ScenLRPG, a board game for the collaborative design of GBL scenarios: qualitative analysis of an experiment

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Abstract: This paper presents the results of an experiment with ScenLRPG, a tool intended to foster collaboration during the design phase of GBL scenarios. Based on a specific graphic formalism, ScenLRPG allows groups of designers to describe scenario elements so as to justify and negotiate their design choices. The version presented is comprised of a board game featuring cards and tokens. The aim of the experiment was to test hypotheses regarding three main issues: the method's propensity to favour designer collaboration, its ability to offer new ideas, and the pros and cons of a board game design tool versus a computer-based environment. The experiment was carried out with the help of fifty-six subjects at a GBL summer school, to test hypotheses, gather user needs and improve the tool. Qualitative analysis of the experiment has highlighted improvement areas with regard to the three issues targeted.

Keywords: collaborative design, role-playing games, learning scenarios, professional training

1. Introduction

1.1 Context and challenges

Today, fostering change within training schemes is a key issue in both the academic and professional spheres. To increase learner commitment and develop particular skills, game-based learning and participatory instructional methods appear to offer promising opportunities. A significant barrier to change stems from the day-to-day habits of instructional designers and the culture initially instilled in them. As students, they were trained using transmissive instructional methods and seldom benefitted from collaborative or game-based learning. One way of influencing change could be to give instructional designers the opportunity to experiment with these alternative methods as part of their professional work. To make this possible, we created a board game tool to support the instructional co-design of Game-Based Learning scenarios. Based on a specific method and formalism (Mariais, Michau and Pernin, 2011), the board game proposed allows teams of instructional designers to build scenarios using cards and tokens (see figure 1).

Figure 1: A participative "learning-design" situation

To assess the benefits of this kind of "design game" and the associated method, we tested it with a panel of fifty-six novices and experts in the field of instructional design. Our main objective was to test hypotheses regarding three key aspects: the collaborative work enabled by the method, the method's

ability to offer new ideas, and the pros and cons of a card game design tool versus a computer-based environment.

1.2 Scientific background: Flexible Learning Design and Learning Role-Playing Games

Our research focuses on the learning design activities of practitioners, a term used to designate pedagogical specialists involved in the design of technology-based learning environments. Depending on the context, this specialist can be a teacher, a trainer or a pedagogical engineer.

Important work has been conducted in the field of learning design since the beginning of the 2000s, to propose formalisms that support the work of designers and which are able to produce computable representations of learning scenarios, playable on Learning Management Systems. Various modelling approaches have succeeded one another, based on different representations of the behaviour expected of the learner. Three main approaches can be identified.

The *documentary approach*, centred on resources, considers learning design as the organization of a set of interoperable learning objects within a learning path (Duval et al., 2001). With this approach, the learner's task revolves around the individual consumption of learning objects, digital or otherwise, according to a sequential process. It is the most commonly used method in professional e-learning.

The *prescriptive approach*, centred on tasks and inspired by workflow techniques, has been popularized by (Koper and Tattersall, 2005) and the IMS Learning Design specification. It differs from the previous approach in that it focuses primarily on performing tasks. With this method, the designer must describe activities, actors, roles and the environment (resources, services) in which these elements exist.

The *flexible orchestrating approaches*, which are centred on interaction and stem from CSCL (Computer Supported Collaborative Learning), argue that too restrictive a description of the tasks involved may induce an "overscripting" that reduces the effectiveness of learning situations (Dillenbourg and Tchounikine 2007). Thus, the designer must describe *learning spaces* or *interaction spaces* in which flexible interaction modalities are defined. These modalities may encompass roles, guidelines, rules and the results to be produced, without constraining the tasks to be performed by each participant. Here we find some of the fundamental characteristics of games.

