ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING 218

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2nd International Workshop on Evidence-Based Technology Enhanced Learning

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2nd International Workshop on Evidence-Based Technology Enhanced Learning

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Preface

Research on Technology Enhanced Learning (TEL) investigates how information and communication technologies can be designed in order to support pedagogical activities. The Evidence Based Design (EBD) of a system bases its decisions on empirical evidence and effectiveness. The evidence-based TEL workshop (ebTEL) brings together TEL and EBD. The workshop proceedings collects contributions concerning evidence based TEL systems, like their design following EBD principles as well as studies or best practices that educators or education stakeholders used to diagnose or improve their students' learning skills, including students with specific difficulties (e.g. poor/slow readers, students living in impoverished communities or families).

The ebTEL international workshop series was launched under the collaborative frame provided by the European TERENCE project (www.terenceproject.eu). The TERENCE project, n. 257410, is funded by the European Commission through the Seventh Framework Programme for Research and Technological Development, Strategic Objective ICT-2009.4.2, Technology-enhanced learning. TERENCE is building an AI-based Adaptive Learning System (ALS) for reasoning about stories, in Italian and in English, through reading comprehension interventions in the form of smart games. The project also is also developing innovative usability and evaluation guidelines for its users. The guidelines and the ALS result from a cross-disciplinary effort of European experts in diverse and complementary fields (art and design, computers, engineering, linguistics and medicine), and with the constant involvement of end-users (persons with impaired hearing and their educators) from schools in Great Britain and Italy.

The first edition of ebTEL collected contributions in the area of TEL from computer science, artificial intelligence, evidence-based medicine, educational psychology and pedagogy. Like the previous edition, this second edition, ebTEL'13, wants to be a forum in which TEL researchers and practitioners alike can discuss innovative evidence-based ideas, projects, and lessons related to TEL. The best papers of ebTEL'13 were also invited for a special issue of the International Journal of Technology Enhanced Learning (IJTEL) through a dedicated call for papers. The workshop takes place in Salamanca, Spain, on May 22nd–24th 2013.

This volume presents the papers that were accepted for ebTEL 2013. The full program contains 14 selected papers from 6 countries (Finland, Germany, Italy, Spain and United Kingdom). Each paper was reviewed by, at least, two different reviewers, from an international committee composed of 29 members of 9 countries. The quality of papers was on average good, with an acceptance rate of approximately 80%.

We would like to thank all the contributing authors, the reviewers, the sponsors (IEEE Systems Man and Cybernetics Society Spain, AEPIA Asociación Española para la Inteligencia Artificial, APPIA Associação Portuguesa Para a Inteligência Artificial, CNRS Centre national de la recherché scientifique and STELLAR), as well as the members of the Program Committee, of the Organising Committee and of the TERENCE consortium for their hard and highly valuable work. The work of all such people contributed to the success of the ebTEL'13 workshop.

We would like to especially acknowledge the contributions of a TERENCE colleague that, sadly, did not live long enough for seeing the results of our joint work: Emanuele Pianta, whose dedication to work, patient guidance and respect for others' views allowed us to hold our ground in difficult times and grow, all together, in the frame of ebTEL. This volume is for you, Emanuele. *Grazie.*

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Contents

The 1st Release of the TERENCE Learner GUI: The User-Based Usability Evaluation

Maria Rosita Cecilia, Tania Di Mascio, and Alessandra Melonio

Abstract. This paper reports the user-based usability evaluations performed in Italy of the first release of the learner Graphical User Interface (GUI) of the TERENCE project. This project aims at developing an adaptive learning system for training the reasoning about stories' events of the TERENCE learners in Italy and in UK. Learners are 7-11 year old children, hearing and deaf, that have difficulties in correlating the events of a story, making inferences about them, and detecting inconsistencies. The evaluation of the first release of the TERENCE adaptive learning system software prototypes tackles their usability in order to quickly reveal possible usability problems, as well as to address the TERENCE team to solve them, before the large scale evaluation. Moreover, authors try to carried out important general issues related to the experiment performance.

