Εκπαίδευση, Δια Βίου Μάθηση, Έρευνα και Τεχνολογική Ανάπτυξη, Καινοτομία και Οικονομία

Τόμ. 2 (2019)

Πρακτικά του 2ου Πανελληνίου Επιστημονικού Συνεδρίου με Διεθνή Συμμετοχή «Ελλάδα-Ευρώπη 2020: Εκπαίδευση, Δια Βίου Μάθηση, Έρευνα, Νέες Τεχνολογίες, Καινοτομία και Οικονομία», Λαμία 28, 29, 30 Σεπτεμβρίου 2018

Developing a Participatory Platform for Teaching Cultural Heritage in Informal Learning Environments: The Case Study of Culture Gate

Zois Koukopoulos, Dimitrios Koukopoulos, George Koutromanos

doi: 10.12681/elrie.2449

Developing a Participatory Platform for Teaching Cultural Heritage in Informal Learning Environments: The Case Study of Culture Gate

Koukopoulos Zois[1], **Koukopoulos Dimitrios**[2], **Koutromanos George**[3]
zkoukopu@upatras.gr, dkoukopoulos@upatras.gr, koutro@primedu.uoa.gr
[1, 2] Πανεπιστήμιο Πατρών [3] Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών

Abstract

The purpose of this paper is to present the educational dimension of the Culture Gate platform and Culture Gate Collector application. Culture Gate is a multidisciplinary multipurpose online participatory platform for the management of cultural heritage digital content. A unique feature of the Culture Gate platform is that it enables any teacher or student to create, upload, share, and comment on a wide variety of cultural content ranging from theatre to music. The platform integrates several characteristics of well-known IT-ready educational theories, such as collaborative learning theory and constructivism theory. Furthermore, the platform possesses an application for smart devices (smartphone, tablet) known as Culture Gate Collector. Using this, students can collect content from formal and informal environments, edit it, and share their own cultural content that comes from the historical-cultural setting of the local community in which they live and operate. Culture Gate Collector can enhance mobile learning, as well as situated learning. This paper makes reference to the developmental philosophy behind Culture Gate and Culture Gate Collector, their educational and technical capabilities, and proposals for their optimal utilization in informal learning environments.

Key – words: Online participatory platform, teachers, students, cultural heritage digital content, formal and informal learning, mobile learning

1. Introduction

The rapid evolution of digital, wireless and mobile technologies (e.g. Web 2.0, Internet of things, cloud computing, augmented reality, mobile/wireless communication) have created new opportunities for learning in both formal and informal educational environments. Learning through these technologies is often described as "*online collaborative learning*" (e.g. Biasutti, 2017; Yücel & Usluel, 2016; Zhang, Liu, Chen, Wang, & Huang, 2017), "*e-learning 2.0*" (e.g. Wang & Chiu, 2011), "*ubiquitous learning*" (e.g. Kong, Chen, Huang, & Luo, 2017), "*here and now learning*" (e.g. Martin & Ertzberger, 2013), "*seamless learning*" (e.g. Wong & Looi, 2011), and "*mobile learning*" (e.g. Crompton, Burke, & Gregory, 2017; Han & Shin, 2016).

Mobile learning is a modern and highly effective weapon at the discretion of each educator providing a series of advantages like portability, user mobility, pervasiveness, ubiquity and immediate interaction with the external environment. Every up-to-date educational platform should provide mobile services to teachers and students. Parsons (2014) argues that "*the future potential for mLearning is to enhance learning both inside and outside the classroom and workplace*" and continues stating that "*by bringing devices into the classroom, we have the opportunity to transform formal education into a more engaging, relevant, collaborative and outward-facing activity. By taking learning outside the classroom using mobile devices, we have the opportunity to transform informal education, by turning the whole world into a learning space*" (p. 225).

These technological innovations have encouraged many cultural institutions to increase the use of on line and mobile cultural context to fulfill teachers and students' expectations and needs. More specifically, many museums have conducted the implementation of dedicated mobile applications in order to offer a more immersive and personalized experience to their visitors. For example, LACMA is a mobile application that provides useful information about the Los Angeles County

Museum of Art like new exhibitions, film screenings or music events (https://www.lacma.org/mobile). In, addition, the State Hermitage Museum is a mobile application that provides tours around the rooms of the famous museum, allowing the visitor to save preferable exhibit images, share her/his discoveries on social media, view museum-related news, events and exhibitions and create a personal collection with her/his favorite exhibits (https://appadvice.com/app/hermitage-museum/498954947). Smithsonian Mobile is a digital mobile guide to the Smithsonian museum, built in collaboration with museum visitors (https://play.google.com/store/apps/details?id=edu.si.sim3&hl=en_US).