Based on the latter of these three approaches, we have developed a set of models and methods to facilitate the design task. We have put forward an *explicative* approach allowing designers to precisely describe context elements and their purpose, so as to guide their design choices. The ISiS model (Emin, 2010), founded on the principles of goal-oriented design (Van Lamsweerde, Dairmont and Massonet, 1995), offers three nested levels of design: intentions, strategies and interaction spaces. Based on this generic model, we have developed several authoring tools, one of which is specifically devoted to Leaning Role Playing Games (or LRPG). This choice was made chiefly because of the known benefits of such an approach in industrial training, as demonstrated by Thiagarajan (1992). In addition, transposing role-playing games from a "face-to-face" context to a hybrid digital environment appears to be a promising avenue, since it allows for a trainee’s time and geographical constraints.

The PhD undertaken by Mariais (2012) relates in particular to the use of “game mechanisms” to support the designer's task. This work has resulted in the iterative development of a graphical formalism geared towards supporting the designer in the development of innovative “role-playing game” scenarios, as well as enabling them to run ideas by other designers or clients. Based on a “user-centred design” approach, as defined by Maguirre (2001), this formalism, dubbed ScenLRPG, has been refined in its successive versions. The first two versions focus on individual design contexts, while the third has more of a focus on participatory design.

The first version, which aims to verify whether the practices of designers are compatible with a very flexible "paper-and-pencil" tool, can be adapted to a wide variety of individual users. This version was successfully tested on twenty different types of instructional designer. With the second version, we developed a digital version of ScenLRPG, which was tested on a dozen designers. While this second experiment demonstrated the benefits of using a computer in terms of accessibility and reusability, it displayed obvious limits when transposed to a co-design context. How can different designers express their point of view? How is it possible to converge towards a consensual design solution?

For these reasons, we decided to return to more "tangible" material for the third version of the ScenLRPG formalism, which is centred on co-design. Thus, we have developed a specific "design game" inspired by traditional board games. This is the version of ScenLRPG we present in this paper and which we tested with fifty-six participants at a summer school.

2. Description of ScenLRPG

ScenLRPG is a board game comprising the following types of material (see figure 2):

- a set of *white cards*, broken down into N categories: *activity cards* and *management cards*
- a set of *grey cards*, explaining the rules and the meaning of the symbols used on the white cards
- four sets of *coloured tokens*, where each colour represents a characteristic to be assigned to one activity card: *game principles* (a list of seven is selected), *modality* (distance/presence, synchronous/asynchronous), *collaboration rules* and *tutoring rules*. Each token can be placed on an activity card, in the corresponding area marked by a circle.

