Designing Educator-friendly Learning Analytics for on-the-fly Progress Assessment

Anastasia Ntagianta[1], Maria Korozi[1] and Constantine Stephanidis[1,2]
[1]Foundation for Research and Technology – Hellas (FORTH) – Institute of Computer Science (ICS)
[2]University of Crete, Department of Computer Science, Crete, Greece
{dagianta, korozi, cs}@ics.forth.gr

Introduction

Learning Analytics is the measurement, collection and analysis of data about learners in order to extract information that could be used to improve teaching and learning [2]. Lately, researchers have created an abundance of toolkits that educators could use to improve their effectiveness, plan their courses and enhance their students' performance [1, 4, 5]. Most of these tools have been designed having in mind that the educator would study the data "offline" in an environment with minimum distractions. However, this is not always the case; educators must make decisions while in the middle of a course and re-evaluate its outline based on the students' needs. This raises the need for an educator-friendly learning analytics mechanism facilitating on-the-fly assessment of students' progress.

Our Approach

This work focuses on the design of several Learning Analytics dashboards created for "Home game" [3], a multimodal educational game that supports training for independent living for children with cognitive disabilities, intended to be used under the supervision of educators in a Rehabilitation Centre (RC).

An iterative process was followed throughout the entire development lifecycle of the game. Requirements elicitation involved questionnaires and semi-structured interviews with twelve RC educators with professional expertise in various domains, such as psychology, occupational therapy and pediatrics; apart from the functionality-related features yielded, major focus was also given on extracting requirements regarding the game's learning analytics. Based on those findings, high-fidelity prototypes were designed and subsequently reviewed by the RC educators to obtain their feedback. Eventually, several dashboards were implemented to present rich information in an easy-to-interpret and rapidly accessible manner.

During a game session with a student, there is no need (and no spare time) for the educator to see the precise values of all the accumulated data. To this end, the user interface representations were carefully selected to better communicate quantitative information. Thus, the dashboards include elements perceived by a person's visual system and need less time to understand: (i) graphs (rather than tables), which give numbers shape and form, (ii) icons and images that convey more information than words, and (iii) color coding as secondary notation.

An educator can launch, at any time and from anywhere, the context-sensitive analytics dashboards that display data relevant to the current play; as an example, when initiated from the system's home screen, it reports a summary of the most important information regarding all the mini games (e.g., performance trends, last played games, etc.), whereas if launched during a mini game, then the analytics are game-specific (e.g., content confusing the player). At a glance the dashboards contain UI elements displaying: (a) number of plays per mini game, (b) the player's overall performance, (c) number of hints and errors per round (d) any recently played games along with the content used, (e) which mini games have never been played, (f) the content that the player masters or usually mistakes, and (g) the content that has never been encountered.

Finally, the (d), (e), (f) and (g) elements are interactive enabling educators to launch on-the-fly any mini game they consider appropriate and tailor its content to the needs of the player. For instance, the top area of the Dashboard displayed in Figure 1, is used to display elements that present information regarding the recently played rounds, such as the content of the round, when it was played, number of hints taken, etc.; the educator can select any of them and launch a game initialized with the content of that particular round.

The next steps include a full-scale user-based evaluation of the tool with the targeted end-users (i.e. educators).

Figure 1: Dashboard for "Find the wrong object" mini game

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