In addition, many researchers have designed and developed applications for with cultural context. For example, the CHESS project attempts to provide adaptive, personalized, interactive storytelling for museum visits (Pujol et al., 2013). Ruotsalo et al., (2013) present SMARTMUSEUM, a mobile ubiquitous recommender system addressing tourist information needs in context-aware on-site access to cultural heritage. Koukoulis and Koukopoulos (2016) present the design of a user-friendly and trustworthy mobile system prototype that includes functionality needed from museums, aspiring to become a helpful guide towards the design and implementation of trustworthy mobile-based museum visiting applications. Kuflik, Wecker, Lanir and Stock (2015) investigates the enhancement of cultural heritage experience beyond the museum visit and towards linking it to personal experience. Authors propose an innovative framework for supporting the pre, during and post visit stages in a personalized manner. SMART is a prototype museum touring application that urges museum visitors to interact with each other and share their experiences with their on-site or off-site friends (Huang et al., 2015). SMART recommends personalized tours to museum visitors based on their preferences, provides interactive activities and allows visitors to mark their favorite exhibits.

Despite the availability of applications such as the ones mentioned above, there was nonetheless an absence of a platform that could provide the educational community with the ability to create its own cultural content and support mobile learning through an application for smartphones and tablets. Such an opportunity is currently being provided via the “Culture Gate” platform (https://www.culture-gate.com/), which has been designed for the creation and management of a variety of cultural content ranging from theatre to music. Through an application it offers for smartphones and tablets known as “Culture Gate Collector”, students can collect, edit, and showcase their own cultural content that comes from the historical-cultural setting of the local society in which they live and operate.

The purpose of this paper is to present the educational content of the Culture Gate platform and the Culture Gate Collector (CGC) application that accompanies it. This paper aims to: (a) describe the theoretical groundwork on which the Culture Gate platform is based and b) discuss the capacity for utilizing the Culture Gate platform and Culture Gate Collector application in teaching and learning.

2. Culture Gate: A Cultural Educational Environment

Culture Gate is a digital participatory platform that facilitates the management and dissemination of cultural heritage digital content (Koukopoulos et al., 2017). One of Culture Gate goals is to provide a complementary path in the educational procedure concerning courses related to cultural heritage.

Currently there are many excellent digital applications, platforms and technologies, classified in various fields, which have been proposed and used vividly by the educational community all over the world at the moment (Bradford, Porciello, Balkon, & Backus, 2007; Dougiamas & Taylor, 2003). Learning management systems is software that administers, documents, tracks, reports and delivers educational courses or training programs (Ellis, 2009) like Moodle, Blackboard Learn and Canvas Network. Moodle is used for educational projects in schools, universities, workplaces and

other sectors (Dougiamas & Taylor, 2003). Blackboard Learn is a virtual learning environment and course management system whose main purpose is to add online elements to courses and develop completely online courses with few or no face-to-face meetings (Bradford et al., 2007), while Canvas Network is a massive open online course (https://www.canvas.net/).