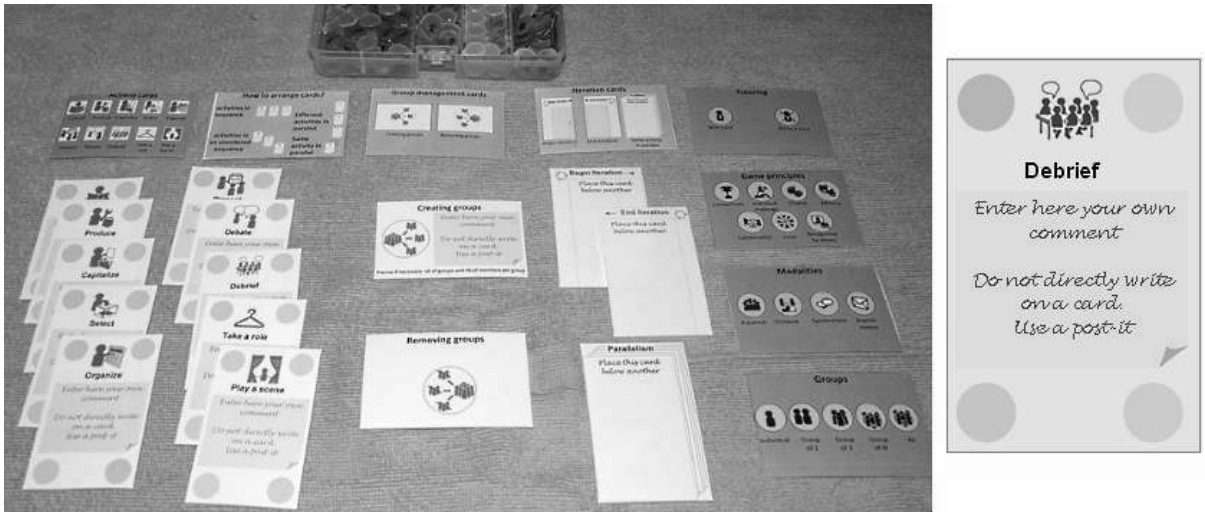

Figure 2: An overview of the *ScenLRPG* material and an example of an "activity card"

Figure 3 provides three examples of grey cards. The first shows the ten different types of activity proposed. This list was defined from a learner perspective: *what is the main task I have to perform, in terms of information processing or role management?*

The second example shows a grey card explaining the various tokens to be used. This example relates to pink tokens (*game principles*) and presents seven mechanisms stemming from a wide array of existing major propositions, based primarily on the work of Caillois (1961) and Klabbers (2008).

The last card shows the rules for arranging cards to represent the way in which activities are organized.

Figure 3: Examples of grey cards (explaining the rules and the meaning of the symbols used on the white cards)

For the players, the overall aim is to propose a learning design scenario for a given training requirement using the cards. This training requirement is usually described in text form, in a more or less detailed way. To build the solution the designers must:

- organize the cards on a table, according to the arrangement rules, to represent the way in which the activities are organized;
- add a comment to each card using a "post-it" detailing any information they consider relevant;
- place the tokens on the activity cards, to specify properties or justify their choices

3. Characteristics of the experiment

We are still in the process of building ScenLRPG. Before it can be finalized, we must explore the needs and expectations of users by adopting a co-design approach. To do so, we decided to provide end users with an initial prototype version so as to improve the proposition. To build the experimental protocol, we drew from the concepts of Design-Based Research (Wang and Hannanfin, 2005) which recommends working in an iterative fashion from the design stage to final implementation, with the participation of researchers and users alike. This allows both qualitative and quantitative approaches to be applied side by side. Qualitative methods are employed primarily during the exploratory and design phases at the start of the process. Quantitative methods (surveys, trace capture) make more of an appearance during the assessment stage at the end of the process. In our particular study, which is at the design stage, the methods implemented are qualitative and allow us to observe the user, understand the various phenomena that occur and make improvements.

From a practical point of view, the experimental protocol was drafted in full, with a detailed activity grid specifying instructions and timing for the experiment, to ensure its reproducibility. The data produced includes audio and video recordings, as well as the answers written in the assessment grids. The qualitative data was analysed according to Spencer, Ritchie and O'Connor (2003).

The aim of the protocol developed was to: (1) observe the collaborative use of ScenLRPG in building a scenario that makes use of game mechanisms, (2) assess whether the tool boosts creativity and favours collaboration and (3) pinpoint the improvements that could be made to the tool.

The experiment took place during the 2011 Game-Based Learning Summer School, organized by the Stellar network. The experimental subjects, all Summer School participants, were involved in research in the area of Game-Based Learning. They included both novices and experts in the field and were aware of its fundamental notions. Before the experiment began, we created groups according to each subject's profile, mixing together computer science specialists and educational science specialists. We set up 16 groups of three to four people, spread over two sessions, i.e. a total of 56 participants.

To carry out the study, we placed the participants in a role-play context broken down into two phases. First, they were asked to play the role of industrial spies assigned the task of copying a competitor's secret instructional-design method, to discover and understand the formalism of ScenLRPG. An extract of the instructions provided is shown in figure 4.

