Using Mobile Digital Storytelling to Support Learning about Cultural Heritage

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Abstract: This paper presents our on-going research related to the use of mobile digital storytelling (mDS) as means for promoting innovative ways of collaboratively learning about cultural heritage. In a joint effort we have worked closely together with our fellow stakeholders – a local museum and a primary school – on actively engaging a group of Swedish school children and their teachers in using mobile digital storytelling as facilitator for introducing the concept of seamless learning. The outcomes of these efforts provided us with valuable insights on how to proceed further in our work of designing versatile mDS applications supporting collaborative learning in authentic contexts.

Keywords: Mobile Digital Storytelling, Mobile Seamless Learning, Collaboration, Participation, Cultural Heritage

Introduction

The objective for the study reported in this paper was to continue our investigations into the development of mobile applications and systems and their integration with pedagogical design approaches for supporting the flow of seamless learning [8]. In this paper we describe and discuss our efforts while developing a seamless and integrated flow of formal learning activities supported by a designated application for mobile digital storytelling (mDS) that we have developed. For this particular case, we wanted to provide and support teachers and young learners with new educational practices and ways of individual and group interaction as well as group dynamics in the specific topic of cultural heritage. In our previous studies [9, 10], we have identified some of the essential components and conditions that may serve for developing an mDS framework, i.e. a complete toolkit for introducing and supporting the methodology and technology in various educational settings. One of the objectives of the current study was to gain additional knowledge and insights useful for developing such a framework.

The concept of mobile seamless learning (MSL) suggests that learners could learn ubiquitously, i.e. regardless of where, when and how, and that they can switch effortlessly between these various learning scenarios by using a mobile device as mediator [8]. Wong and Looi [14] have identified the following ten different dimensions applied to MSL: 1) formal and informal learning, 2) personalized and social learning, 3) learning across time, 4) learning across location, 5) ubiquitous access to learning resources, 6) physical and digital worlds, 7) multiple device type, multiple learning tasks, 8) switching between multiple learning tasks, 9) knowledge synthesis, and 10) multiple learning models. In section II we illustrate in more detail how we integrated the MSL dimensions with each phase of the study. Today's wide-ranging use of mobile devices offers a unique potential and support for learning interaction regardless of context, well in tune with the MSL dimensions above. Keeping in mind Goodyear's [6] declarations on two major changes in contemporary educational research: our altered understanding of when and where learning actually takes place, and our heightened perception of the importance of learning design, the present study is inspired by a design-based research approach [5], or a "design intervention", where the research impacts on and leads to upward spirals of revision, in close relation to user needs and experiences, and to earlier findings [9, 10].

1. Using Mobile Digital Storytelling for Learning: Motivation and Study Rationale

Applying digital storytelling in learning contexts is a relatively new field of research within Technology Enhanced Learning (TEL). Adding a mobile dimension to the concept of digital storytelling for learning might provide added opportunities for supporting the experience of seamless learning [14] - i.e. a time and context independent learning model - than using a solution of a more stationary kind. How factors of digital software and web 2.0 social media may be changing patterns of stories are discussed in [1], in the sense that stories are now open-ended, branching, participatory, and unpredictable, and may be revealing new directions for how we tell narratives, which is also discussed in [11 & 12]. Lombardo and Damiano [7] have worked on a system supporting contextually aware storytelling units, using methods addressing both interactivity and movement to adapt the flow of stories as to how people actually move around in exhibition areas in a museum. In this case, the system acted as the storyteller, not the user, delivering its stories depending on where the visitors chose to go. Callaway et al. [3] present a mobile museum system delivering slightly different dramatic stories to participants of smaller visiting groups, encouraging the group to share their experiences through animated discussions. Druin, Bederson and Quinn [4] have developed a mobile application called StoryKit, intended at intergenerational storytelling. Bidwell, Reitmeier, Marsden & Hansen [2] have developed StoryBank, a mobile tool aimed at cross-cultural storytelling. Although these efforts have explored how digital storytelling can be used to support different aspects of formal and informal learning, none of them have explicitly investigated how to utilize mDS to specifically support and provide a mobile seamless learning experience.

Our purpose for developing an mDS application of our own is twofold: 1) to provide users with a number of functionalities for mDS that are not supported by other existing applications [9], and 2) to offer an important component that will be part of a complete toolkit supporting the entire learning experience of mDS: from the workflow of the learning activities, via relevant technical features and scaffolding tools, to a web service for sharing, storing and retrieving stories, together with a collaborative editing feature for continued work. Furthermore, we are aiming at creating a cross-platform application which is not contextually restricted or bound to a certain subject or activity, but rather dynamically adaptive to whatever purpose it is used for. The research efforts connected to this study involve different aspects of TEL design and implementation, innovative educational practices together with usability and sustainability, closely connected to the framework of Mobile Seamless Learning described above. We are predominantly exploring what factors may transform TEL designs into functional, sustainable technologies in combination with approaches supporting innovative designs for teaching and learning in the 21st century.

