A Lean Experience of Game Fabrication

From School to University and Back

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ABSTRACT

Gamification of educational contexts can be used to playfully engage all for diverse goals. This paper shows how we gamified school contexts for co-designing educational games (sic) for schools. In our gamified co-design, mixed teams of children and designers fabricated game prototypes together, by resolving missions and challenges as in a game context. The paper then shows how such low-fidelity prototypes were further developed, following a lean user experience design approach: the fabricated prototypes of games were evaluated by mixed teams, then by other schools and finally developed as high-fidelity prototypes at university.

Categories and Subject Descriptors

H.4 [**Human-centred computing**]: Interaction designInteraction design process and methods

General Terms

Interaction Design, Co-design, Lean User Experience Design, Player Centred Design

Keywords

Co-design, participatory design, co-creation, cooperative learning, gamification of learning, learning context, children, teachers, mixed teams

1. INTRODUCTION

In recent years, *user experience* (UX) design has been evolving towards lean approaches [6]. In lean UX design, *minimum-value products* (MVB's), such as low-fidelity prototypes, are used to create or evaluate alternative ideas with users, as quickly as possible, as often as possible. The presence of different types of expertise in design teams is deemed fundamental for the creation of usable products: experts of different sorts sit together with designers, and collaboratively create products so that the role of a designer "begins to evolve toward design facilitation [...] [so as to work] on the best solutions in an ongoing way".

When designing with users, *co-design* becomes the ideal companion to lean UX design. Sanders and Stappers in [9] characterised co-design as an approach that extends participatory design and co-creation, and aims at involving all stakeholders as co-designers. When these are children, specific methods are used, which vary according to the design stage [5, 11, 7]. Examples relevant for this paper are low-fidelity prototyping techniques for co-designing with children, such as layered elaboration [10]. Co-design techniques allow designers to prototype with users in their natural environment, e.g., children and their teachers in their school, using their everyday material, such as paper, scissors and pencils. Nowadays school contexts, however, pose their own requirements to co-design, which can affect its success. For instance, school contexts tend to be associated to boring rote by learners, who are used to interactive digital games. Gamification of co-design contexts can then help in engaging school classes in co-design so as to create a flow state, as games do. See [4].

This paper takes up such a view. It shows how we gamified school contexts, and fabricated low-fidelity prototypes of educational games therein, working with mixed groups of learners and game designers. Then it shows how we inserted the result of gamified co-design in a lean UX design lifecycle, e.g., middle-fidelty prototypes of games were evaluated by other learners in their schools, and finally developed as high-fidelity prototypes by mixed teams at university.

2. GAMIFIED CO-DESIGN AT SCHOOL

2.1 Products

We worked with gamified co-design in two primary schools in 2013, and then again in 2014. In both years, school classes

and designers fabricated low-fidelity prototypes of games for interpreting children stories, which were previously read and discussed in class. The remainder of this section outlines the 2013 gamified co-design describing its participants and roles, as well as its protocol.

2.2 Participants and Roles

Gamified co-design in primary schools was conducted in four classes in 2013: two of *younger* learners, 8–9 year old, one from the M.L. King school in Bolzano, and the other from the G. Galileo school in Brunico; two of *older* learners, 10–11 year old, one from the Bolzano school, and the other from the Brunico school. In total, we involved 56 learners, 4 teachers, and 4 designers.

Roles of participants were as follows. **Children** were the main game prototype designers. Their work was organised for either small groups of 4, individuals or the entire class. All were asked to comply with cooperative learning rules for interacting so as to "cooperate as best as possible" [8]. **Designers** were experts of the product under design. They were one per group of learners. Each designer took care of illustrating the organisation of work, coaching and scaffolding proper development in their group (e.g., to resolve possible doubts, assist learners in case of serious risks of failure), observing and, during the evaluation of prototypes, assessing cooperation and engagement. **Teachers** took care of composing small groups, heterogeneous in terms of social and learning skills, moderating class and group behaviour so as to enhance cooperation, and stimulating conversation at the class level when required by designers.

2.3 Co-design Protocol

The prototyping session took four sessions, one per school class, with always 4 designers and a teacher per class. Details are as follows.

Missions. Each session was split in 3 missions with predefined timings, lasting c.a 2 hours and a half also due to school constraints. In the first mission teacher and learners read and commented about the chosen story in class, under teacher guidance. The second and third missions saw work in groups. In the second mission, groups of 4 children worked for co-designing a game prototype. Each group prototype was discussed with the class in the third and final mission, and then displayed as in a gallery tour, see [8] and Fig. 1. Fig. 2 shows two game prototypes, one by a group of younger children and the other by a group of older ones.

Rapid feedback. Rapid feedback was mainly verbal across missions. In the first mission, it was the teacher feedback for their class. In the second, it was the designer feedback for their group and peer feedback within the group. In the third mission, feedback was of the class for each group.

