International Journal of Innovation and Scientific Research
ISSN 2351-8014 Vol. 9 No. 2 Sep. 2014, pp. 473-480

http://www.ijisr.issr-journals.org/

The Study of Mobile Guiding Course Construction Applied to Museum Printing Collections

Chi-Shu Tseng, Cheng-Wei Fan, and Mei-Tsen Chen

National Science and Technology Museum,
720, Jiouru 1st Road, Kaohsiung 807, Taiwan, R.O.C

ABSTRACT: This study focuses on how to develop an effective online learning platform as a developing basis of digital learning materials for museum guiding course. A new learning mode of mobile guiding system will be proposed with example of the printing collections of National Science and Technology Museum. The museum digital resources will be converted into digital learning materials which can be used by the museum's volunteer tour guides through multimedia and mobile carrier. Such platform will be helpful for museum volunteer tour guide training and their self-growing. It will further provide museum visitors more autonomous learning environment.

KEYWORDS: Mobile learning, Museum learning, Volunteer tour guide training, online learning platform, instant information services

1 FOREWORD

The ubiquity of the Internet in recent years has caused an online learning boom that coupled with support from mobile devices has created a new model of education termed “mobile learning”. This provides students a better online learning platform through wireless communication devices. The convenience and mobility of mobile devices has increased its application in various learning environments from on campus supporting curriculums and documenting observations to off campus in coop learning. The results of both have been confirmed through experimentation and this type of learning activity, especially in informal education institutions such as museums, is receiving more emphasis for application. The primary reason is how technological advancements have changed the physical operations and service aspects of museums and this is especially apparent in the use of information systems for exhibitions, collections, and guided tours. Through the use of mobile devices, communications between the museum collection and the audience becomes simpler and more effective. However, museums still face the important issue of consolidating digital resources on an electronic platform to provide an online learning community for autonomous learning.

The National Science and Technology Museum (NSTM) is Taiwan’s first museum of applied sciences, encompassing themes such as telecommunications, biotechnology, and transportation. It possesses many classical collections from the technology industry but for the average audience, the content of these items are oftentimes more difficult to understand than historical artifacts and require in-depth guided tours for comprehension. This study attempts to propose a new mobile guiding course for museums to utilize their resources in establishing digital learning materials to conveniently train tour guides and provide museum visitors with a more autonomous learning environment.

Corresponding Author: Chi-Shu Tseng

2 RESEARCH PURPOSE

This study mainly utilizes case studies to achieve the purposes below:

1. Utilize new technology to convert the museum's traditional printing collections to digital learning materials.
2. Provide museum learners with a learning network and system to access learning materials.
3. Establish a common browsing platform and provide museum volunteers with a model for education training, provide instant information services with broad applications in the future to achieve the goal of autonomous learning.

3 DOCUMENTATION ANALYSIS

3.1 MOBILE LEARNING (M-LEARNING)

Mobile learning can be defined as: "A service or equipment used that is not limited by time and place that can provide digital information and learning materials to the student for the purpose of obtaining knowledge." [1]. Scholar Yang [2] defines mobile learning as learning that occurs at any time or place through the use of mobile devices; the device must display learning content and provide a means for two-way wireless communication. These definitions jointly point out the critical elements of mobile learning: mobile equipment, wireless communication, and digital content. In other words, mobile learning is using wireless communication services that allow students to use devices to conduct learning with digital content. Due to the mobile of characteristic devices, the student is not restricted by time or place. Using mobile communications technology, the student can use devices such as a PDA, mobile phone, e-book pack, and more to learn any place, any time.