2. Design and Development of the Learning Activity

2.1 Methodological Approach and Implementation

The following section describes the flow and content of the learning activity as well as the settings in which it took place, together with a brief presentation and overview of the technology designed and used for the activities.

The study was designed as a series of five interrelated intervention phases, actively involving 4 teachers and 53 children in the ages of 7–8 from a local primary school together with staff from the museum of Kulturparken Småland, and the authors of this paper. It was conducted over a total time period of three weeks during May 2012, and cautiously adapted to the guidelines of the national curriculum. Consequently, the main learning objective for the children was to achieve a deeper understanding about the notions of time and space by exploring, studying and sharing historical sites and events in their school neighborhood. Divided into 18 groups of 3 pupils in each, the children initially took a guided tour with a museum curator to learn about some of the historical features in their school vicinity. The tour content was augmented using iPod Touch with a guide application developed by us, providing a tour map with five designated points of interest (POI), each revealing a series of historical images, accompanied by sound where applicable. During the tour, the groups used

mind maps for writing down a minimum of four keywords at each POI. The mind maps were primarily intended for memory support when later selecting the story theme and creating the script for the voiceover recordings. At the POIs, the children took turns taking notes and using the iPods for photographing objects of interest, later serving as digital content for creating their stories. Thus, each group member took an individual and active part in the gathering of materials and the story creation process. However, before venturing into the concluding mDS stage, each group had to examine and discuss all their images and keywords, agree on what their story should tell, and which images and script would best support their chosen theme.

After the day of the tour and story creation, the children met the researchers at three further occasions. The purpose of those meetings was to conduct a discussion concerning the use and perceived benefits and disadvantages of the mobile applications, and to accomplish a reflective discussion about the stories, their content and the overall story creation process. Fig. 1 below outlines and describes the activity phases, their settings and content:

Figure 1. Study Activity Outline

	Theme and setting	Researcher & museum staff activities	Teacher and student activities	MSL dimensions
Phase 1	**Introduction,** 60 min, @ classroom	Staff presentation, activity and assignment introduction | Mobile device introduction and software overview, mDS instruction. | "Tour rules": when to photograph, when to open POI's, when to use mind maps, etc.	Presentation, discussion, questions	1-2, 5, 8 - 10
Phase 2	**Inspirational tour and mDS activity,** 5 hours per day, @ outdoors	Division into workgroups | Repetition of software and storytelling instruction, repetition of tour rules, hand-out of mobile devices and mind maps | Run tour | Manage hands-on activities at museum grounds | Run storytelling activity.	Take tour: Photograph | Mind-map key words and take notes | Participate in hands-on activities | Accomplish mDS assignment: a) Negotiate and decide story theme, b) Select which photos to use, c) Storyboard and script, d) Run mDS app: add and arrange photos, add story title, record voiceover, preview, edit, finish. | Hand in device and materials.	1-5, 8-10
Phase 3	**Concluding activity,** 2.5 hours, @school yard	Activity introduction | Run activity | Finish up: what happens next time we meet?	Collaboratively discuss, plan and create a physical time line of tour and stories, using a rope divided into time sections combined with images from tour app + images of own house + images from stories.	1-5, 9-10
Phase 4	**Application evaluation,** 30 min per group, @ school	Activity introduction | Initiate and moderate usability discussion using app screen shots with smiley indicators.	[Groups A - I focus on mDS app Groups J - R focus on guide app] In groups discuss and answer a series of questions relating to the applications used during the tour and the storytelling activity.	1-5, 8-10
Phase 5	**Reflective discussion on story content and work process,** 40 min per group, @ school	Activity introduction | Initiate and moderate discussion using app screen shots with smiley indicators + post-it notes.	Watch all stories | With focus on own story: Name 4 group views on the following components: image use, sound quality, theme relevance, and overall impression. | With focus on all stories: a) If you were to recommend your friends to watch these stories, how would you describe them? What would you say? b) Discuss the following: If your group were to create a new story, would you do anything differently? If so, what? If not, why? c) If you were to help some new group members create a mobile digital story, what would you tell them? What do you think is important to know and consider?	1-5, 8-10

Inspired by the ideas and theoretical concepts described in the previous sections, we strived to address and incorporate relevant criteria and aspects of MSL in all phases, as presented in Fig.1 above. After completing all phases, the authors lastly returned to the school to meet with the teachers and museum staff to discuss issues related to the story creation and production, the collaborative work process and the general views of the activity.

