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Wandering: A Web-based platform for the creation of location-based interactive learning objects

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ABSTRACT

Wandering is an innovative web-based platform that was designed to facilitate outdoor, authentic, and interactive learning via the creation of location-based interactive learning objects (LILOs). Wandering was integrated as part of a novel environmental education program among middle school students. This paper describes the Wandering platform's structural architecture and an evaluation study that was conducted among grade nine students ($N = 102$) who participated in the innovative educational program. Our goal was to examine students' learning outcomes and experiences while creating LILOs' and providing comments. Findings indicated high motivation among students to use Wandering, not only for completing their school assignment, but also for contributing to the community. Despite the fact that the tagging and commenting tools could have been used more efficiently by students, more than one third of the LILOs received an excellent grad. In addition, our findings indicated that Wandering is a good platform for enhancing 21st century skills, including: engagement with others, personalization, control release, and change adaption.

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1. Introduction

In the past decade, the understanding of the importance of integrating ICT and Web 2.0 tools for enhancing students' meaningful learning was signified (Annetta, Cheng, & Holmes, 2010; Barak, Ashkar, & Dori, 2011; Barak, Herscovitz, Kaberman, & Dori, 2009). Today's learners frequently find themselves in learning and working environments that are constantly and dramatically changing. Emphasis on what students can do with knowledge, rather than how many learning units they acquire, has become the essence of skills named the 21st century skills (Griffin, McGaw & Care, 2012).

In the past few years, advanced technologies are integrated into our daily life and they have become an important tool for collaboration and knowledge construction; however, it is still unclear how educators view the use of these applications and whether their use requires new skills for learning and working. This paper introduces 'Wandering'—an innovative educational methodology and technology that seamlessly integrates web applications with mobile technologies (http://thewandering.net). Wandering is designed to facilitate outdoor, authentic, and interactive learning through the creation of location-based interactive learning objects (LILOs). Wandering enables students to leave the four walls of their classroom and "wander" around, while exploring new information and interacting with the environment and with each other.

This paper presents three main sections. The first section provides an up-to-date literature review on location-based services and learning objects. The second section introduces the Wandering platform, its structural architecture, and its educational methodology. The third section presents an exploratory study that investigated students' learning outcomes and experiences while using Wandering for creating LILOs. This study is the preface of a large research project that investigates out-of-classroom learning via smartphones and its effect on students' meaningful learning.

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2. Literature review

2.1. Location-based services

Location-based services are a new concept integrating a user's geographic location with the general notion of services, such as dialing an emergency number from a cell phone or using a navigation system in a car (Schiller & Voisard, 2004). Location-based service can be conceptualized as the ability to find the geographical location of a mobile device (e.g. smartphones, notepads), through the mobile network, providing services based on the location and time information. The location of a mobile device is constantly retrieved through the widespread inclusion of GPS (global positioning system) that is based on satellite navigation system, and GPRS (general packet radio service) that is based on cellular network tracking (Brimicombe & Chao, 2009). In addition, location maybe retrieved through active use of QR (quick response) codes. Location-based service informs both the user and others regarding their whereabouts, making it possible to synchronize information for live databases. This process generates a new type of information that is created, compiled, selected, or filtered in relation to the users' current locations and the location of other users (Küpper, 2006).

Location-based applications change the way people act, make decisions, travel, and learn (Ahson & Ilyas, 2010; Brown et al., 2011). Location based applications include: location based social networks (e.g. Foursquare, Google latitude) location based advertisement (e.g. Yellow pages, Facebook places, Whatsup) navigational GIS systems (e.g. Waze, Bing maps, Nokia maps), augmented reality platforms (e.g. Layer, Junaio), social recommendation systems (e.g. Yelp, Wikiloc) photo sharing (e.g. Picasa), location based games, and educational applications. All applications share three aspects: location, time, and constant internet connectivity (Brimicombe & Chao, 2009). Location-based applications have the potential to generate new learning environments, accessible at any time, from any location (Brown et al., 2011). In this learning environment, content is abundant and geographically contextualized. Therefore, content needs to be filtered by tagging, searching, adding social relations, and examining past profile. In the context of education, a new pedagogical framework is required for learning in such a dynamic and changing environment.