Mobile learning, aside from having the features of "just-in-time learning", "self-directed learning", "life-long learning", and "training on-the-job", [3], it also carries six major characteristics [4]: the urgency of learning, aggressive obtaining of knowledge, mobility of the learning environment, interactivity during the learning process, contextualized learning activities, and overall integrity of teaching content. Wireless Internet applications are used to consolidate various sources of information to support the student in non-linear, multi-dimensional, and flexible learning and thinking. It is especially beneficial for highly complex learning content with little structure

The broad applications below can be determined with the application method and curriculum content design of mobile devices:

1. Presentation of text-aware mobile learning material: An example would be a software medium that is text-aware is used. This software is the study's own design and development, used to detect the user's mobile device type.
2. Utilize mobile devices to conduct coop learning: An example would be similar to Swedish University Vaxjo's C-Notes project that worked to supplement student learning and memory and encourage cooperative thinking; an application suitable for PDA equipment is used in conjunction with an external device called C-Pen to obtain and save critical information and concepts. [5]
3. Utilize mobile devices to supplement courses: An example would be usage in a course teaching about plant life in the campus. Students can document plants by taking pictures and then comparing the photographs to plant data in learning materials to confirm the type of plant and obtain related information .[6]
4. Utilize mobile devices and probes to conduct exploratory learning: An example would be elementary students in a Michigan elementary school that use the device ImagiProbe to connect to a PDA in order to gather data on water quality, which is then uploaded, to an online database. Long-term observation of the results is used to explore the changes in the environment [7].
5. Utilize GPS systems to conduct exploratory learning: For example, the historic preservation office of Illinois has developed a geographical information system of historical buildings and cultural resources. Historical sites with cultural significance are first input into a PDA for students to use GPS to locate these sites to update and maintain data [8].

3.2 MUSEUM APPLICATION OF MOBILE GUIDED TOURS

The diverse application of new technologies has changed how museums communicate with their visitors pivoting museums from an "education" orientation to a "learning" orientation. The importance and complexity of learning tools has also increased. Education in museums focuses on providing the visitor a true to life scenario or actual participation in activities to facilitate the learning of knowledge or skills; therefore, early tour methods consist of pamphlets, guided explanations, and listening devices which have evolved to the mobile devices of today [9][10]. The medium used in tours has evolved from still to interactive multimedia. Computer multimedia surely plays an important role in museum tours but

computers are cumbersome and not easily transported. Therefore, they have been replaced by light, mobile devices that are now used in museum tours [11][12]. Aside from being convenient to carry, mobile devices when used in conjunction with the tour system can offer the learner freedom in learning that is not restricted by time and space. Many studies explore the effect of mobile guided tours on museum exhibitions or exploratory learning [13][14][15] and results all point out that the use of mobile guided tours for exploratory learning shows results significant to standard museum personnel guided tours. The current application of personalized mobile digital tours is broad and when the personal device is consolidated with voice, infrared transfer, wireless communications, databases, and other technologies, functional expansion becomes even greater. Aside from museums and art galleries, this device can also see widespread use in seminars, guided city tours, and other topics [16]. If used in conjunction with RFID or Wi-Fi wireless signal positioning and surveys, it can provide a flexible guided tour and exploratory learning that will be beneficial for the conduct of educational training.

Tour guidance is an activity that is both transmissible and educational; positive effects produced by tour guidance can transform a monotonous museum into an enjoyable place of leisure for the public. Elaborate explanation through museum commentators, in combination with such technology, can be used to achieve the greatest of its value, and that is why mobile tour guidance is now broadly used. Digital devices possess powerful computing and storage capabilities and their high mobility marks their critical role for learning in museums. Many museums such as San Francisco's Exploratorium, Seattle's Experience Music Project, [17] and Taiwan's National Palace Museum and National Museum of History have all developed mobile tour systems. Most museum guided tour system designs focus on hardware with very little discussion about digital content or the exploration of educational training materials.

3.3 Museum Collections and Digital Learning Materials Design

More and more researchers feel that during a visit the visitor's attention should not only be on the cultural artifact, a stronger emphasis should also be placed on the exhibit's background history or cultural pulse. Through interpretation of the exhibit's cultural and historical background the visitor will have a deeper learning experience [18]. The visitor's prior knowledge is beneficial to the visitor's interpretation of the exhibit. Assuming the visitor's motives or attention span, long descriptive texts is not the optimal method of understanding an object. Yet, most tour guidance databases often use this method. In this aspect, the use of designing tour scenarios or through providing simulation software can achieve better results. [19]

There was a study in which researchers [20] focused on Chi Mei Museum's autumn harvest exhibit and designed an interactive museum mobile guided tour audio visual system in hopes of letting the general public understand the artistic meaning of the pieces. The study used Windows Phone, Flash, C#, full scene video and more to create a friendly interactive guided interface. QR Code technology was also used to store the contents of the collection in a back-end server and when mobile devices used the QuickMark software to scan the QR code, the information was returned wirelessly and the visitor would receive an interactive guided screen with pictures and text on their mobile device.

