Digital storytelling with mobile media for inquiry-based museum learning

The student as author of the museum experience

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Abstract—This paper proposes a conceptual framework informed by narrative learning and inquiry learning, for designing museum experiences around digital stories crafted by students using mobile media. The museum is seen as a narrative learning environment and the student as the author of the museum experience. Two case studies, the Storyscope and the CHEAD project, are reviewed to examine how digital storytelling facilitates mobile-enabled museum learning. The paper ends with recommendations for further research.

Keywords—digital storytelling; mobile-enabled inquiry-based museum learning

I. INTRODUCTION

This paper proposes the implementation of digital storytelling with mobile media in museum education as a framework for inquiry learning. Digital storytelling can empower the voice of the student-visitor to better understand how s/he engages with the museum and makes the most of the museum experience. The paper aims to scaffold the adoption of digital storytelling in museum education illuminating the benefits of structuring visitor experiences around digital stories and inquiry.

Growing evidence shows how mobile devices increase the access students have to resources and build their cognitive and digital literacy skills, their motivation and engagement levels. Mobile storytelling in the museum setting [12, 28, 47] can take advantage of this to enable students' learning and self-expression through context-aware story construction anytime, anywhere [33]. Commensurate with a constructivist approach [50], digital storytelling can enrich museum learning, what Hawkey [14] described as a journey for active pursuers of experience and knowledge, a journey in which the learner uses technology-enhanced "narrative engagements" [40] to articulate his/her own thoughts about the museum and its objects.

This paper is structured as follows. Section II presents a literature review of narrative learning, mobile-enabled inquiry learning, and digital storytelling in formal education and in museum education. Section III analyses the Storyscope project and the CHEAD project in an attempt to examine how these two cases contribute to the theories being tested. The final section draws conclusions and recommendations for further research.

II. LITERATURE REVIEW

A. Narrative learning and mobile-enabled inquiry learning

This section draws heavily on narrative learning and mobile technology-assisted inquiry learning. Goodson and Gill [13] provided a grounded theory on narrative learning arguing that the act of narrating one's life story is an ongoing, episodic in nature, meaning-making process leading to a deeper understanding of oneself and contributing to his/her being and becoming. Narrative is understood as the way through which lived experiences are interpreted, shared, storied and re-storied. To put it simply, narrative sheds light on the process of making sense of experience re-examining assumptions and coming to new realizations of meaning. This means that the museum visit can be examined as a dynamic experience where sense-making is an ongoing process informed by narrative learning and the interpretation of objects and artefacts, and their relationships to places and people.

When working with stories as a resource for experience interpretation, it is of heightened significance to see how Herman [16] elaborated on narrative theory to better understand learning. He argued that narrative is a fundamental cognitive tool that enables the process of deriving meaning from experience, and he saw storytelling as a way to explain cognitive processes such as knowledge acquisition, reasoning, problem solving and the generation of new knowledge [16]. Herman further claimed that these cognitive processes are found not only in the content of stories but also in the ways stories are told and organized [17]. Stories can bring to the fore situated learning [27] and with multimedia devices they can bring context-aware learning within the reach of the students whether in the classroom or in the museum.

Narrative learning in technology-enhanced environments, as examined by Dettori and Paiva [8], can foster sense-making as well as the development of cognitive skills. They argued that technology can amplify the learning potential of narrative, and herein, it is suggested to examine this concept in light of inquiry-based learning enabled by mobile technologies. In fact, attention is placed on the ways students collect, interpret and present personalized content using mobile media to craft their own stories. The work of Peltekova et al. [36], who examined how mobile technologies facilitate learning using an inquiry-based method, is quite relevant to the research focus

of this paper. They argued that inquiry as implemented in the weSPOT project, a web-based mobile learning environment, can assist students to collect mobile data using the ARLearn app, conduct investigations while playing games, analyse content and share it online to prompt further investigations. Their work suggests mobile technology integration in formal education; however, its applied value to facilitate inquiry learning in informal settings should be further explored.

In the Personal Inquiry project [41], inquiry learning was viewed as the process of setting up an inquiry question, designing and conducting investigations to collect, analyze and interpret evidence, and then draw inferences and engage in informed debates. The nQuire toolkit [1] developed as part of the Personal Inquiry project supports mobile inquiry learning across formal and informal settings. “The nQuire toolkit, a software application to guide personal inquiry learning, was designed and developed to support the inquiry process from deciding on a hypothesis or question through collecting and analysing data to its presentation, and to support inquiries that move between contexts” [19]; and because the toolkit is web-based, it is accessible in different locations and on a range of mobile devices.