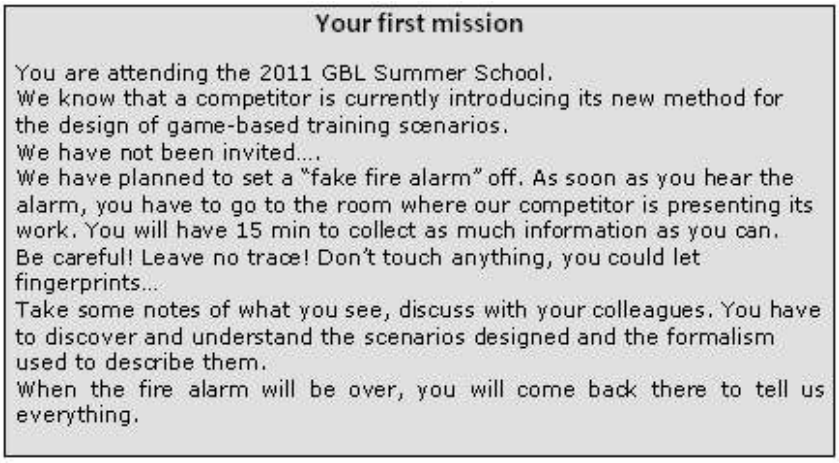

Figure 4: Extract from the instructions for the first task assigned to the subjects

The instructions were given to all the participants during a preliminary session. The groups were then split into two rooms in which two experimenters were charged with observing the groups activities .

In the second phase of the experiment the participants were given a new assignment, in which they were given a certain amount of time to produce a scenario relating to a new training requirement using the ScenLRPG formalism (see figure 5).


Your second mission

You certainly know that our company has now adopted a new design methodology called ScenLRPG.
Yesterday, I have heard about a new call for proposals (PhDTrain project). It has been launched by the government. The submission deadline is tomorrow.
GABALSO absolutely wants to submit a proposal.
The aim of the PhDtrain project is the development of an international training program dedicated to new PhD students.
At the end of training the Phd students should have the following abilities:
- ability to prepare presentation material
- ability to conduct an oral presentation, and to defend a scientific work in various contexts (conference, seminar, PhD defense).
The training must fulfil the following conditions:
- organisation and duration: 2 sessions of 4 hours each separated by a week.
- training scenario must use game principles (particularly collaborative activities) in order to favour the PhD students' engagement.
A jury will be gathered within GABALSO members this evening in order to choose the best propositions.
You now have to prepare a proposal using the ScenLRPG method.
When it's done send us a picture of your proposal.
Let's get inspired!

Figure 5: Extract from the instructions for the second task assigned to the subjects

Before detailing collected users opinions, we present some characteristics of the scenarios produced during the experimentation.

Firstly, all the groups succeeded, within the time limit, in producing achievable scenarios matching with given instructions (conformity to the command, proposing collective game-centered solutions),
The produced scenarios share some common chacteristics such as:

- the scenario breakdown between different phases alternating present and distant activities;
- proposing group activities integrating resource creation, brainstorming, debates, voting, etc.

More precisely concerning the use of game mechanisms, the following points can be underlined:

- *Role-playing* is mainly used to simulate an oral presentation. For example, the doctoral student had to make a presentation in front of an audience composed of different profiles: peers, conference participants, supervisors, jury members, actors dealing with the treated question etc. Certain roles can match with specific behaviors mixing benevolent or critical attitudes.
- *Alea* is used for different goals : (1) proposing to students a unknown subject in order to put them on a equal footing ; (2) defining the presenting style or context (poster, conference, thesis defence) ; (3) triggering a disturbing event during a presentation (videoprofector failure, falling of a series of documents, charge of plagiarism, etc.).
- *Competition* is often used for selecting the "best presentation".
- *Debriefing* is used in a systematic way as the last phase of a scenario.

At the end of the experiment, the participants were asked to express in writing what they thought were the positive and negative aspects of the five points listed in figure 6.