Another case is the "Discover NPM App" provided by the National Palace Museum [21]. This is Taiwan's first smartphone application with interactive functions with cultural artifacts. Through the use of this app, the public can experience the joy of holding cultural artifacts in their palms. The National Palace Museum chose 100 elite pieces most representative of their collection and created 20 interactive artifacts and 80 artifact introduction interfaces. The cultural artifact interaction used the many sensors on smartphones including touch, tilt, blowing, and more to display the various features of national treasures. The public used their smartphones to control and fully inspect the infamous "Jade Cabbage" and its' locust from all angles and learn about this classical artifact with diverse methods

From these case studies we can see that focusing on the creation of digital content with character is the way to fully express the characteristics of mobile devices to increase the value of mobile-guided tours. Here we can see the importance of digital learning materials.

4 Constructing Mobile Tour Guidance Learning Materials – National Science and Technology Museum (NSTM)Print Collections as Example

The NSTM's collection is located in an opening storeroom and is displayed on open shelves including experience and maintenance work zones, marking it as the first viewable searchable collections in Taiwan. Of these, the collection volume for printing technology is the most complete as the museum's many years of digitizing their print collection has shown ample results. There is a massive amount of text, images, and video resources that provide learning through the audio-playback system. Content learning of the print collection has also become a training focus of volunteer tour guides. However the open collection, due to concerns of artifact preservation and safety, has been arranged on shelves. Therefore, it cannot compare

to the exhibition hall's interactive learning environment and is highly reliant on the in depth explanations from volunteers. As this is limited by manpower and training time, a new learning model is needed to supplement the learning of the print collection.

Mobile learning is the intersection of mobile technology and e-learning making learning possible at any time and place. This has become the training solution for the print collection and once an operation model is established, the wireless environment of the open collection can in the future also provide the audience with learning opportunities through their mobile phones using Wi-Fi. Learning materials of the print collection includes artifact content description along with multimedia designs to include technical activity learning materials, cultural story audio and video, technical principles, and printing digital collections e-books. The construction of learning materials and their applicable models are described below.

4.1 TEACHING PLAN CONTENT DEVELOPMENT

The mobile guided tour design for the museum visitation tour-learning plan is basically in two methods: audio-visual guidebook with visiting map design and scenario-based approach design. This study will combine the positive aspects of both and use an optimal learning interface and consolidated digital learning resources and introduce this to the autonomous learning area of the museum. An attempt to establish a mobile-guided tour learning platform and using the platform's generated QR-Code to present the museum's print collection then combine the display contents to make autonomous learning convenient. The advantages include knowledge transfer of specific themes in terms of collection knowledge and ease of training for volunteers.

As the design of this project's main focus is the training of volunteers guides for the museum's collections and future aspirations for applications in the exhibit for learning by the audience, the design of this project mainly consists of audio and visual learning materials for tour guidance supplemented by presentations and object research data. The digitizing of museum collection resources into learning content for the convenience of the repeated training of volunteers requires the considerations below:

1. The categorization of resources must be simple and adhere to user habits so that volunteers are willing to use this system to go online to learn and train at a whim.
2. Utilization of resources should be classified for the convenience of the student to observe and learn according to their abilities. Considerations must be given to which portions are suitable as learning materials for guided tours as material that is too difficult can lead to frustration while simple materials lack challenge and decrease the desire for autonomous learning.
3. The presentation of resources should be converted or organized which can not only help volunteers quickly take in the more difficult content of collections to increase tour skills and abilities but also increase the desire for autonomous learning to let museum collections become objects that talk and make learning more interesting.

4.2 CONSTRUCTION OF MOBILE TOUR GUIDANCE DIGITAL LEARNING MATERIALS

The structured system operations of the museum's print collection mobile learning materials are as described in Fig. 1.