An inquiry-driven instructional design could be of great value to museum education where learning is personal, contextual and constructivist-based. Digital storytelling could prove useful in the development of mobile-enabled inquiries that would engage students personally and equip them with multimedia authoring devices to craft their own stories about the museum experience. As Craig [7] claims, narrative inquiries represented through digital stories are dependent on the relationship between people, places and things, perspective and authorial voice, and further research should shed light on this relationship.

B. Digital storytelling in formal education

Storytelling, this old as the hills art of telling stories which help us make meaning out of experience [4, 42, 52] and shape identities [35], developed into an edutaining art that combines oral storytelling with multimedia. Digital stories are recorded audio narratives weaved with still and/or moving images, videos, animations, background sounds and/or music, two to five minutes long and text-wise between 200-350 words [3, 6]; exported and distributed on portable disks, USB keys and/or online. They can be testimonial or purely fictional, personal such as adventure or recovery stories [26], and/or they can be instructional [39, 34].

Leading theorists argue that digital storytelling is an effective way to integrate technology into the curriculum in a project-based way focusing on personal engagement and reflective learning [25, 34, 38, 39]. In fact, research shows that digital stories which probe deeply into experience “reproduce the insight and experience of the storyteller while prompting the audience to ask questions about their own experiences” [26]. It is argued that digital storytelling helps students to express and communicate their ideas, concerns, and feelings, to present facts, and to exchange freely and constructively diverse viewpoints. Students learn to conduct individualized research, organize and express their ideas meaningfully as

they hone their synthesizing, analyzing, evaluating, and presenting information skills [39].

C. Digital storytelling in museum education

In contemporary constructivism-based museum learning practices [5, 11, 15, 18, 43], considerable effort and time have been dedicated to implement instructional technologies into museum programs for schools. In an attempt to shed light on the realm of the student-visitor, museum curators and educators use digital media to enliven museum learning and evaluate levels of meaningful engagement. More than ever, there is a growing demand for a coherent pedagogy for technology-integrated practice that responds effectively to the visitors’ learning needs and embeds an understanding of the potential of different technologies [14].

Narrative theories offered museums a communication and engagement tool [40], leading to their re-conceptualisation as narrative environments [29]. Storytelling is at the heart of what museums do [2] as they work with stories to breathe life into their collections and provide space for narrative learning [10, 47]. Furthermore, the use of digital technologies has opened up new opportunities for researchers to re-approach the learner not only as interpreter but also as author of the narrative. Vayanou et al. [45] highlight the importance of authorship and personal choice in the design and delivery of tailored information during a museum visit. “When visitors experience a museum that encourages individual narrative construction actively, these narratives are directed not toward the acquisition or receipt of the information being communicated by the museum but rather toward the construction of a very personal interpretation of museum objects and collections” [40]. This personal interpretation facilitates learning and “making sense of experience” [18].

Most importantly, a learning approach that calls for personal engagement can be an ideal context for learning by inquiry [30], as the student has the freedom to explore the environment and research for information to answer questions of interest. By encouraging individuals to reflect upon their experiences and create their own meaning [40], digital storytelling can help frame personally relevant and meaningful inquiries within museum spaces. Several mobile applications have been proposed in museums, which support and facilitate inquiry learning [44]. When learning through inquiry, students engage in self-directed investigations where they formulate questions, plan research activity, and make informed conclusions [24]. This approach enriches their engagement with the museum objects as they recall personal memories, imagine possible scenarios, and craft their stories to make sense of the exhibited objects and the experience itself.

III. CASE STUDIES EVALUATION

This section presents two case studies to review their relevance and contribution to the purpose of this paper while considering extensions and enhancements that could lead to effective visitor inquiries framed by digital storytelling. The Storyscope project and the CHeSS project shed light on how multimedia authoring devices can craft museum narratives and facilitate visitor engagement and learning.

A. Storyscope

Storyscope (initially named Storyspace) is part of the EU-funded DECIPHER project (2011) that uses multimedia devices and interfaces to assist museum curators in presenting the stories of objects in narratives put in order by facets such as time or theme. Storyscope is founded on the basic narrative principles about plot, temporal ordering, location, events and dramatic effect. It combines rich event-based metadata with causal reasoning models to develop coherent stories about the objects. “Each heritage object tells a story about why it is significant, what it shows, where it came from, and how it relates to other items in the collection and elsewhere” [51]. Curators use the objects as the subject of a narrative inquiry and develop plots “to interactively assemble, visualize and explore, not just collections of objects, but the knowledge structures that connect and give them meaning” [22]. The project showcases that information about museum objects can be stored in digital stories and communicated accordingly.