Rules and challenges. Each mission came with its own rules and progressive challenges. Challenges were linearly organised, each building on the previous one, so that each had to be completed before moving to the subsequent one. The second mission challenges required diverse skills. For instance, its first challenge required groups of children to discuss and negotiate the so-called game idea [1] in relation to the assigned goal. Verbal skills were then those mainly elicited.

Figure 1: Gallery tour during the third mission

Figure 2: Game prototypes: the top by younger children, the bottom by older children

When realising the game scenario on paper in the second challenge, visual-motor skills were those mainly activated.

Cooperation, competition and rewards. At the end of the first mission and before children were divided into small groups for the second mission, teachers made it clear that groups would be competing against each other in creating game prototypes: the group best collaborating according to designers and teachers, and realising the best game according to other learners would see a valuable reward: their prototype implemented as a 'real' game for tablets, to play with. However children were also told that the work of each group would receive a reward: their presentation of how to play with their game prototype was video-recorded in the third mission, and made available online to all school participants.

3. GACOCO PRODUCTS LIFECYCLE

In a lean UX lifecycle model, products are evaluated by mixed teams. In our case, all the low-fidelity game prototypes resulting from the above co-design in primary schools were evaluated by 4 experts of co-design and 4 school teachers. The evaluation was run as follows. Teachers and designers expressed their ideas about the coherence of the realised prototypes with the original game idea. Then designers evaluated each single game according to specific game playability heuristics [3], as well as the level of cooperation in each

group. Out of this evaluation, 4 game prototypes were selected and then turned into middle-fidelity prototypes, that is, videos, by the game designers.

The middle-fidelity prototypes were then evaluated by 2 primary schools in the Centre of Italy: two classes, of 8–9 and 10–11 year olds, in the Oriente primary school in Pescina; two classes, of 8–9 year and 9–10 olds, in the Cerchio primary school in Cerchio. In total, this study involved 64 children, 2 teachers and 2 designers. Using again a co-design approach, the entire class, coached by designers, evaluated each middle-fidelity prototype in turn. The design of the prototypes was then revised according to the evaluation results and developed as Java high-fidelity prototypes by a student working on game design at the Free University of Bozen-Bolzano, working collaboratively in team with 2 game development experts of Bolzano. Across all design lifecyle, children's ideas and artifacts were preserved. For instance, Fig. 3 shows how also drawings by children were taken from their low-fidelity prototypes and inserted in the high-fidelity versions.

4. CONCLUSIONS

Co-design is an ideal companion to lean UX design with users. When moved in nowadays school, it faces school-dependent challenges [4], such as engaging diverse children in a school context, which they tend to perceive as boring rote. This paper presents gamified co-design as a viable solution for engaging schools and producing products together, following a lean UX design approach. On-going work sees a more pervasive use gamification of co-design contexts: low-cost gamified objects are introduced at school and used for co-designing products with educational value.

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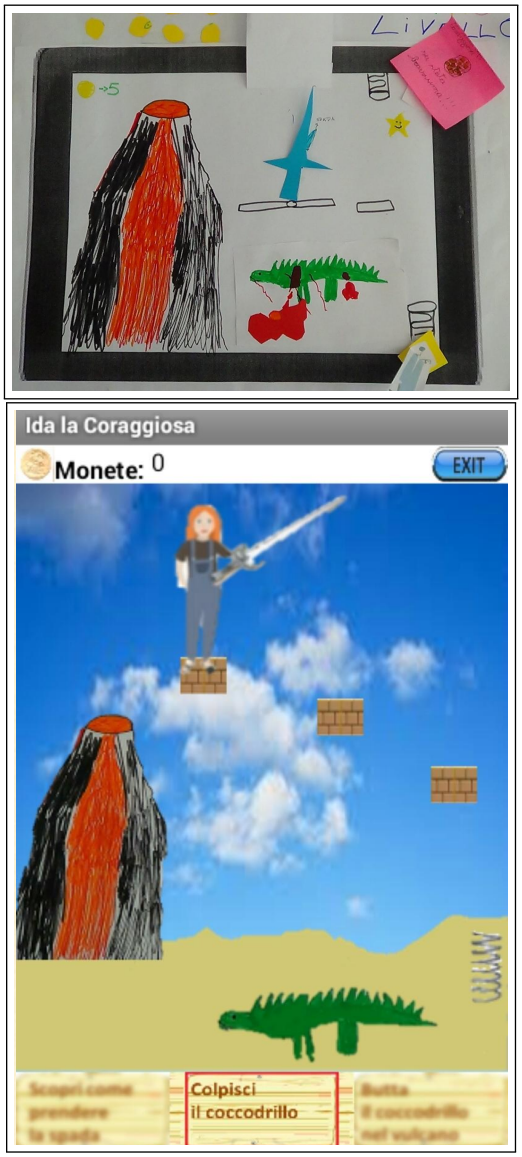

Figure 3: Game prototypes: from low-fidelity (top) to high-fidelity (bottom) for Android tablet

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