Fig. 1 Structure System Implementation of Print Collection Mobile Learning Materials

Once the demand for learning materials is proposed, aside from assessing viability of the technical platform, considerations must also be given to whether the print collection's related resources can support the content of the learning material; this includes aspects such as digital collection, storeroom resources, cooperating class activities and more to jointly form the knowledge contents of the digital collection to develop the museum's knowledge community. First the demand for mobile learning materials is analyzed and according to operational experience there are the requirements below:

(1)Help the volunteers of collection tours with training; establish example tutorials for each print artifact to help new volunteers to quickly understand the contents of the collection.

(2)Work with gifted volunteers to establish in-depth tour capabilities for special topics on print. Through the in-depth learning resources provided by the platform, knowledge of the museum's collections will deepen with supplementary data that further completes the knowledge base.

(3)Establish a social network with a print based theme and use the platform to share insights. Combining this with the examination measures for volunteers, learners can aggressively collect related content and share experiences. This will not only improve understanding of print topics, but can stimulate autonomous learning and start a beneficial cycle.

The mobile tour guidance learning platform's design principles include:

- The system's front end and management interface will be done through the web browser.
- Can automatically determine device (computer, iPhone, iPad, android mobile or tablet) and deliver their specific interface.
- Can add, delete, or edit various administrator groups including systems administrator, members, and more.
- Can directly browse content with an iPhone/iPad or other tablets including formats such as mp4, mp3, and PDF.
- Provide programmable playlists and maintenance methods such as add, update, delete and provide upload formats in the same field including: mp3, m4a, m4v, mp4, pdf, mov, avi, wmv, flx, m2ts, mts, dot, swf, epub.
- Once attachments are uploaded, the system will automatically produce a QR-Code matching the file to allow quick browsing using mobile phones.
- Content administrator and members can establish personal web pages and immediately produce mobile web pages.

4.3 Design of Mobile Device Tour Guidance Teaching Plans

To meet the needs of training volunteers, the design principles of the mobile device platform are as below:

1. Layout will be classified by the contents of the print collection.

2. Adhere to practical operations and divide the video learning materials of each print artifact into videos of approximately 10 minutes in length for convenient mobile delivery and browsing.
3. The system's interface is to be designed in a method that is simple to use and include the sections: channels, newest programs, featured area, and museum Facebook area (as in Fig. 2).

Fig. 2 Control interface design of the mobile tour guidance service platform

4. Use podcast audio and video resource channel categorization so that users can quickly find learning materials relating to printing themes.
5. Uploaded data automatically generates QR-Code image files.

For instance entering the system's letterpress printing technology artifact channel, the related artifact content will be displayed as in Fig. 3 and through the categorization of print programs; each program's videos will produce a QR-Code image file once uploaded to the system. The user can scan the QR-Code to retrieve that program's tour guidance audio and video learning materials to make the museum's online tour guidance learning simpler.

Fig.3 Print technology artifact section

5 CONCLUSION

The purpose of this study is to introduce the concept of autonomous learning for volunteers through the establishment of learning materials for museum tour guidance, and to achieve the goal of consolidating all of the museum's digital resources and learning materials to develop a mobile e-learning system that can provide various interactive learning activities to finally establish the museum's digital learning environment and further develop the museum's knowledge community.

From the case studies of digitizing learning materials of print collections we can see that applying mobile devices and service platforms for the purpose of training can be functional in transferring knowledge of artifacts. In the future this model of creating learning materials can be broadly used to develop other mobile learning systems for the museum's other exhibits. However, in terms of the effect of attracting autonomous learning in visitors, more exploration is required. This unnumbered section is used to identify people who have aided the authors in accomplishing the work presented and to acknowledge sources of funding.

REFERENCES

[1] Stephen J. H. Yang, "Context Aware Ubiquitous Learning Environments for Peer-to-Peer Collaborative Learning," *Journal of Educational Technology & Society, vol.* 9, no. 1, pp.188-201, 2006.

[2] K. U. Hummel, H. Hlavacs, and H. Weissenbock, "Web based online learning in technology equipped and mobile student societies: A case study," in *Proceedings of the interactive computer aided learning Workshop, Villach, Austria,* 2003.