Nonetheless, it would be interesting to explore this concept further by employing a visitor-centered approach to encourage visitor authorship in the narrative construction process. “Within museums stories allow visitors to engage with collections and to gain meaningful understanding of museum objects” [22]; however, besides the evaluation of visitors’ physical, emotional and intellectual engagement with the curatorial stories, research should focus on the stories visitors could craft themselves as a response to the experience based on their interpretations and what the objects mean to them in relation to their prior knowledge and understandings.

Also, as Wolff et al. [51] suggested, it would be interesting to see how the curatorial stories could be used for an online exhibition which would give the user the flexibility to explore the plot both onsite during his/her visit with mobile media; and online as a post-visit activity to consolidate and deepen learning. And see how the process of unfolding the facets of each story based on the visitor’s needs has an impact on the ways s/he responds to the content annotating, recording an audio response, taking photographs and/or sharing a comment online during as well as after the visit. Mobile devices and the Internet can be of great use if integrated in the process serving well-thought-out pedagogical objectives [37] which aim to sustain visitor engagement long after the visit, enable learner autonomy and promote lifelong learning in diverse contexts.

B. Chess

CHESS is a project co-funded by the EU (2011) that aims to enrich the museum experience through personalized interactive storytelling with mobile and mixed reality technologies. CHESS offers to the museum visitors tailored information for personalized meaningful engagement. It follows the basic phases of digital story construction, namely scripting, staging, producing and editing, and “a hybrid, plot-based approach with pre-defined content, where *story authors* (curators, museum staff, script writers) write stories around pre-selected museum themes” [46]. It then matches the visitors to their personas using the PAROS profiling system, and guides them through the exhibition space based on their preferences.

CHESS depends heavily on immersion and the interactivity between the user, the mobile device and the physical environment. It collects implicit feedback in order to increase the accuracy of profiling and adjust the museum experience accordingly, thus maximizing the visitors’ engagement and enjoyment through narrative learning. That is possible because “visitors drawn into an experience through their senses make deeper connections leading to the possibility that greater learning could ensue” [9]. In other words, this project uses digital stories to address the relationship between the visitor, the interactive technology and the museum space, and thus it could support inquiry learning.

Working on the idea of mobility as a “narrative experience itself” [32], it would be interesting to see how the students use the pre-defined story content to conduct research during their visit and either to contribute to the content of the existing stories adding audio recordings and/or photographs, or to craft new digital stories based on personal interpretations. Nack and Waern [32] argue that adding mobility to storytelling creates a hybrid author-reader role that blurs the origins and destination of stories. How this blurring might shape museum mobile-enabled inquiry learning practice is worth examining because museum learners can benefit greatly from an experience which prompts them to ask questions, collect information, analyze and synthesize to craft their digital stories, and share them in order to come to new realizations of the museum experience.

IV. CONCLUSIONS

“Museums are powerful learning environments, and mobile technology can enable visitors to experience the narratives in museum objects and galleries and integrate them with their own personal reflections and interpretations” [40]. This paper suggests taking a step beyond West’s [49] narrative learning as a process of inquiry that museum visitors could engage in. The ways the students engage in narrative inquiry by observation, suspending disbelief, recalling personal memories, imagining possible meanings, and re-storying experience into new interpretations [49] offers fertile ground for research in inquiry-based digital storytelling.

The lessons learnt include the realisation that the museum space can be interpreted as a narrative learning environment where the students can learn and express themselves creatively using mobile and interactive technologies. The affordances of digital storytelling used in museum education for mobile-enabled inquiry learning point towards new developments in constructivist student-centred engagement approaches. “By enabling learners to be co-constructors of narratives, narrative-centred learning environments can promote the deep, connection building, meaning-making activities that define constructivist learning” [31]. Museums are the ideal environments for that type of learning because “[i]ncorporating a form of narrative in a museum visit comes as a natural extension to the museum function as a storyteller” [20].

As the museum of the future increasingly becomes a place of experience [21], museum educators would benefit greatly from answers to the research questions:

- What is the applied value of using digital storytelling for inquiry-based learning in museum education?

- What are the limitations of enabling students to become the authors of their own object-based inquiries?
- How will inquiry-based museum learning be assessed?

Further research and fieldwork is expected to address scientifically the theories presented herein as museums become more and more inclusive places of individualised multisensory experiences and as exhibition design is steered towards visitor-generated mobile-enabled interpretations. Because “[l]earning occurs when museums cease to view visitors as passive containers and begin recognizing them as active constructors – not only of meanings inside their heads but also of connections and creations in the world, on the screen, in the museum, and beyond” [48].

ACKNOWLEDGMENT

This paper benefited greatly from the insightful input of Dr. Giasemi Vavoula from the School of Museum Studies, University of Leicester, United Kingdom.

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