Give your opinion on the following topics	What you like +	What you don't like -
The scenario produced through your work		
The collaborative work made possible by the method		
The method's ability to offer new ideas		
The gaming aspects of the method		
The benefits of a card game design tool vs. a computer-based environment		

Figure 6: The final questionnaire handed out (the topics covered in this paper are in bold)

To perform the experiment, various material had been created: (1) a scenario in LRPG format allowing the experimenters to control the protocol's execution, (2) a presentation of the instructions, (3) an annotation grid to record the order in which the game objects are used and the points at which collaborations take place, (4) a document indicating to the experimenter what annotations they should make during the experiment and (5) the questionnaire shown in figure 5.

A recorder was placed on each table to record the conversation between the members of the group. Each group's output was photographed and the work of the two groups was filmed. The answers to the questionnaires were also recorded in full.

The method of analysis chosen was of the thematic type. It focused on the answers to the open questions asked in the positive/negative aspects grid. The aim of a thematic analysis is to group together answers or parts of answers that have the same meaning (Paillé and Mucchielli, 2003). The thematic groups were then analysed to identify the different categories of opinion, the objective being to gather and list all the themes covered by the answers, so as to reflect the widest possible range of opinions.
The analysis, which was performed by two people independently, focused on the five themes covered by the questionnaire. Their two analyses were compared to ensure that the answers could be clearly understood and to eliminate replies that were deemed ambiguous. A fresh analysis was then conducted by describing the opinions gathered, noting down the most significant answers or answer extracts, and determining the number of subjects who expressed similar opinions.

4. Qualitative analysis of the experiment
A large amount of qualitative data was collected from the experiment. Around five hundred comments were supplied by the fifty-six subjects.

We chose to focus our presentation of the experiment's outcomes on the three questions relating primarily to the ScenLRPG method and board game.

- The collaborative work made possible by the method
- The method's ability to offer new ideas
- The benefits of a card game design tool vs. a computer-based environment

This section presents the results according to Spencer, Ritchie and O'Connor (2003). The sentences in italics sum up a view reflected in the opinions of several subjects. The number in brackets is the number of subjects who expressed this view out of the fifty-six who took part in the study. The sentences in quotation marks are extracts of opinions expressed by the subjects.

When asked about **the collaborative work made possible by the method**, fifty-four out of fifty-six subjects provided a reply on at least one aspect. Among them, one expressed no positive aspects and thirty-two expressed no negative aspects.

Most of the positive aspects expressed by the subjects can be grouped into three views.

The first view can be summed up as *the method promotes collaboration among all members of the team* (15). Comments such as “great for triggering discussion”, “everyone participating” and “good for developing team spirit” illustrate this view. The second view enriches the first with the opinion that *the method favours the sharing of ideas and helps to be collectively creative* (17). The following extracts provide a good illustration of this: “effective debating, compromising, selection and implementation”, “we all participate in the creation process by contributing ideas and saying what we think is wrong with other ideas”. The third view highlights the positive features of the SCEN-LRPG board game: *the cards and the board provide effective and flexible material to aid team communication and sharing, but also for the description and modification of scenarios* (11).

Finally, the *fun and productive nature of the method* (5) was highlighted and subjects stated that *the method offers a good overall vision of the scenario and an immediate view of its structure and the iteration loops, as well as enabling a collective appraisal* (2).

As regards the negative aspects, the most commonly-held opinion was that *the method lacks a regulatory mechanism to favour collaboration between designers, regardless of their different backgrounds, and the emergence of leadership, as well as an insufficient level of organization* (8). Some users also bemoaned the fact that *the method does not allow them to describe and detail everything they need* (3), *that certain terms and cards can be interpreted differently (2) and that a minimum amount of experience in scenario design is required*. Finally, certain practical concerns such as *token instability, only one reading direction or difficult to manipulate cards and tokens together* (4) were expressed as negative aspects.