[3] Tai-Cian Gao, "Learning in Future Classroom : Cognitive Apprenticeship Learning Environment in Wireless Network," *Journal of Teaching and Learning, No.*9, pp.23-34, 2001.

[4] Lin-Jung Wu, "A Study of Mathematics Path and Interactive Problem Solving Discussion System in Mobile Learning Environment," M. thesis, Department of Industry Technology Education, Taiwan Normal University, Taipei, 2004.

[5] Tsu-Ling Fang, "A Study on Mobile Learning Device Applied to the Nature Science Class in Elementary School," M. thesis, Department of Science Education, National Taipei University, Taipei,2004.

[6] Lin-Jung Wu, "A Study of Mathematics Path and Interactive Problem Solving Discussion System in Mobile Learning Environment," M. thesis, Department of Industry Technology Education, Taiwan Normal University, Taipei, 2004.

[7] Shu-Chuan Chen, "The Study of the Application of Global Positioning System into the Teaching of Senior High School Geography," M. thesis, Department of Geography, Taiwan Normal University, Taipei, 2003.

[8] Li-Ling Wu, "A Study of Tours Guide and Visitor Involvement Level for Museum- A Case of da Vin ci Exhibition," M. thesis, Graduate School of Visual Arts, University of Taipei, Taiwan, 2000.

[9] Meng-Jie Wang, "A study of an integrated learning environment and mobile touring system for historical museum," M. thesis, Department of Industry Technology Education, Taiwan Normal University, Taipei, 2006.

[10] Ping-Fu Chen, "The Design and Application of a Situated Mobile Guide System - A Case of Tang Tri-Color Glazed Pottery at the Nation Museum of History," M. thesis, Department of Information Education, Taiwan Normal University, Taipei, 2006.

[11] Meng-Jie Wang, "A study of an integrated learning environment and mobile touring system for historical museum," M. thesis, Department of Industry Technology Education, Taiwan Normal University, Taipei, 2006.

[12] Shao-Ching Yu, "Interaction Design of Personal Digital Mobile Guide Example of The Exhibition "Emperor Ch''ien-lung''s Grand Cultural Enterprise" in National Palace Museum," M. thesis, Department of Information Community, Yuan Ze University, Taoyuan, Taiwan, 2003.

[13] Hsien-Sheng Hsiao, Hsiang-Wei Huang, and Wan-Ti Hong, "The Study of Mobile Guiding System Applied to Museum Learning," Journal of The National Kaohsiung Normal University, No.23, pp.29-52, 2007.

[14] Yao-Ting Song, Gguo-En Jhang, and Wun-Jheng Yu, "Usage of Mobile Devices in Museums: Promotion of Human-Computer-Situation Interactive Design," Museology Quarterly, vol. 20, no. 1, 2006.

[15] Shao-Ching Yu, "Interaction Design of Personal Digital Mobile Guide Example of The Exhibition "Emperor Ch''ien-lung''s Grand Cultural Enterprise" in National Palace Museum," M. thesis, Department of Information Community, Yuan Ze University, Taoyuan, Taiwan, 2003.

[16] Exploratorium, 2013. Electronic Guidebook Forum. Electronic Guidebook Research Project. [Online] Available: http://www.exploratorium.edu/guidebook/ (May 17, 2014)

[17] L. Beck,, and T. Cable, Interpretation for the 21st Century: Fifteen Guiding Principles for Interpreting Nature and Culture. Boston: Sagamore Publishing, 1998.

[18] Yao-Ting Song, Gguo-En Jhang, and Wun-Jheng Yu, "Usage of Mobile Devices in Museums: Promotion of Human-Computer-Situation Interactive Design," Museology Quarterly, vol.20, no. 1, 2006.

[19] Te-Ming Tung, “Interactive and Mobile Feature applied to Museum Audio-Visual Navigation System,” M. thesis, Graduate School of Digital Living Technology, Kun Shan University, Tainan, Taiwan, 2011.
[20] National Palace Museum, 2013. Taiwan's First Artifact Interactive App "Discover NPM" Officially Launched. [Online] Available: http://vr.web-street.com.tw/?Mods=News&File=Info&Nid=116 (July 7, 2014)