Educational and pedagogical theories like constructivism, collaborative learning, learning objects, multimedia learning theory or mobile learning have been investigated throughout the last years for their potential integration in educational digital applications. Various scientists have stated that constructivism as a theory can be directly applied in educational procedure through software applications (Ben-Ari, 2001; Hadjerrouit, 2005). Hadjerrouit (2005) proposes a pedagogical model that translates constructivism into a web-based course in object-oriented software engineering. Osuna and Dimitriadis (1999) present a framework for the development of educational collaborative applications based on constructivism. The connection between constructivism and community in online teaching and learning is investigated by Farmer (2004). Several studies search and confirm the successful integration of collaborative learning theory in educational digital applications (Caballé, Daradoumis, Xhafa, & Conesa, 2010). The design of a collaborative learning environment that aims in facilitating students in group collaboration is proposed by Wang (2009). A generic platform for the systematic construction of knowledge-based collaborative learning applications is proposed by Caballé, Daradoumis, and Xhafa (2007). The design of an online collaborative location-aware platform for history learning is introduced by Chen and Choi (2010). Online education using learning objects educational theory is presented thoroughly by McGreal (2004). Laverde, Cifuentes, and Rodriguez (2007) introduce an instructional design model based on learning objects for use in higher education and Xu, Yin, and Saddik (2003) present a web services oriented framework for dynamic e-learning systems that use the idea of learning objects, which enables learning service providers to publish their learning objects or applications universally. Computer-based multimedia learning and its basic principles (multiple representation, contiguity, coherence, modality, and redundancy) is thoroughly discussed by Mayer and Moreno (2002). Distributed multimedia learning environments are discussed by Pea and Gomez (1992). The approach of mobile learning as the next generation of e-Learning is highlighted by Sarrab, Elgamel, and Aldabbas (2012). A comprehensive guide about the educational foundations of modern networked learning is presented by Kukulska-Hulme and Traxler (2005) where various aspects of mobile learning like pedagogy, technology, usability and accessibility are discussed. Park (2011) introduces a pedagogical framework for mobile learning where various types of educational applications of mobile technologies are identified.

Filtering the above technology-ready educational theories we end up with some main characteristics which have been integrated in many educational digital applications like collaboration, participation, contribution, personalization, user friendliness and easy-to-use, interactivity and mobile friendliness. CLEV-R is a collaborative learning environment using multimedia and virtual reality for an effective cooperation and communication among students (Monahan, McArdle, & Bertolotto, 2008). Educators are guided to design effective cross-cultural online collaborative learning environments and experiences by Chen, Caropreso, Hsu, and Yang (2012). An intelligent computer-supported collaborative learning environment based on a theoretical framework for enhancing social interactions between instructors and learners is discussed by Kreijns, Kirschner, and Jochems (2002). CeLS is a web-based educational system that promotes student participation, content contribution and collaboration (Ronen, Kohen-Vacs, & Raz-Fogel, 2006). Wiki is a social software tool fully integrated in educational procedure that promotes student-generated content and direct authoring by the teacher (Wheeler, Yeomans, & Wheeler, 2008). A learner model server implementing personalization in digital educational environments is presented by Ayala and Paredes (2003). An advanced architecture for a personalization system to facilitate web mining is proposed by Romero, Ventura, Zafra, and de Bra (2009) aiming in providing recommendations to students with the most appropriate links/Web pages to visit next. A multi-model approach for

supporting the personalization of ubiquitous learning applications is presented by Rosa, Ogata, and Yano (2005). WELS is a web-based educational system used primarily in academia that takes into consideration user satisfaction dimensions like user friendliness and easy use, features highly appreciated by students (Shee & Wang, 2008). The importance of interactive applications in education is pointed out in numerous studies like Reeda and Afjeha (1998) that present the implementation of interactive educational engineering software for the World Wide Web with Java or Dickey (2007) where 3D virtual worlds as interactive learning environments are used in traditional classrooms or in distance education. As mobile learning tries to find its place in the educational procedure, mobile friendliness as a feature of educational applications becomes apparent (Jeng, Wu, Huang, Tan, & Yang, 2010). Trying to combine mobile educational applications and personalized tutoring Virvou and Alepis (2005) introduce Mobile Tutor a mobile educational tool that can be used effectively by teachers to provide their students with access to theory and tests, monitor student progress and communicate with students during the course.

Digital educational applications and methods can address to either teachers or students. Lin, Young, Chan, and Chen (2005) proposed teacher-oriented web-based authoring tools and teaching methods and they performed a qualitative assessment on online teachers. Authors concluded that adaptive modules like curriculum, co-teaching and privileges, reward, assessment and information sharing settings, could support their online teaching effectively. Tutor, a teacher-oriented web-based educational software system that promotes a blended learning environment in higher education is presented by Hornos et al. (2012). Personal learning environments are student-oriented social software-based tools for learning that include operating environments and networks that people already use (Syvänen, Muukkonen, & Sihvonen, 2009). A student-oriented digital tool, called FINEL, for use in electrical and computer engineering undergraduate course is described by Hoburg and Davis (1983).

