# Gamify your Field Studies for Learning about Your Learners

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**Abstract.** TERENCE is an FP7 ICT European project that developed a technology enhanced learning system for supporting its learners, who are primary school children, and their educators. In the course of the project, we run field studies with a large number of learners for analysing the context of use of the system. This paper explains why project constraints triggered the gamification of the field studies, as well as how the field studies were conducted. This paper ends by rummaging over the pros and contras of gamifying field studies as in TERENCE.

## 1 Introduction

Constructivism states that learning depends on the specific learners and the context in which they learn. TERENCE is an FP7 ICT European project that is developing a *technology enhanced learning* (TEL) system for supporting primary-school children in learning to read and comprehend texts, in the main context in which this form of learning takes place—schools.

A TEL system that rests on constructivism should be designed so as to be usable and pedagogically effective for its learners, according to the learning context. As there is not a single design methodology that takes care of both the usability and pedagogical effectiveness of a TEL system, the TERENCE consortium mixes two design methodologies: one, the *user centred design* (UCD), that is iterative and places users at the centre of the design process for attaining usability; the other, the *evidence based design* (EBD), that stresses the role of empirical evidence for attaining pedagogical effectiveness. See [4]. The methodologies are used throughout TERENCE: the system is iteratively designed, starting with the analysis of the context with all the TERENCE users, and revising prototypes of the system through evaluations with users again.

More specifically, the TERENCE analysis of the learning context is concerned with (1) the characteristics and preferences of the TERENCE learners, (2) the learning tasks and their organisation into a stimulation plan by domain experts for the TERENCE learners, (3) the environment. Now, the main sources for learning about the characteristics and preferences of the learners are the learners themselves. Thus the TERENCE consortium planned field studies in UK and Italy with c. 550 learners for "learning about learners", specifically, their characteristics and preferences for the system design.

However, the TERENCE learners are children, aged 7–11 year old. There are a number of data gathering methods for interacting with learners that are adults, however, the same methods cannot be often used "as is" when learners are young children [3]: for example, [16] explains that children might become anxious at the thought of taking a test, and test taking may conjure up thoughts of school. Hanna et al. [10] give suggestions for interacting with children, in particular, they suggest that *you should not ask children if they want to play the game or do a task, that gives them the option to say no. Instead use phrases such as "Now I need you to…" or "Let's do this…" or "It's time to play…". However, the better thing is playing with them.* Druin [6] moves along the same lines, and suggests to use indirect methods to interact with children when children play the "user" role. More in general, co-design offers a series of suggestions for gathering data with children as users, where co-design is defined as "collective creativity […] applied across the whole span of a design process" [17].

When situated at school and within school activities, however, co-design has some limitations, in particular, if it is done with many learners and strict timings. See [4] for the organisational school constraints of TERENCE. For instance, schools may impose that all children of a class are involved at the same time in the data gathering, as well as that the timing of the gathering is less than a given time. Such constraints place severe limitations on the data gathering methods one can use in a project. In order to overcome such constraints, one can try to engage classes of learners as best as possible in the data gathering, so as to optimise the time constraints and the quality of the gathered data. One way for engaging classes of learners is to gamify the data gathering. Gamification is the usage of game concepts from game design in order to engage learners and solve problems in non-game situation. Therefore, in TERENCE, we planned the data gathering for the context of use (which is not a game situation *per se*) by using gamification. More specifically, we gamified field studies, borrowing and adapting methods from co-design. This paper starts outlining the essentials of co-design and gamification and, stronger with that, moves on outlining how we gamified the TERENCE field studies for the context of use analysis. The paper ends by briefly assessing the pros and contras of our approach.

## 2 The Essentials of Co-design and Gamification

This section serves to outline the essence of co-design and gamification, necessary for the remainder of the paper.

### 2.1 Co-design Overview

Co-design [17] evolves from cooperative design and participatory design. It attempts to actively involve all users in the design process in order to help ensure that the product under design meets the users' needs, and is usable. Involvement of users early in the research and ideation phases of the design of a new product is often equated to "asking users what they want". However, therein, the key and the main goal of a cooperative session is the collaboration between users for supporting anybody to imagine, express and access their experience and expectations [18]. Co-design sessions can allow us to create

a shared understanding and shared language between participants and the designers so as to understand the new product from the point of view of the participants [2]. The outputs are sources of both inspiration and information for designers and participants.

Specifically, in the area of co-designing with children, the work of Alison Druin [5,6] has provided many frameworks and methods that allow us to work with children as partners during a product design. Several co-design methods can be used with children at different stages of the product design and the appropriate methods may vary depending on the purpose of the research [7,9,20].

There are also examples of co-design at school, with users that are school learners. For instance, in [19], the authors explore the applications of co-design methods with 7–9 children. In [8] the authors describe the empirical studies conducted with 36 children at home and in a school environment.

However, to the best of our knowledge, there are no co-design studies with hundreds of school learners and strict timings as required in the TERENCE project.

### 2.2 Gamification Overview

From both theoretical and empirical points of view, nowadays learners are usually more motivated to participate in school-class activities if these are shaped like games, e.g., see [11]. Gamifing a school class activity requires to introduce specific game elements in the activity [14].