2.2 The mDS application

In this subsection we give a brief description of the mDS application that we have designed and developed. Our intention is to provide built-in support and encouragement of the pedagogical ideas we established and implemented through our previous trials, together with stable and relevant mDS functionality. Some of the specific functionalities we have developed that we see as crucial for the mDS workflow, and that are not or only partly included in other mDS apps available, are e.g.: 1) an image-by-image voiceover recording for each of the included images, allowing the user to smoothly edit and redo the recordings

for each step, 2) the possibility to add text to images, and to add, design and edit title and credit pages, and 3) the possibility to add two separate soundtracks for voiceover and background music or sound effects. From a technical perspective, we chose to use HTML 5 and JavaScript in order to support a mobile application that partly has access to the native device features (camera, voice recording, etc.), and that can run across platforms. For this particular study, the application code has been deployed on the iPod Touch using PhoneGap and Xcode. Each specific mobile digital story generated by this application contains images, sounds and transitions stored with a unique ID identifier, allowing storing them in a well-defined data structure. In the current implementation we used JSON (JavaScript object notation) for the data structure as it provides a lightweight data-interchange format that is becoming a "standard" for web development. This approach allows for content reuse and the potential integration of the digital materials generated for the different stories with other collaborative web applications that will be developed in our future work.

3. Study Outcomes

In this section we describe the outcomes of the learning activities described above. The data we collected during the different phases mainly consists of three kinds of video: the children's stories, the observation films from the activity, and the videos from the evaluation sessions. Also, we collected the mind maps, the scripts and the notes from each group, along with notes from the simplified usability test and the reflective discussions.

The stories created by the 18 groups covered four main themes covering various aspects related to the neighborhood's development through time and space: the old dairy/brewery, the plague grave, the girls' school, and the railway restaurant. As it turned out, most groups chose to focus their stories on the plague grave, and only one of the total 18 groups chose to tell their story about the school for girls. To get additional information on how the children perceived handling the mDS application and experienced the work method, a simplified usability test and a follow up discussion concluded the study (see Fig. 1). In phase 4, we used screenshots of all nine steps of the mDS process, applying smiley icons to help the children relate their discussions to their perceptions and experiences of the app [13]. The children's young age had fuelled concerns on their prospects of handling the varied and complex assignments as intended. We therefore piloted careful discussions with the teachers and museum staff to try to facilitate as much as possible. However, the groups managed very well to handle both the technology and most of the complications that occurred, in general by trying out each other's suggestions. The overall familiarity with technology actually proved to be much more advanced than expected, which greatly influenced their capability of coping. Most technical incidents occurred in relation to the voiceover recording, which is not an easy task for any age group, and many of the children agreed that the interface for the voiceover recording could be improved. Several groups also reported that when problems occurred that none of the group members could solve, they rather started all over again than persisted in trying to solve that specific difficulty. However, this "start-all-over-approach" resulted in two stories with no or extremely distorted sound, and one story not showing any of the selected images. Most of the "incomprehensible" issues occurred in relation to the overall mDS process, i.e. the how, what, when and who. Therefore, a vital lesson learned to remember well when venturing into the next design iteration, is to make all process steps and stages of the mDS workflow as clear and self-regulated as possible, also so since very few of the children paid attention to the built-in reminders and instructions available.

4. Discussion and Concluding Remarks

This study has integrated mDS as a facilitator for encouraging a mobile seamless learning experience when learning about cultural heritage. The study was conducted in May 2012 as a stage in further developing a framework and toolkit for mobile digital storytelling for educational purposes. The outcomes supplied us with valuable feedback on how to proceed with the next iteration of design and development. One of the most interesting lessons learned from working with children as young as these was they did not encounter as many

problems in handling the technology, as with coping with the mDS methodology, which after concluding the last two study phases stood out as the greatest obstacle for the children to overcome. Most children also found it challenging to account for their decisions and choices throughout the process. Few of them had a clear sense of why a specific theme was finally chosen, or how they had gone about selecting the images to go with that same theme. Conversely, it was much easier for them to discuss how they went about creating the script for the voiceover recording, probably so due to the mind maps in which they gathered keywords from each tour POI. Contrariwise, the general concern of the teachers was focused on handling and mastering the technology rather than understanding the mDS workflow, which none of them reported to struggle with. All teachers agreed on a great need to learn more about mobile units and the applications used before daring to run similar activities on their own.

For the reported technical issues there are now well-advanced redesigns awaiting final implementation. One of the highest priorities is to get the voiceover interface stabilized and easier to handle, along with designing a contextualized help option assisting each step of the mDS process. Also, two separate workflows will be implemented: a basic alternative covering essential features only, and an advanced ditto providing the user with a more substantial toolbox. Part of the next iteration of the full mDS toolkit development will also be to carefully test the consequences of the suggestions of improvement derived from this particular study, along with some of the before planned alterations, e.g. options for sharing. The qualities of MSL have inspired the efforts described in this paper and we will continue exploring and developing learning activities that encourage learners to collaboratively construct knowledge in engaging and inspiring ways.

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