2.2. Learning objects

In the past decade, the understanding of the importance of web-based instruction for enhancing students' meaningful learning and higher-order thinking skills has grown (Barak, 2007; Barak et al., 2009). One way for enhancing such skills is to create and integrate Learning Objects (LOs) into the learning process. LOs are recognized as independent instructional experience that contains an objective, a learning activity and an assessment. Wiley (2002) conceptualized LO as any digital resource that can be reused to support learning. Rehak and Mason (2003) defined LOs as a digitalized entity which can be used, reused or referenced during technology supported learning. In a more recent work, Kay and Knaack (2008) identified LOs as interactive web-based tools that support learning by enhancing, amplifying, and guiding the cognitive processes of learners. Today, LOs are thought of as standards-compliant piece of eLearning, with an explicit objective and built-in assessment. Although there are many definitions to LOs, there is a broad understanding about the functional requirements of LOs, such as: *Accessibility* – the LO should be tagged with metadata so that it can be stored and referenced in a database; *Reusability* – once created, an LO should function in different instructional contexts; and, *Inter-operability* – the LO should be independent of both the delivery media and knowledge management systems. These requirements are derived from the object characteristics in object-oriented programming (Polsani, 2003).

LOs are stored systematically into databases. In order to retrieve materials from the databases, each object has to be tagged with Metadata defined as data about data. Metadata contains information about the main objective of the LO, its target group(s) and designer, date created and modified, size, type, and usage. Both tagging and storing processes have particular standards such as IEEE Learning Objects Metadata (LOM) Standard. Varies of standard have been established and multiple repositories were developed for LOs. One example is MERLOT – Multimedia Educational Resources for Learning and Online Teaching (http://www.merlot.org/merlot/index.htm). Other examples are CAREO – Campus Alberta Repository of Educational Objects and Wisc-Online – Wisconsin Technical Colleges Consortium (http://www.wisc-online.com). LOs can be in different file formats such as pictures, audio, movie, animations, or web pages. Examples of LOs include instructional content, multimedia content, instructional software and tools (Churchill, 2007).

Studies on LOs indicated that compared to traditional teaching, students are more engaged and their performance increases (Kay & Knaack, 2008). Since LOs integrate multimedia and provide immediate feedback, they were found to be enjoyable and easy to control with respect to the pace of learning (Bradley & Boyle, 2004). Kay and Knaack (2008) examined individual differences in the effectiveness of learning objects in secondary schools, focusing on gender, age, grade, subject area, and self-efficacy. They found no gender differences with respect to student attitudes about LOs and their performance. However, students who were more comfortable about computers appreciated LOs more than their less confident peers. Recent study conducted by Boyle (2010) indicated that learning objects should be viewed as instances of learning designs, concluding that it is the design of the learning activity that is often most crucial in ensuring the effectiveness of the LO.

Indeed, LOs are usually created by teachers who design the learning activity. Conversely, in this study we describe an innovative program that encourages students to create their own LOs, developing short, self-contained, re-usable units that include an objective, a learning activity, and peer assessment.

3. Introducing the Wandering platform

Wandering is a web-based technology, designed to facilitate outdoor, authentic, and interactive learning via the use of mobile devices and the creation of Stations which are location-based interactive learning objects (LILOs). Wandering is designed to encourage students to leave the four walls of their classroom and "wander" around, while exploring new information and interacting with the environment and with each other.

Users can log into Wandering with their Google account, Facebook account, Windows Live ID, or create their own account. Once logging in, they enter Wandering platform home interface (Fig. 1).

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