Gamified Children Universities: An Exploratory Study *(Preprint)*

Vincenzo Del Fatto, Gabriella Dodero, Rosella Gennari, Alessandra Melonio, Marco Montali, Simon Razniewski, Santina Torello, Xiaofeng Wang, Floriano Zini
Faculty of Computer Science, Free University of Bozen-Bolzano
Piazza Domenicani 3, 39100 Bolzano, Italy
name.surname@unibz.it

ABSTRACT
Children universities see universities hosting activities for exposing children to research findings. However, universities are not per-se designed for children. This paper advances the idea of gamifying university contexts for children in order to provide them with a positive engaging experience. The reported qualitative study serves as proof-of-concept. Engagement results, albeit preliminary, are positive.

ACM Classification Keywords
H.4 Human-centred computing: Interaction design Interaction design process and methods

Author Keywords
Gamification; qualitative study; children university

INTRODUCTION
Involving children in academia is a way of raising awareness of public about research. Several universities took up such an idea and created various "children university" initiatives. The majority of them are organized within university premises. However, university contexts are not usually designed for running dissemination activities for children, which can affect the success of the activities. Children are difficult to engage in a context if they perceive it far away from their daily experiences or goals. This paper argues that gamification of university contexts is feasible and helps in engaging children in dissemination activities for them. To this end it presents a qualitative study concerning computer science dissemination. The currently available results of the study seem encouraging for the approach: children were positively engaged. The paper ends by speculating about the experience.

ESSENTIAL BACKGROUND
Children University in Brief. As the 2011 Ankara Declaration [7] states, "all children should have the chance to be in touch with academic thinking, to engage with scientists, artists, practitioners, researchers, students and research institutions". The declaration, counter-signed by several universities, gathers principles that inspired initiatives for children in university premises. Nowadays, more than 200 institutions offer initiatives in line with the Ankara declaration, gathered under the term of children university. Junior Uni is a children university initiative, counting already more than 100 events organized by diverse faculties in the last 3 years. Within Junior Uni, short-term activities were organized for school classes at university for disseminating computer science research applications. These are under focus in this short paper.

Gamification in a Nutshell. In its most common acceptation, gamification means properly using game design principles and elements, such as progression bars, in a non-game context in order to create a positive engaging experience, e.g., see [6]. The number of studies concerning gamification is rapidly increasing: the literature review of [5] shows that, depending on the context and types of users, gamification can result in positive experiences for engagement, at least in the short term, and possible negative effects such as increased competition. Diverse motivation theories are invoked to explain why gamification can positively engage children [6]. In particular, this paper follows researchers that base their work on *self determination theory* (SDT) [2]: in brief, a gamification that nourishes a sense of competence, autonomy and social relatedness can lead to a positive engaging experience, e.g., an experience of enjoyment and deep concentration.

GAMIFICATION OF CHILDREN UNIVERSITY CONTEXTS
As the above literature overview suggests, gamifying children universities for dissemination purposes means designing like a game designer a dissemination activity with children in a university environment, so as to foster a positive engagement. The activity is then presented as a game mission to accomplish with a goal that is clear and meaningful for all. According to their complexity, game missions are broken down into manageable but non-trivial challenges with clear rules and goals, of which the first challenge is usually easy to take up. By referring to SDT, firstly, children should perceive a sense of autonomy along the mission. To this end, story lines can be used to create a virtual world populated by characters, in which children feel free to explore and move. Moreover, children should experience a sense of progression through missions and challenges so as to feel competent. To this end, one can use progression bars and various reward mechanisms, such as timely and continuous feedback. Relatedness needs can be satisfied in different manners, for instance, by dividing children in groups the members of which cooperate so as to compete against other groups [3], or by enabling all participants to cooperate in tackling missions or challenges. Once

CHI PLAY'14, October 19–21, 2014, Toronto, ON, Canada.
ACM 978-1-4503-3014-5/14/10.
http://dx.doi.org/10.1145/2658537.2661300

so conceived, gamification of university for children was put to work and refined via two semi-structured qualitative studies [1]. The main one is reported below.

AN EXPLORATORY STUDY

The dissemination activity hereby reported was conducted in university premises with a middle-school class of 22 12–15 year old students, 2 teachers, 7 computer-science researchers, an industrial designer and a technologist. The latter two helped in preparing the study material, whereas all researchers conducted the dissemination activity except one that acted as passive direct observer. The dissemination activity was presented as a game mission with challenges with clear goals. All children worked together along the mission challenges. Avatars, a story line and an interactive progression map, with a movable character and hidden objects to collect, served to arouse curiosity to explore and guide children through the mission challenges, as explained in the following.