Table 1: Culture Gate educational features

Features	**Description**
Collaboration	Culture Gate is a collaborative learning environment where students and teachers can work together to achieve a common educational goal. Students can work on cultural projects in teams and implement a series of tasks.
Participation	Each student can register on the platform and become a part of Culture Gate online community. A registered user is allowed to use various services and participate actively in different activities.
Contribution	The platform lets users (students or teachers) to upload primitive or existing digital content. Each user retains full ownership over her/his content and can modify or delete it at any time.
Personalization	Users view prioritized cultural content based on their interests, as they have declared them during registration. Based on the time they spend and activities they perform, the system awards each user with points that lead to additional privileges and gifts.
User-friendliness	The platform implements several features that are optically pleasing.
Usability	Culture Gate is constantly trying to make its use as easy and simplified as possible.
Interactivity	The platform implements several interactive services, like the interactive geographical cultural map in order to become more interesting and engaging for the students.
Mobile Friendliness	The system hosts mobile applications for the collection and dissemination of existing or primitive cultural content. Platform's online interface is mobile-friendly and can be accessed easily from mobile devices without losing functionality or aesthetics. Culture Gate Collector (CGC) is a smartphone application that helps users capture and upload primitive or existing educational content to the platform.

Authoring	Culture Gate gives the opportunity to teachers to monitor student-generated content and check it for validity and soundness prior content notification to the broad public.
Content organization in learning objects	The system organizes contributed content in learning objects.
Multimedia content	The platform urges users to contribute multimedia content.
Educational orientation	The platform can be adapted for use both from an educator's perspective and student's perspective.
Trustworthiness	Contributed content belongs solely to the user that has made the contribution and not the platform itself. A contributor is in position to delete her/his content if he decides to without any consequences. The platform implements authorization mechanisms to ensure that user contributions cannot be manipulated by other users.

An important issue in online learning environments is security. Access control mechanisms combine user identification with user authorization in order to protect the stored user data. One of the most common models proposed in the literature for collaborative learning environments is the RBAC model (Su, Yang, Hwang, & Zhang, 2010; Montero, Aedo, & Díaz, 2002). Courba platform based on RBAC model supports personalization of online lessons (Montero et al., 2002). Another example of RBAC model is the PAMS 2.0 system (Su et al., 2010), which is a Web 2.0 collaborative teaching environment permitting learners to comment on documents.

Culture Gate is a unique participatory collaborative environment that uses cultural heritage content, uploaded by students and teachers, for educational purposes. Culture Gate combines and evolves various characteristics and ideas from the above platforms, systems, applications, tools and frameworks (Table 1). A unique characteristic of Culture Gate is that it is optimized for use by both teachers and students in contrast with applications like Mobile Tutor, Tutor or FINEL. Culture Gate design is oriented in user-friendliness, interactivity and easy use which is, also, common in systems like WELS or Reeda and Afjeha (1998). Culture Gate identifies the importance of personalization in educational environments offering corresponding services as indicated by Rosa et al. (2005), Romero et al. (2009) and Ayala and Paredes (2003). Culture Gate along with CLEV-R (Monahan et al., 2008), Wang (2009), Caballé et al. (2007), Chen and Choi (2010) or Kreijns et al. (2002) present applications that promote student collaboration. Moreover, Culture Gate supports the direct interaction of students with their teacher allowing teachers to monitor and guide students during content generation in real-time like Wiki (Wheeler et al., 2008). Culture Gate and Xu et al. (2003) adapt learning objects for content organization purposes in order to promote content reusability and independence. Incorporating the basic ideas of constructivism, Culture Gate and Osuna and Dimitriadis (1999) promote students participation and collaboration in educational tasks.

2.1 The environment of Culture Gate

2.1.1 Users. Culture Gate uses an extended role based access control model and implements three user types/roles with different scopes and permission levels, which can adjust to educational procedure. The teacher role addresses to educators of all grades, from kindergarten and elementary school teachers to academic professors. Similarly, the student role addresses to students of all grades, from preschoolers and adolescents to undergraduate and postgraduate college students. Users are classified in registered users (teacher, student) that have created an account and non-registered users (guest) that do not have an active account on the system. Registered users can use the full potential of Culture Gate educational services, while non-registered users can use only a part of the supported services.

Teacher: Users that search public content, view both public and private content, create and assign tasks and projects, formulate private groups and include students in them, author content contributed by students and contribute educational content public or private.

Student: Users that search public content, view both public and private content, contribute content, participate in a private groups, comment on another user's contribution and share public content on their social media.

Guest: Nomadic users who view and search public content.

