Up-scaling Mate Marote: a university-industry interaction experience

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Abstract. The new digital era opens up great possiblilities in education. Mate Marote is a platform including activities and educational games for massive scale interventions. Recent creation of Fundación Sadosky, has favored the collaboration between industry and academia in projects involving novel methods and ideas with big scale software platforms which require experience in architecture and high-end software development. The collaboration established showed exceptional conditions for the mutual benefit: the incorporation of academic research in educational neuroscience in the industry and the transference of well-established methodology and software development experience in the academic environment.

1 Introduction

Education is a fundamental piece of our culture which persistently influences every aspect of society. As the world moves deeper into information-based societies, the contrast between traditional educational approaches and the real-world challenges that students and graduates face is becoming starker.

Argentina is living a unique opportunity where a great amount of primary and secondary school students have their own laptop, given by institutional programs such as Conectar Igualdad and Joaquín V. González (La Rioja). The fact that learners and teachers have their own personal computers and thus educational tasks may be represented in the same digital environment allows novel educational applications and large-scale interventions.

Concurrently, the advances in educational neuroscience have shown that research in cognitive neuroscience and behavioral methods – which investigate the development of mental representations – may help to improve different teaching

approaches [7, 9]. Moreover, many initiatives introduce games as a strategy to stimulate learning in children by increasing motivation [5, 8, 4, 1–3].

Mate Marote is a flexible framework consisting of educational games and activities, which combines massive access to computers and educational neuroscience [6]. This tool was specially designed to implement interventions, allowing to measure the improvement of users while using the activities. Based on pilot a implementation in La Rioja province, Mate Marote was able to manage a few hundreds of registered users using the platform.

In this digital era, where a significant fraction of students and teachers have their own laptops, Argentina is not alone. Worldwide initiatives are being implemented, delivering low-cost laptops to every primary and secondary school student, for example adopting the One Laptop Per Child program (OLPC). Only in Uruguay, the OLPC CEIBAL program, provides the whole population of elementary and secondary schools – some 400,000 children and their teachers – with the same digital platform.

This new social phenomenon has the potential of making a profound change in the education of millions of children around the world. With the goal of re-implementing Mate Marote for massive scale interventions, University of Buenos Aires joined industry experts in architecture and scalable systems of EPIDATA) to create a new partnership that may upgrade Mate Marote to the Big Data era. In this article, we describe the collaboration program started.

2 On-Going Work

Pilot interventions of Mate Marote were successful in terms of educational issues, but did not scale well in technological aspects. Based on these results, a proposal of upscaling the system was presented to the Ministerio de Ciencia, Tecnología e Innovación Productiva (MinCyT). The main goal was to get the investment to re-development of the Mate Marote platform in order to be able to support millions of users.

The MinCyT accepted the proposal and forwarded it to the Fundación Dr. Manuel Sadosky (FS), which is a mixed (public / private) institution whose goal is to promote stronger and closer interaction between Industry and the scientific-technological system. Mate Marote research team and FS discussed the requirements needed for the upscaling of framework, and thus FS launched an open call for companies to develop the upgrade of the platform.

The company Epidata was the winner of the call. Epidata is an argentinian multinational company, which provides software development and maintenance services focused on: software architecture, agile methodologies, and open source technologies. Epidata has also a proven track record working on research and development projects along with several research departments in latin-america.

The software project management is based on the iterative and incremental agile software development framework Scrum, coordinated by a project leader offered by Epidata. The Scrum schedule is designed in ten-working-days sprints, with the review and planning meetings on the same day (after last day of current

sprint and before the next sprint starts). The review meeting consists of reviewing planned issues developed, where researchers have to analyse and eventually approve each individual issue. On the other hand, the planning meeting consists of defining the issues to be developed during the next sprint, consensuated by researches and developing team.

The development time was divided in two big subprojects with equal dedication: the backend, which consists in a web server with resources and services; and the frontend, which consists on games and graphical resources.

3 Preliminary Results

After 6 months of project execution, we have completed 11 sprints where we have achieved, in this first stage, over 75% of backend development and the frontend for players. Also we have five games implemented on testing phase, with even more games and new features to develop in future stages. The development includes more than 7,000 lines of code with over 95% of acceptance rules based on Sonar, with 86% of successful integrations based on Jenkins statistics.

The team consists of three game-design, web-development and backend professionals who have so far spent about 2,500 hours of development. This number does not include the time spent in analysis, design, UI, testing and management that was done by different professionals in these areas, who helped carry out the project and contributed their ideas and knowledge to reach the stated goal.

At the beginning researchers as product owners, developers and the Scrum Master do a planning meeting where priorities are defined and story points are assigned to each story that could to be included in the next sprint. After that, according to the priorities, the candidate stories and the team work capacity (measured in story points per sprint), stories are selected to be done. Finally, with the revision and the approval of this selection by the product owners the sprint scope is defined.

During the sprint, stories are implemented following the specifications. Having fluid contact between the developer team and product owners it is important to clear up doubts and avoid rework. When a story, or part of a story, is completed the functionality is deployed in a testing environment to make an appropriate quality control check. If there is a bug, or something does not have the desired behaviour the developers received a feedback of the problem to solve it. If everything works as expected the story is marked as done and ready to be checked at the end meting.

At the end of the sprint there is a review meeting where the developer team shows project progress and stories implementation. The product owners approves, or disapproves, the implementation of the stories included in the sprint according to criteria of approval defined in each story. As a result of the product owner revision, the backlog is updated. Finally, a retrospective meeting is done where teams discussed the ups and downs of this sprint and they defined, if necessary, new work patterns to improve productivity, such as how many story

points can be done in a sprint. After all this, a new planning meeting is done in order to start the next sprint.

