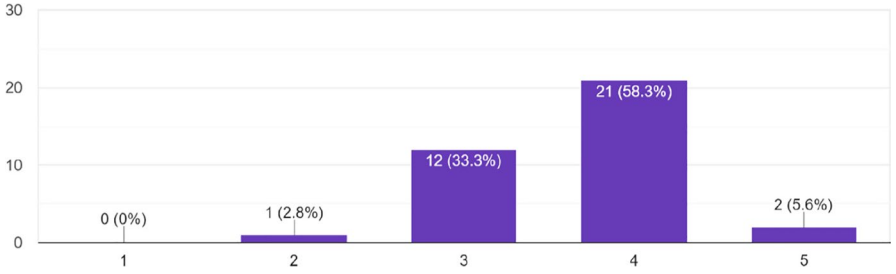

Fig. 5 The distribution of the participants' answers regarding the rules of the game

5 Results

5.1 Participants' profile

In total, 40 persons participated in the workshop; 36 of them answered the survey. Figure 3 depicts the distribution of the participants across age groups. As it is shown in the Fig. 3, the age range was very broad. In terms of occupation, eight were faculty members, twenty-four were master students, two were educational consultants at universities, and two were researchers working in higher education.

Table 1 The most frequent answers

Positive comments (word/expression, times mentioned)		Negative comments	(word/expression, times mentioned)
Teamwork	9	Time constraints/ limited time given to the players	11
Collaboration	4	Confusing/difficult to understand game rules / instructions	10
Communication	3		
Interaction (with team members)	3		
Creativity	3		
Fun	3		
Sharing different point of views/different perspectives	3		

5.2 Evaluation of the workshop by the participants

Figures 4 and 5 illustrate the participants' responses on whether the goal and the rules of the game were clear. As shown in Fig. 4, the majority of the participants answered positively or very positively regarding the clarity of the goals of the game, whereas Fig. 5 demonstrates that the majority of the participants were moderately or somewhat satisfied regarding the clarity of the game rules.

Table 1 presents the results of the qualitative analysis and shows the main concepts that emerged from the participants' comments with respect to what they liked on the one hand, and what they disliked on the other hand, regarding the game. Also, the table shows the frequency of occurrence i.e., times mentioned by different participants. On the positive side, the four most frequently mentioned aspects indicate that the social aspect of the game worked well if we aggregate the comments that claim that it promoted teamwork, collaboration, communication, interaction with the groups, and sharing of different perspectives. On the negative side, there existed two main hurdles, namely, time constraints and difficulty to understand the game rules or the instructions given.

5.3 An example of the participants' TEL scenarios

This section describes the participants' TEL scenarios of one group for illustrative purposes. Eliciting information about the cards used, the 'bad' scenario and the 'good' scenario was performed by the authors via aggregating information from the participants' responses. Thus, the excerpts used are taken from the participants' answers in the survey.

- Cards used: 'is this in the exam' student (Persona), feasibility and active learning (Criteria), student response system, interactive whiteboards (Tool), 3–2-1 bridge (Method), Diagnostic assessment (Assessment), help students learn from each other (Mission), Recursion in programming (Subject).

- 'Bad' scenario: To check students' prior knowledge in mathematics, which is a prerequisite for the topic of recursion in programming, initially the tutor administered a questionnaire which can be answered via a student response system using a dedicated mobile application. Via this app students are graded based on their answers on the questionnaire. No feedback is given to the students with respect to why they were right or wrong in their answers. Then, the teacher suggests to the students a book for self-study. From the book, the students can draw information that will help them pass the exams. It is a bad solution because it doesn't help students to learn, since is doesn't promote their understanding and it is boring for the students.
- 'Good' scenario: It involves a gamified student response system like Kahoot on mathematics used for diagnostic assessment, where the questions involve real-life examples. Students are informed that recursion will be part of the final exam. The interactive whiteboard is used as a tool to learn mathematics along with the method 3–2-1 bridge and the mission 'help students learn from each other'. The answers are combined, synthesizsd and displayed in the interactive whiteboard. The students exchange opinions with each other and the tutor, while the tutor keep notes on the whiteboard. More concrete conclusions emerged about what recursion is. The students learn through interactive examples illustrated via the interactive whiteboard (e.g., the queens' example) and discussions. Finally, the students cooperate to solve an exercise at home.

6 Discussion

This paper introduced a card game and the associated workshop format, presented the conceptions of the participants, and illustrated a typical example of the outputs of the game from one group of participants to show whether the game can be used as a means of eliciting knowledge regarding co-designing TEL activities. In particular, as a means of capturing the components of a 'bad' and a 'good' TEL scenario, and a justification of why a selected scenario is good or bad.