2.1.2 Content organization and types. The system organizes uploaded cultural content, contributed by registered users, in database tables. The basic content entity is the digital learning object. Each contributed object can be used as an independent learning unit or can be grouped in more compound learning collections, depending on the occasional educational goal. Each learning object is characterized by a series of attributes classified in three categories:

Content-based attributes: include thematic ones like title, description, creator (like artist, group of people, institute), and discipline (field of cultural heritage the contribution belongs to).

Context-based attributes: include contextual ones like featured image (contribution's most representative image), files (multimedia files corresponding to the contribution), location (region's geographical coordinates where the contribution was uploaded), digitization equipment (equipment used to collect the data), date (date and time of the contribution).

Model-based attributes: include attributes imposed by the proposed model such as the permitted user operations, like authoring or content notification.

Platform supports different types of content like text, audio, images, video and multimedia. Text content can be content description, historical background, notes, theatrical plays and scripts, literary works or reviews and references. Images can be site and artifact pictures or depictions like drawings, pictures, notes and sketches. Video can be animation or live activities like excavation or a folk theatre performance. Audio content can be narrations, interviews and vocal guides. Multimedia files can be a full demo package with all kinds of data types.

2.1.3 Educational Services. As a multipurpose platform, the system implements various services. For the purposes of the work, we will try to concentrate on platform services that can be used for educational purposes.

Search educational content: Users can search for educational content by utilizing the appropriate search areas. In each case, a user provides one or more search terms (i.e. geographical location, title, keywords, discipline) and sends her/his request to the system. If the system finds no learning objects that correspond to user's search terms, it asks user to refine the search. Otherwise, the system retrieves and displays the desired information. It is not required for users to have an active account of Culture Gate in order to search for cultural content.

View educational content: The system uses two ways to display educational information: interactive map and thematic lists. The interactive geographical map (Google Maps) hosts pins of various colors and icons (Figure 1). Each pin represents a learning cultural object. Pins of the same cultural discipline bear the same marker color and icon. In this way, users can easily distinguish information that belongs to different disciplines. If a user wishes to explore a learning object, she/he can click on a pin and a modal window appears with cultural item's title, distinctive image and some brief information. If users want to find out more about a learning object, they can click on the title of the modal window and they will be redirected to the object's dedicated web page. That page displays a more detailed presentation of the learning object with information concerning description, multimedia content, associated YouTube videos or the user who listed the item. Thematic lists are a more traditional way to display information. Learning objects are being displayed in lists per cultural discipline. When a user wants to find information about a cultural discipline, she/he

navigates to the corresponding page, by using the appropriate menu item. Every page presents a blog style list of items that belong to the requested thematic category. The user can be redirected to cultural item's dedicated web page by clicking on the list item.

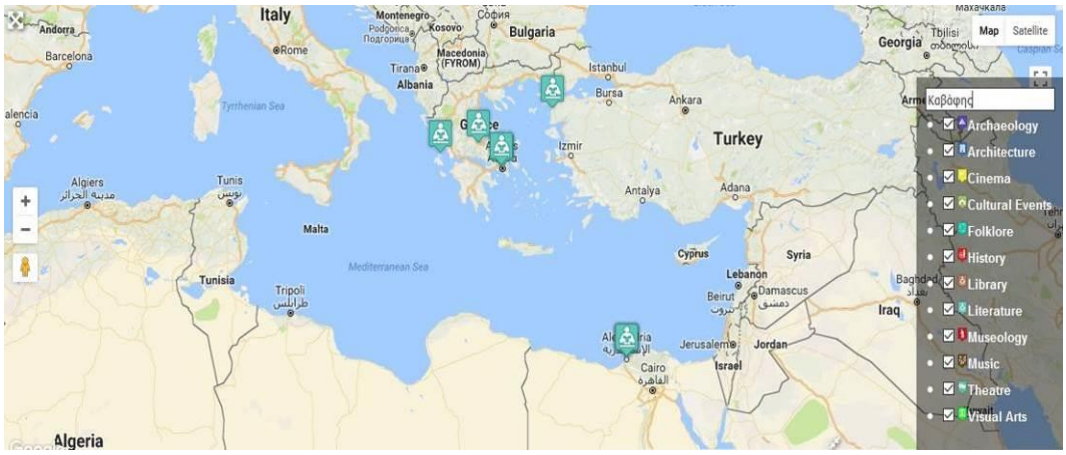


Figure 1: Culture Gate interactive geographical map

Private group formation: Culture Gate provides the opportunity to its users, to create private groups in order to exchange content with other designated users. This content is not visible by users that are not members of the same private group. The teacher as the group leader is the person that initializes the group formation procedure and decides which students to include into. The teacher is responsible for the content uploaded by any member of the group. Such content is private and restricted only to the group members for viewing. A group member that uploads private content must declare that the content is only available for the group members.

