

Learning through Exploration of Cultural Heritage via Virtual Expeditions – A Usability Study

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Abstract

MOSAICA's Virtual Expeditions (VE) are designed to allow interactive exploration of pre-selected semantically related content through alternative story-telling templates and games. A constructivist learning environment is applied in the VEs through the use of different modes of knowledge representation and active exploration of cultural heritage stories. The stories of two Jewish women scientists were presented within the mock up VEs we developed.

A pilot usability study was conducted in order to investigate the VEs' usage characteristics, content comprehension, thinking skills enhancement and open-mindedness of users. We developed a questionnaire that included both open- and close-ended questions, based on the four usability principals: time of task, accuracy, recall, and emotional response. The study participants found the VEs easy to use and interesting. They all demonstrated content comprehension, but their open mindedness towards Jewish women scientists was not strongly expressed in their responses. The usability questionnaire provided a broad insight of users' usage and comprehension of content while exploring Virtual Expeditions.

Keywords: Virtual Expedition, Usability, Jewish women in Science, MOSAICA project.

Introduction

As part of the European Commission 6th Framework Program, we collaborated with colleagues from eight European countries in order to develop a system named MOSAICA – a Web-based portal dedicated to the preservation of Jewish cultural heritage in Europe. As part of the MOSAICA project we introduced the concept of Virtual Expedition (VE).

Theoretical underpinning

Learning Theories: MOSAICA's pedagogical framework and its Virtual Expeditions theoretical underpinning emerge from two learning theories: the Constructivist Theory (von Glaserfeld, 1987) and Mayer's Cognitive Theory (Mayer, 2002). The basic assumption of the constructivist learning approach is that knowledge cannot simply be transmitted; therefore

learners must be engaged in constructing their own knowledge (Bruner, 1993; Driver, Asoko, Leach, Mortimer & Scott, 1994; Duit, & Treagust, 1998). Indeed, studies on technology embedded active learning, have shown to improve users' learning and cognitive abilities such as higher order thinking (Barak, 2006; Dori, 2006; Dori & Belcher, 2005).

The second theory (Mayer, 2002) emphasizes the visual-pictorial and the auditory-verbal cognitive channels as a way by which knowledge should be represented and manipulated.

Usability: Usability is a term used to measure how easily people can interact with a computer program in order to achieve a particular goal. The way that users will work with the product is a basic issue for the product designers and developers (Dumas & Redish, 1999).

Usability testing generally involves measuring how users respond in four areas:

- Time on Task - How long does it take for users to complete basic tasks?
- Accuracy - How many mistakes did the users make?
- Recall - How much do users remember immediately or after a period of non-use?
- Emotional Response - How do the users feel about the tasks completed?

The data collected from the usability tests can be both quantitative and qualitative (Jerz, 2002). Nielsen and Landauer (1993) claim that five users are enough for running usability tests at various stages of the development process, in order to find most of the usability problems. Our study adopted Nielsen and Landauer's (1993) approach, focusing on five users for examining the VE application.

Study Environment – Virtual Expeditions

MOSAICA's Virtual Expeditions can be conceptualized as a path to the past via exploration of cultural heritage stories. The cultural heritage stories are designed as a collection of Heritage Items that the user is encouraged to explore.

The VE story is presented through five templates:

- The Story – a simple text presented in a book format;
- Timeline – a scrollable table with three rows: year, short description of event, and a small relevant picture;
- Maps – a single graphic file, marked with visible hotspots on it. Clicking on them displays a relevant Heritage Item;
- Family tree – consists of names and lines connecting them. Clicking on a certain name opens a Heritage Item with links to relevant websites;
- Gallery – a number of graphical templates (a room, a synagogue, outdoor location, etc.) with hidden hotspots. Clicking on hotspots opens Heritage Items with links to relevant websites.

The early stage of the project includes the design and development of a mockup presentation** that consists of VE's of two Jewish women scientists: Rosalind Franklin and Rita Levi-Montalcini. These VEs were presented to a group of users in order to study their usability and learning impact (cognitive and affective).

Study Objectives

Our study was designed as a pilot test-case. Its objective was to assess the VE's within a framework containing three aspects:

** <http://fw.xlab.si:9080/mosaica/Default.aspx>

- Usage characteristics,
- Content comprehension and thinking skills enhancement,
- Open-mindedness and tolerance

Based on the conclusions from this test case, we will improve the VE's as well as the assessment questionnaire. Following this test case, the improved questionnaire will be administrated to larger and diverse groups of users.