The map in Fig. 1 shows a country land, resembling the local environment of children. In the map, children see a puppet, named Alex. Moving Alex along the map, a researcher acting as narrator tells the story of Alex in Computerland: Alex goes around the land and ends up in spots in which the help of computer-science friends is badly needed. For instance, Alex ends up in a local hospital. In order to find out how computer science can help Alex out of this spot, the narrator opens it and reveals beneath a cartoonized mobile phone. This is an object to collect. Detaching the phone from the map, a video gets activated: this shows where children can find, in the university, a computer-science friend of Alex who is expert of phone apps for hospitals. At this point, children become active players: they physically move and locate where the computer scientist is in the university building, following the instructions given by the video. Once found, the computer scientist acts as avatar: starting from the cartoonized phone that led children to him or her, the researcher briefly explains what computer science has to do with the smart navigation of hospitals, availing himself or herself with ad-hoc material correlated to the phone. Finally, he or she throws a challenge concerning the smart navigation of hospitals. Children have to collectively work on it, with the assistance of the computer scientist, who provides continuos and rapid feedback whenever needed. Once the challenge is solved, children can return to the progression map and tackle the next challenge in a similar manner: following Alex, they find and collect an object that guides them to discover another real-life application of computer science research, and hence to overcome the associated challenge with another computer scientist acting as avatar.

RESULTS AND CONCLUSIONS

Qualitative data were gathered in the above study. The passive observer took unstructured notes of children's (1) behavioral and (2) emotional engagement with gamification material in line with [4], e.g., progression map. At the end of the mission, teachers' feedback was sought with interviews and so was class feedback. Moreover, learners used tablets to document talks by researchers during the dissemination activity, and discussed them with teachers when back at school. The

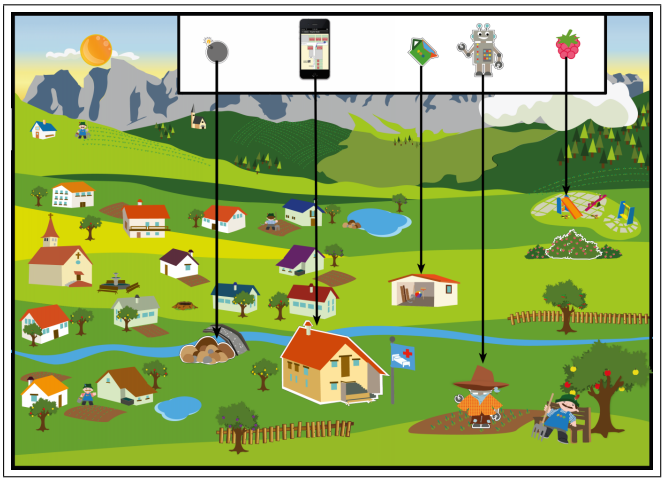

Figure 1. Progression map. Objects to collect are shown on top, pointing to their hiding spots

currently available results concerning engagement are positive. For instance, children's attention and curiosity were observed to be generally high. They listened to the narrator intently and in expectation of the next hidden object leading them to a challenge. Moreover, they were solicitous in tackling challenges, in order to be allowed to go to the progression map and proceed along the mission. Future editions of gamified children university contexts are planned in September 2014 with a large sample of primary and middle school students and a mixed approach, with quantitative and qualitative data concerning children's engagement.

Acknowledgments

We thank Naomi Mastachi, industrial designer, for producing the gamified material, and Alex Tomasi, technologist, for his support and lending his face and voice for the Alex puppet!

REFERENCES

1. Blandford, A. *Semi-structured Qualitative Studies*. The Interaction Design Foundation, Aarhus, Denmark, 2013.
2. Deci, E. L., and Ryan, R. M. *Intrinsic Motivation and Self-determination in Human Behavior*. Plenum, New York, 1985.
3. Dodero, G., Gennari, R., Melonio, A., and Torello, S. Gamified Co-design with Cooperative Learning. In *Proc. of alt CHI 2014*, ACM (2014).
4. Dodero, G., Gennari, R., Melonio, A., and Torello, S. Towards Tangible Gamified Co-Design at School: Two Studies in Primary Schools. In *Proc. of CHI-Play 2014*, ACM (2014).
5. Hamari, J., Koivisto, J., and Sarsa, H. Does Gamification Work?: A Literature Review of Empirical Studies on Gamification. *In Proc. of 47th Hawaii International Conference on System Sciences* (2014).
6. Kapp, K. M. *The Gamification of Learning and Instruction*. San Francisco: Pfeiffer, 2012.
7. SIS-Catalyst, and EUCU.NET. Ankara Declaration, retrieved in 2014 from http://eucu.net, 2011.