Content contribution: Teachers and students can contribute educational cultural content. Users that upload contributions have full ownership over their content. In order to upload content, each user must login to the system and use the Add Listing screen. The user can declare the content public (for everyone to see) or private (can be seen by her/him or a certain user group).

Content authoring: Teachers are responsible to author content contributed by their students as part of the educational procedure.

Project creation: Teachers can create a new educational project, add intermediate tasks and assign them to specific students or provide hints and solutions.

Task completion: Students are assigned to specific tasks by their teacher. Tasks are always associated with specific preset projects. When students complete an intermediate task the system unlocks the next task until they reach the final project goal.

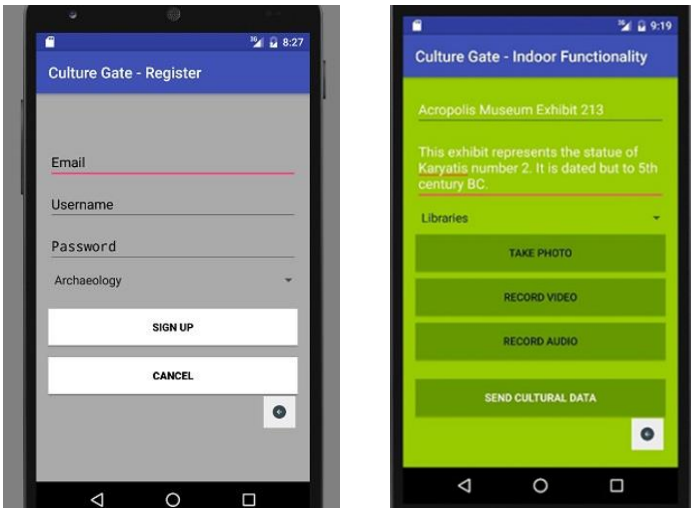
Social media sharing: Users can share on their social media accounts any learning object contributed by themselves or other users. In each webpage dedicated to a specific learning object there is a sharing button that can be used to initiate the sharing procedure.

Content commenting: Students are able to comment on another user's contribution.

Personalization: Culture Gate prioritizes content shown to each user based on her/his fields of interest. When a user requests a learning object the system returns items related to the user's interests as they have been declared during the registration process.

2.2 Culture Gate Collector (CGC)

Culture Gate Collector (CGC) is a smartphone application that aids in collecting cultural data from outdoor or indoor locations and storing it on a database or file server for further use.



A B

Figure 2: A: CGC registration screen, B: CGC indoor functionality screen usage

CGC is a dedicated smartphone application that is distributable to Culture Gate community members. Users can install the application directly to their android mobile devices. With the use of CGC a mobile user can store data in real time with the only requirement being an active internet connection. The basic usage scenario for CGC follows: After the application is installed on an android smartphone or tablet, the system prompts users to create an account, using a registration screen (Figure 2). The user submits username, email, password and discipline. For security reasons, the user's password is encrypted. This is the first level of security implemented by the platform. When the registration procedure is completed, the user accesses a navigation screen that prompts her/him to choose the desirable service: (a) Field service: Captures audiovisual content from an outdoor uncharted location (like an excavation point) and sends it with its coordinates and notes to the web server. Users complete fields like: Title, Description, Discipline, Audio/Video/Image Files. CGC sends geographical data automatically during the uploading procedure. (b) Street service: Captures audiovisual content from an outdoor charted location (like a city street) and sends it with its coordinates and notes to the web server. (c) Indoor service: Sends text content related to a tangible cultural item (like an artifact in a museum), along with notes or audiovisual files to the web server. Each of the above services can be used by several user groups to store real-time data.