From a purely game-theoretic view point, the necessary elements for turning an activity into a game are the actions or *moves* of the players, with their *outcomes*, so that an action of the players makes the game progress from state to state.

However, from a motivation theory perspective, those elements are not sufficient for making a game engaging. Other elements of digital games such as points, levels, and rewards are therein considered, and have been used to engage learners as players in formal learning contexts. The authors of [15] propose a motivational model that explains more general key factors of game engagement, which encompass other studies in the field. They overview research findings investigating the correlations between the appeal of games and the psychological need satisfaction that play can provide. The surveyed results demonstrate that at least three factors make, in the short term, independent contributions to game engagement:

- *autonomy*, that amounts to experiencing a sense of choice and psychological freedom in playing games;
- *competence*, that is, an individual's inherent desire to feel effective in playing;
- *relatedness needs*, satisfied when learners experience a sense of communion with others.

Autonomy, competence and relatedness needs can be realised by means of diverse game elements. Autonomy can be provided by allowing the player to take decisions, for instance, concerning the player's game levels to play, game avatar or game scenario. Competence is generally realised by carefully balancing the game challenges to the players' skills, providing motivating rewards and feedback. Relatedness needs can be satisfied by allowing collaboration, cooperation or competition, for instance, by means of a personal guide in the form of an avatar or by playing with or against other peers.

## 3 The Gamified Field Study

The TERENCE data gathering was run as part of the regular school activities in UK and Italy from May to July 2011. The studies involved 2 schools in UK and 5 in Italy, for a total of 282 learners in Italy and 226 in UK. Learners were aged 7–11 year. Like in co-design, the data were gathered class per class, with c.a 20 children per class, two facilitators and the school class teacher, working as informant for the facilitators and familiar referent figure for children. See [12] and [13]. Due to project organisational constraints, the data gathering with each school class could not last longer than 1 hour.

Despite the number of learners in each school and the strict timing, we aimed at gathering high quality data from learners: we needed genuine and dependable information from children concerning their characteristics, environment and life-style for profiling the learners for the TERENCE system. See [1]. In order to gather high quality data, the data gathering was gamified so as to engage the learners as best as possible and comply with the time constraints. In the planning stage, the protocol of gamified activites was checked and assessed with school teachers so as to meet the needs of the school learners and constraints. For instance, if a challenge was deemed too difficult or too boring for a school class, it was then revised according to the teachers' feedback.

The data gathering was organised as 6 different game challenges, and each of these was organised a self-referential independent game. There were 2 collaborative games, involving all class learners at the same time, and 4 single-player games. At the start of each game challenge, the facilitators explained the goal and the learner's moves for advancing through the game. Autonomy, competence and relatedness needs were pursued across the various challenges. Autonomy was elicited by allowing the learners to choose among several options for tackling a challenge or to take the decision to skip it. Competence was pursued by stimulating diverse skills across game challenges, for instance, some games required mainly verbal skills whereas others required mainly drawing skills. The presence of a facilitator working as guidance through the games helped to satisfy relatedness needs; in two challenges, these were achieved by stimulating the school class to work together.

A framework was created for each challenge specifying the goal of the challenge, its moves, and how autonomy, competence and relatedness needs are pursued. Table 1 is an example of an instantiation of the framework for a specific challenge.

## 4 Conclusions: Pros and Contras of the Method

In the European TERENCE project, we run field studies with young children for analysing the context of use of the TERENCE system. This paper explains why project constraints triggered the gamification of the data gathering activities, as well as how the gamified data gathering was run, borrowing and adapting methods from co-design. In the remainder of this paper, we reflect on the pros and contras of the approach adopted for analysing the context of use.

*Pros.* The data gathered via gamified field studies were qualitatively genuine (a child could express his or her true self), and dependable for creating fine-grained profiles of

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| **Goals**:<br>the goal of the challenge is to describe popular video game characters.<br>**Moves**:<br>each learner has to choose a card from the container. A card depicts a character of a popular console game. The entire class then discuss what they like or dislike about that character.<br>**Autonomy**:<br>each learner can choose whether to extract the card and participate, or not, in the game; each learner can choose what to tell about the selected character.<br>**Competence**:<br>each learner can express their verbal skills.<br>**Relatedness needs**:<br>each learner can feel part of the class by telling about console games characters, or listening to others' preferences. |  |

Table 1: Game challenge for learning about popular console-game characters.

the learners, also considering the preferences of the TERENCE learners. The reliability of data gathered from learners is supported by evidence gathered from teachers and parents of the involved learners, that was acquired via contextual inquiries. The gamification of data gathering was definitely engaging for children and their teachers to the point that schools became more and more interested in the project, and volunteered to participate in the prosecution of all the TERENCE activities. Moreover, since all children actively participated in the activities under the expert guidance of the facilitator, school constraints for time were respected.

*Contras.* On the other hand, gamification of field studies require considerable human resources and time for constructing material for playing with children. Moreover, the collected data are only semi-structured and therefore their analysis can be long and expensive.

**Acknowledgments.** The authors' work was supported by the TERENCE project. TERENCE is funded by the European Commission through the Seventh Framework Programme for RTD, Strategic Objective ICT-2009.4.2, ICT, Technology-enhanced learning. The contents of the paper reflects only the authors' view and the European Commission is not liable for it.

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