When asked about **the method’s ability to offer new ideas**, forty-nine out of fifty-six subjects provided a reply on at least one aspect. Among these, one expressed no positive aspects and twenty one expressed no negative aspects.

As regards the positive aspects, the first view was that *the method facilitates the emergence of new ideas* (10), with statements such as “very intuitive to create many different ideas” and “we produced a lot of ideas” being made.

The second view was that *the method contributes ideas while providing new elements, prompting questions* (6) *and drawing attention to game principles* (Caillois, 1961) (3). The following extracts illustrate this view:
“Different types of building blocks, as so many opportunities and so many questions to consider”, “It was good to have the various game elements in front of us, to remind us to incorporate them into the scenario”. One subject added “Great for brainstorming. Produces ideas that are clear and easily transferable to the next cycle of development”.

The ScenLRPG board game’s strengths in terms of creativity (15) were emphasized by opinions such as “the cards and tokens offer ideas, and combining them favours debate”, “No time is spent working out how to represent things, we just do it immediately”, “The fact that the scenario design task is supported by categories and patterns helps the design process” and “The method provides a very precise framework for the design space thanks to the tools and mechanism provided”.
One subject added that “the blank cards provided are very useful for expressing new ideas”.
Finally, subjects underlined the fact that *the collaborative process supported by the method stimulates creativity* (7).

As regards negative points, the most frequently stated opinion was that *the formalism may influence and limit creativity* (19). Statements such as “I often found that the availability of certain cards forced us to adopt a particular solution. What I mean is that my co-players and I often used the cards as an idea generating tool rather than as a tool to express an idea” or “Some activities were always difficult to fit into existing categories” illustrate this opinion. One subject added that the formalism “might lead to unnecessary elements being added to the scenario”. Another criticism expressed is *the lack of scenario assessment mechanisms* (2), as exemplified by statements such as “The design process may be ineffective without feedback”.

When asked about **the benefits of a card game design tool vs. a computer-based environment**, fifty-five out of fifty-six subjects provided a reply on at least one aspect. Among these, one expressed no positive aspects and twenty-four expressed no negative aspects.

As regards positive aspects, the leading view is that *tangible material offers more flexibility* (10), as underlined by statements such as “more flexibility offers more open spaces, which is better for kinesthetic users”. The latter opinion is reinforced by the following quote: “I find the sensation of touching and feeling a card more pleasant that touching a mouse”.

The second view is that *the tangible format facilitates collaborative design* (8), an opinion expressed as follows: “the cards make it easy to play with many other participants. Each person provides their own suggestions”, “a card game played by hand is better for collaboration purposes and preferable to CBE for multi-user game play”. This opinion on the collaboration process is enriched by the following view: *the tangible format is better suited to brainstorming* (3), illustrated by remarks such as “The people (the designers) in the group could discuss ideas in “real time” and complete the game => very good for brainstorming” and observations such as “you can capture a card that allows you to force the others to listen to you”. Finally, two strengths of the tangible format were pointed out. The first was that a *tangible format is more usable* (8). The points expressed include “tangible material breaks down technical barriers” and “no learning interface”. The second was that *the tangible format is more fun*, with adjectives such as “enjoyable”, “user-friendly” being employed.

The main criticisms expressed about the tangible format reflect the absence of functionalities usually available in Computer-Aided Design environments. *The tangible format lacks the editing functions needed to perform checks and find help online, as well as facilitating modifications* (6). The following remarks illustrate this view, “no undo/redo - no automatic consistency checks: are all the students in a group? Does the scenario keep to the time limit?”, “Some modifications are not easy to perform (e.g., moving a group)”, “difficult to explore alternatives”. One subject added that “it might be easier to build complex scenarios (e.g., with several levels of parallelism) using a computer”.