As the gained experience sprint to sprint, the use of this methodology has impact in the team production which rises the accuracy of estimating development times, improves the quality of the product and overall productivity.

One of the remarkable fact of the scrum methodology is that at the end of each ten-working-days sprints a working software is delivered to the product owners which is incremented every sprint. This give the opportunity to show, use and test the project progress without unwanted detours.

Currently, we have finished programming almost the complete backend, including the admin interface that enables the creation of intervention programs (see a screenshot of admin interface in Fig. 1) and also the front end is nearly finished, (Preliminary gameflow design where games are selected is shown in Fig 2a and a screenshot of the game Tower of London in Fig 2b).

4 Conclusions and Discussion

The massive availability of laptops owned by students opens up a new era in education, combined with recent advances in educational neuroscience. Argentina is leading this route with the one-to-one educational programs all over the country. Mate Marote has rised as a platform with educational games and activities, taking advantage of this new reality. However, pilot interventions were deployed in reduced scale scenarios.

Recent creation of Fundación Sadosky, has favored the collaboration between industry and academia in projects involving novel methods and ideas with big scale software platforms which require experience in architecture and high-end software development. The collaboration established showed exceptional conditions for the mutual benefit: the incorporation of academic research in educational neuroscience in the industry and the transference of well-established methodology and software development experience in the academic environment.

Moreover, the Scrum methodology adopted for the requirement definition was particularly successful as both sides dominated the technique. This particular (uncommon) situation helped the rapid development of the platform, with elevated scaling and the inclusion of several new games.

One of the biggest benefits for the industry side of this experience, i.e. Epidata, was the incorporation of state-of-the-art knowledge about educational games based on neuroscientific studies. Additionally, this kind of projects help reducing costs in I+D+i, while it harvests prestige because of linking with University.

From University's point of view, the development methodology introduced by industry and the short-term implementation times are very valuable, mostly due to its human resources with full-time dedication to the project. However, some disadvantages were observed, specially in the specific objectives of the platform and the quality-quantity tradeoff.

Government presence, through Fundacion Sadosky, facilitated the link between University and Industry, with the grant policy and acting as supervisor in the University-Industry link, towards the success of the project. This experience suggests that strategy adopted in this University-Industry interaction is advisable for the execution of future project of this kind.

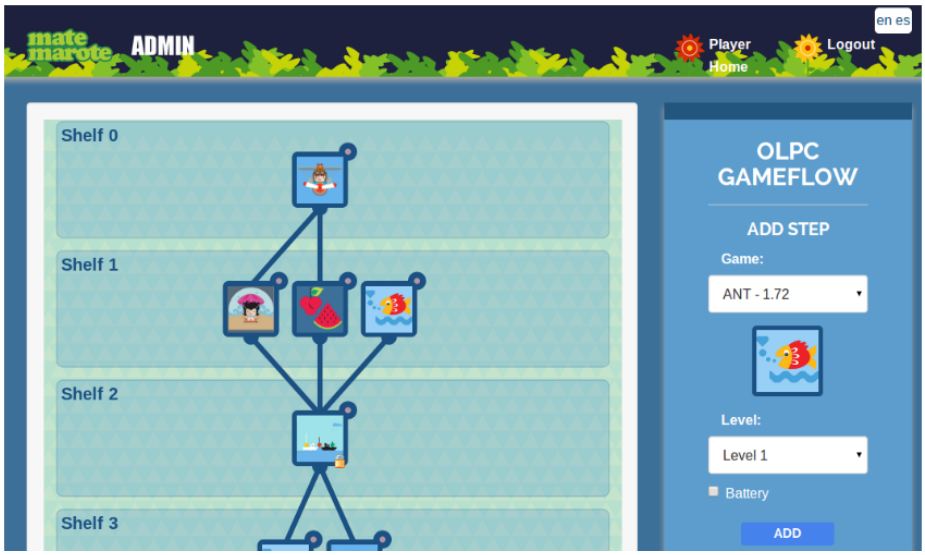

Fig. 1. Backend screenshot of Mate Marote new implementation. In this screenshot is shown the new tool designed by Epidata to elaborate interventions.

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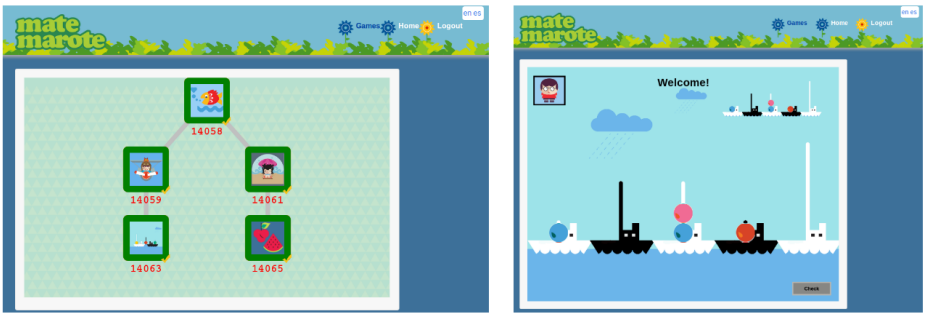

Fig. 2. Frontend screenshot of Mate Marote new implementation. In the left panel (Fig. 2a) the Gameflow that the user will play is show, and in the right panel (Fig. 2b) the game Tower of London is exhibited.

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