Study Participants

We chose a focus group of five computer science undergraduate Jewish students, all in their first academic year. The rationale for this selection was to assess a group of people with high computer skills¹. All students were at the age of 21-25, three were male (student A-C) and two female (students D, E).

Study Tools

Our assessment was based on the four usability principals (Dumas & Redish, 1999): time on task, accuracy, recall, and emotional response.

Time on task and Accuracy were measured via observations as students were exploring the VEs.

Recall and Emotional response were measured by using a questionnaire that included both open- and close-ended questions. Recall questions focused on content comprehension and higher order thinking skills (level 2 in the questionnaire). Emotional questions focused on the students' interest, enjoyment and personal opinions (level 1 and level 3 in the questionnaire).

Level 1 – usage characteristics

These questions aimed to characterize the ways users explore the VEs, to find out whether the VE structure fits diverse learning styles and to learn about emotional response about the learning process.

Level 2 – Content comprehension and thinking skills enhancement

The various questions focused on knowledge, comprehension, comparison, posing questions, judgmental argumentations, and critical thinking.

Level 3 – Open-mindedness and tolerance inclination

The questions examined whether the exploration of Jewish women's biographies and contribution to science can arouse pluralistic views and tolerance towards women and Jews.

Findings and Discussion

This section includes three parts in relation to the study objectives described above.

Usage characteristics

- ☆ All users needed about 20 minutes to explore the VE's and the whole process was clear and no mistakes or questions were observed.
- ☆ The most interactive, innovative and interesting template of the VEs is the gallery, since four of the users marked it as their favorite template. The timeline was also mentioned as a favorite template, because it presents information in a very clear and defined way.
- ☆ All the users except one found it interesting to read about Jewish women scientists.

¹ All the users in this pilot study are more qualified than the target population (school students, teachers and public users). Our users can be considered as expert reviewers and since this is the first stage of the VE usability test, after we upgrade the system, our next step will involve a group of plain users.

Content comprehension and thinking skills enhancement

The users were first asked to declare how well they can describe a few themes presented in the VEs. The results indicate that the users can reasonably up to excellent describe the first two theme – professional activities of the scientists and their personal background. The other two themes – scientific achievements and aspects of being a Jewish female scientist, are controversial. This may indicate that these two themes are not emphasize enough in the VEs.

Open-mindedness and tolerance

In order to indicate the users' feelings towards the stories they explored, we asked them the following questions presented in Table 1:

Table 1. Users' attitudes towards Jewish women scientists

Question	User	Answer				
		Not at all	Very little	Reasonably	Very much	I don't know
In your opinion, in what way were the two scientists' lives affected by the fact that they were women?						
	A				X	
	B				X	
	C				X	
	D				X	
	E				X	
In your opinion, in what way were the two women's lives affected by the fact that they were Jewish?		Not at all	Very little	Reasonably	Very much	I don't know
	A					X
	B				X	
	C			X		
	D		X			
	E			X		

Findings in Table 1 reveal that while all the users felt that those women's lives were mostly affected by being women, their response to the fact that they were Jewish was diverse. Three of the users (the female users) felt empathy towards the women scientists who had to struggle their way in a "men's world": "*... they were women who practiced a profession that was considered masculine, I relate to their problems since I'm also studying a 'masculine' profession*" [Information systems].

Most of the users agreed that the VEs should be presented to various populations and all of them asserted that they would recommend the VE's to other users on the basis of interest, interactivity and ease of operating. The open mindedness towards Jewish women scientists was not strongly expressed in their responses.

Summary and conclusions

For meaningful learning, knowledge needs to be presented in an authentic context, i.e. settings and applications that would normally involve that knowledge. This assumption is at the heart of the conceptualization of MOSAICA's Virtual Expeditions, which allow users to engage in the authentic and situated exploration of cultural heritage items and their unique stories. It has been well established that education and learning is a function of the activity, context and culture in which it occurs (Barak & Rafaeli, 2004; Dori, 2006; Dori, Bark, Herscovitz & Carmi, 2005).

All users in this pilot study found the VEs easy to operate and interesting. The gallery template was found to be the most interactive and pleasuring template.

The variety of information we received in this pilot study indicates that using a questionnaire which includes both open- and close-ended questions, based on the four usability principals: time of task, accuracy, recall, and emotional response provides a broad insight of users' usage and comprehension of content while exploring Virtual Expeditions.

We believe that further study will promote the growing body of knowledge on web-based environments for learning, knowledge sharing, and might shed light on the enhancement of pluralism and open-mindedness.

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