1 Introduction

The main reason to concentrate our effort on evaluating the usability of the TERENCE Graphical User Interfaces (GUIs) before the large scale evaluation mainly derives from the fact that, as well described in the [3] survey, "... the approaches used to evaluate Adaptive Learning Systems (ASLs) are similar in one aspect: they

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tend to evaluate an ALS as *a whole*, focusing on an *end value* delivered by the system such as the overall user's performance or the user's satisfaction... Evaluating a system as a whole can be acceptable in the field where no acceptable component model of a system can be identified. However, it is not the case for adaptive systems...'.

This paper suggests using a *layered evaluation process*, in which one of the layer is represented by the learning material and an other by GUIs. The authors introduced such an approach to guide designers in the ALS development process. Such a layered approach is in line with the *User-Centred Design* (UCD), used in the TERENCE project, where the evaluation is used iteratively and incrementally to refine the requirements, the design or the development of the system. Moreover, all the evaluation studies reported in [3] stressed the fact that the usability issues of the ALS interfaces have to be solved before starting the evaluation of the ALS in order to minimize bias in the evaluation study of the ALS' usability as "a whole", that is the ALS' pedagogical effectiveness. A thing which is mandatory in UCD as well.

The TERENCE project took up such a two layer up for the learning material and the GUIs, before the large scale evaluation, in two main manners:

- the TERENCE team evaluated the learner material and the GUI prototypes via expert-based evaluations reported in [9],
- the TERENCE team evaluated the refined version of the learner material and the first releases of the GUIs via user-based evaluation, reported in [5].

In this paper, we focus on the user-based evaluation, mainly reported in [5], of the most complex GUI, namely TERENCE learner GUI. The entire learner GUI is available at http://hixwg.univaq.it/learner-gui.html; its design is described in [10].

2 Experiment Description

For the experiments we here describe, we adopted user-based criteria methods like observational evaluation [1], semi-structured interviews [7] and think-aloud protocol [6]. In fact, the approaches used in the literature for evaluating TEL projects are mainly user-based (see [8]). An important reason justifying the usage of user-based approaches in TEL projects is the fact that users are often involved in the design of the projects. Like the other TEL projects, the TERENCE project involves users in the evaluation process. In doing so, the TERENCE team opted for methods that are adequate to the TERENCE main users, that is, 7–11 year old children, and prone to being used in numerous but short inexpensive evaluation sessions. In fact, observational evaluation, semi-structured interviews, and think-aloud protocol are semi-structured methods for examining and reporting problems with the learner GUI in qualitative and quantitative ways.

The reports of the assessments for the learner GUIs usability evaluations and the learning material in [5] is divided as follows: (1) *goals* of the assessment; (2) *participants*, that is, the description of the involved users; (3) *tasks and material*, that is,

the description of tasks and material proposed for the experiments; (4) *results*, that is, the description of significant results. This choice is the same we use to structure this section.

2.1 Experiment Goals

The overall goal was to examine whether the sequence of tasks in Table 1 and, more in general, the navigation of the learner GUI were usable for the intended age range. In particular, we also tried investigating the user experience with the learner GUI, more precisely, with:

1. the avatars, and its role in the learner GUI,
2. the stories, whether appealing or not for the learners,
3. the cards of characters, whether interesting or not,
4. the smart games, whether playful or too difficult,
5. the relaxing games, whether sufficiently appealing.

The focus was on identifying areas whether and which improvements should be made prior to the large scale evaluation.

In Italy, it was possible to run several sessions and, by incrementally and iteratively improving on the learner GUI prototype, it was eventually possible to gather also quantitative data where sufficient technical facilities, like a stable wireless, were available.

Table 1 Usability evaluation tasks

Task order	Task description
1	accessing the system via the login page
2	choosing an avatar
3	choosing a book
4	choosing a story in the spatial map of the book
5	browsing and reading the cards of characters
6	browsing and reading a story
7	browsing and playing with smart games
8	browsing and playing with relaxing games

2.2 Experiment Participants

The evaluation in Italy counted 57 learner participants, out of which 16 are deaf, all aged 7–12, and from different locations from the North and the Centre of Italy:

- Centre of Italy: the summer school of the National Laboratories of Gran Sasso (LNGS), nearby l'Aquila; the summer school of Sacro Cuore in Avezzano;