The results have shown that the goals of the offered game were clear to the participants at a great extent, and the instructions of the game were moderately understandable for the participants, in the sense that at the beginning some of them (10 out of 36 participants) felt somewhat confused. Also, some (11 participants) mentioned that more time was needed. Yet, the majority of the participants (22 participants) seemed to appreciate the social aspect of the game, since they thought that it promoted teamwork (nine participants), collaboration (three participants), communication (three participants), interaction within the groups (three participants), and sharing of different views (three participants). Moreover, fun and creativity were also mentioned by a small number of participants (three participants for each concept). In total, one could argue that, according to the participants' views, the game promotes in a playful manner the application of twenty-first century skills in combination with the design of TEL activities. Finally, the workshop format also enabled data collection which can help towards documenting the TEL scenarios of the groups.

These findings are in line with the work of Burkey et al. (2017) who claimed that the participants of their GBL approach showed increased interest and engagement. In addition, they are in line with the case of the GRASP approach in the sense that both approaches encouraged participation and collaboration in conjunction with LD for TEL. Furthermore, as in the case of Buchner and Kerres (2020) who introduced a card game that employ Augmented Reality for Computer Science education, the findings herein also revolve around extended communication and collaboration among the game players. Finally, the proposed approach presents an alternative and joyful solution for the facilitation of team-based LD that supports the co-creation of LDs not via the use of computerised environments (as in the case of the 'Ld-shake' and the 'Educational Design Studio' software tools), but via an 'analog' (i.e. physical) game.

7 Conclusion

LD aims to help educators to describe and to share their ideas, but much of the work on LD for TEL has been focusing either on prescriptive approaches on how LD should be, or on the representations of learning designs in formats that are interpretable by computers (Muñoz-Cristóbal et al., 2018). Recently, the emphasis has shifted to the process of eliciting representations from tutors, i.e., a phenomenon that could be studied organically through participatory design approaches that actively involve the main stakeholders of higher education (Flynn et al., 2018).

Furthermore, there are several frameworks and tools that provide support for the conceptualization and the design phase in the lifecycle of TEL activities. However, only a few of them cater for collaborative design and to our knowledge, none of them is promoting GBL. GBL is important since research has shown that it can promote engagement among the participants, which is crucial in the case of designing TEL activities. According to the literature, involving stakeholders in this process has been difficult and the adoption of LD approaches for TEL suggested by researchers has been low so far. Todorova and Moffat (2016) argue that games should be part of university curricula and that we should look at how to include them to positively affect students' learning.

With respect to these two main aforementioned challenges, this study has presented a participatory design approach for TEL that seeks to elicit LD representations and solutions by actively engage its participants, i.e., university tutors and students, through GBL. In particular, the main questions were focusing on a) the perceptions of the participants about the game and b) whether it can be used for the purposes of eliciting learning design solutions in TEL. The game suggested herein actively engages these stakeholders in the processes of designing, collaborating on, and sharing of TEL solutions. Through the suggested workshop format, university tutors and students have the opportunity to contribute as co-designers of TEL activities, since the workshop format involves them into working together in groups in a playful manner to co-design TEL micro-scenarios/activities. The workshop format can be used by tutor trainers (e.g faculty trainers, school teacher trainers) in order to understand the participants' design choices when they are acting spontaneously in a

design space full of possibilities, without any supervision or guidance that embeds prescriptive guidelines for TEL. This can be used for instance, as a diagnostic tool for the faculty trainer in the context of a professional development program or for stakeholders that are interested in mechanisms that give voice to students and promote their role as co-designers (e.g., TEL experts and instructional designers, university tutors).

The study also could be considered in terms of offering new and alternative suggestions for TEL researchers, practitioners and systems builders. In particular, the literature suggests that collaborative approaches that support the co-creation of LDs are limited to a few software tools. Although the effectiveness of these tools has been empirically tested, none of them supports GBL. Yet, it emerged from the findings that a GBL approach could sustain engagement in the co-creation of LDs. This study is unique in the sense that it provides empirical evidence to that. In contrast, the GRASP approach is similar but no empirical evidence was found in the literature for it. Thus, an ensuing recommendation would be to focus future efforts on enhancing the already existing LD collaborative systems by embedding GBL to them or to build new software tools, and test them empirically. In doing that, one should be careful with respect to the clarity of the game rules and the time allocated to play the game, as it emerged from the findings.

Limitations of this study pertain to the small number of participants, which in turn has an impact to the generalisability of the results. Yet, no unanticipated challenges emerged during the workshop. Also, that the study is based on self-reported data which can contain possible sources of bias. Future plans include finetuning the workshop format so that it has a longer duration and to run the workshop again with a larger audience. In general, since there is a limited number of games for TEL, more research is needed on how games can be designed and used for the purpose of eliciting from the participants learning design solutions in TEL, or for similar purposes. Furthermore, the authors invite other researchers to use the cards and the game in their own relevant educational settings.

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Data availability Data is available upon request.

Declarations

Consent to participate Written informed consent for participation was obtained from the study participants.

Conflict of interest We declare no conflict of interest.

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