Participants pointed out the lack of other functions such as *scenario saving and storage* (2), *tracking of the editing process* (2) and *final operationalization in an LMS platform* (3).
Finally, the tangible format seems *neither transportable* (2) *nor robust* (1): “a design can be accidentally destroyed by bumping the table!”

As for the hypotheses tested during this co-design experiment, the results obtained seem to confirm that the ScenLRPG method and board game bring real benefits.

The first general observation we can make is that, in response to the three questions, a large proportion of the subjects express no negative aspects, while very few express no positive aspects (see figure 7).

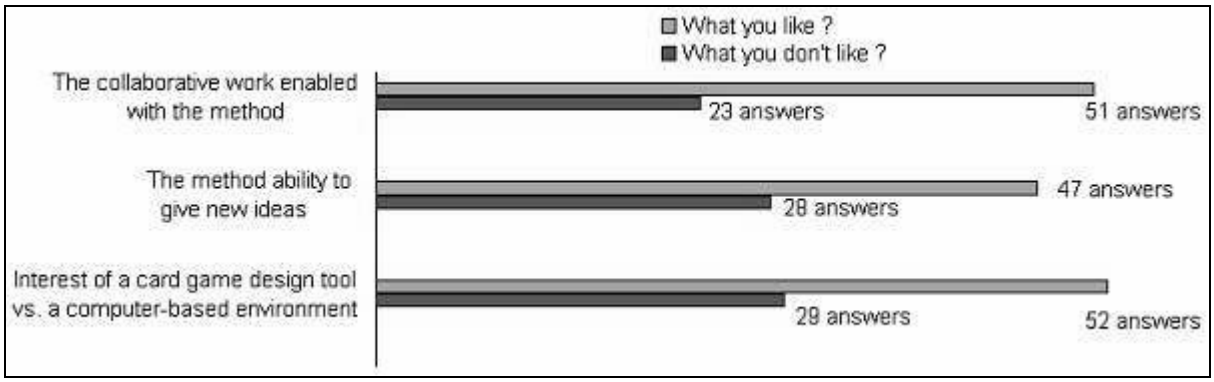

Figure 7: Answers provided to the three questions covered

There is a strong perception that the method stimulates and facilitates both collaboration and collective creativity while the tangible material is seen as flexible, user-friendly and fun. The main criticisms focus on the limitation of creativity, the influence the method may have on decisions and the lack of a regulation mechanism for collaboration. Finally, while the tangible format’s strengths are widely highlighted, the lack of basic computer functions is bemoaned.

5. Conclusion and outlook

Analysing the results of the presented experiment allows us to propose improvements for the ScenLRPG method and board game, and will help guide future work.

The key points established are that a physical game may (1) increase collaboration among members of the team, (2) facilitate the emergence of new ideas and (3) provide a flexible way of aiding communication and sharing. However, the physical format lacks the editing functions generally offered by computer-based tools, which can help designers to employ "trial and error" strategies, offer multi-level views, and reuse or retrieve shared elements from large databases. Another main advantage of computer-based tools is that they offer not just a contemplative design approach, but also a productive approach that leads to actual operationalization within an LMS. It is important to underline that advantages or the proposed methodology are not typically specific to Game-Based-Learning, and could be adopted for the design of a wider range of technology-based educational activities.

This mixed opinion shows the importance of promoting hybrid approaches to the design process. Here, this hybridisation would involve combining physical tools with digital ones, primarily during the early design stages. The objective would be to benefit from the advantages of each tool, so as to significantly improve designer creativity and collaboration. In particular, we are currently studying the possibility of combining these two types of tool using augmented-reality devices.

The last issue relates to the importance of offering two approaches with regard to creativity: creativity can be a learning objective (the aim being to develop the creativity of learners) and/or creativity can become inherent to the design process (the aim being to develop the creativity of designers). This is the underlying spirit of our approach, the aim of which is to develop the creativity of teachers and trainers when constructing "game-based learning" and, in turn, to favour the creativity of learners. A consequence of this approach.

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