For CGC implementation we used Android Studio as the IDE, target SDK version 23 and minimum SDK version 8 in order for Culture Gate application to be applicable in the vast majority of android smartphones and tablets and Samsung Galaxy Grand Neo to test the resulted application. Android applications use JAVA and XML to implement functionality. A user downloads the application from https://www.culture-gate.com/, free of charge, installs it on the machine, collects cultural material and sends it to the Web Server. Responses from the server use JSON. JSON is an open standard format that uses a human-readable text to transmit data objects consisting of attribute–value pairs. It is the most common data format used for asynchronous browser/server communication.

2.2.1 Recommended Use of Culture Gate Collector

Culture Gate Collector (CGC) can be used within the framework of inter-thematic activities and projects related to the local history and culture of a school's surrounding area. Furthermore, it can be used to collect digital content during students' visits to formal and informal learning environments that possess special cultural and historical value. Finally, CGC can be used by schools from different regions in a country or even different countries as part of a framework of collaboration established through European Programs (i.e., Erasmus+). Below, two scenarios regarding the optimal use of CGC are presented.

Usage scenario 1 – Indoor use on a museum school visit: A class teacher decides to visit the city museum with a class of students and communicates with a moderator of Culture Gate in order to create a private user group for the class, with her/him as the group leader. Moreover, the class teacher asks students to install CGC to their smartphones and create accounts. The teacher informs moderators about the user accounts to be added to the user group. When the class visits the museum, the teacher informs students to sign in Culture Gate and navigate to "Indoor Functionality" screen (Figure 2) to start using CGC's indoor service. Students consults the teacher about capturing artifacts, making notes stating their point of view and sending them to Culture Gate. The teacher can use CGC to record an audio file with museum's conducted guide. When the visit is over, the teacher accesses and checks the content contributed by students. Afterwards the teacher publishes the content with visibility only to group members. In the next lesson, she/he will be able to discuss this museum visit with the students and publish the corresponding virtual tour to the public.

Usage scenario 2 - Capturing a cultural event situated on a city street: A student walks on a city street and witnesses a folklore event happening right now. Several individuals are dancing traditional songs on a stage. The student activates CGC on her/his smartphone and navigates to "Street Functionality" from the "Functionality Board" screen. The student fills the appropriate fields (Title, Description, and Discipline) and starts capturing the event by clicking on the "Record Video" button. When recording is over the student clicks on the "Send Cultural Data" button and sends the cultural document to Culture Gate web server. A cultural happening that would otherwise be lost in time has now been captured, digitized, preserved in digital form and available to all from the screen of their computers through Culture Gate OWP.

3. Conclusions

This paper presented the educational dimension of the Culture Gate platform and the Culture Gate Collector (CGC) application. Culture Gate is a multidisciplinary multipurpose online participatory platform for the management of cultural heritage digital content. A unique feature of the Culture Gate platform is that it enables any teacher or student to create, upload, share, and comment on a wide variety of cultural content ranging from theatre to music. The platform integrates several characteristics of well-known IT-ready educational theories, such as collaborative learning theory and constructivism theory.

Furthermore, the platform features an application for smart phones known as Culture Gate Collector. The application operates as a real-time collector of content (text, images, sound, and video). This content is sent to the Culture Gate platform together with the location from where it was collected, and they are correlated with a post on the cultural map after being vetted by administrators. In this manner, educators and students can operate as researchers, recording content and experiences at sites of cultural interest (i.e., museums, archaeological sites). Accordingly, opportunities are provided to foster mobile learning, utilization of experiences from informal learning environments, and the development of activities at cultural heritage sites focusing on situated learning features. In fact, the Culture Gate platform and Culture Gate Collector can provide

numerous benefits to teachers, such as a better educational environment for collaboration and participation, as well as various technical capabilities.

This paper focused on presenting the capabilities of the Culture Gate platform and the Culture Gate Collector application. Future research could focus on examining: (a) the usability of the platform and application by the educational community on the primary, secondary, and tertiary education level, (b) the opportunity it provides to students and teachers to become creators of their own cultural content within the framework of formal and informal learning environments, (c) the process of student engagement, interaction, and collaboration during the creation, management, and sharing of digital cultural content. Finally, future studies can examine factors that positively affect students' knowledge in the development of their cultural heritage and their views regarding the intangible and tangible culture of their local area through the use of Culture Gate and Culture Gate Collector.

References

Ayala, G., & Paredes, R. (2003). Learner model servers: personalization of web based educational applications based on digital collections. In D. Lassner & C. McNaught (Eds.), *ED-MEDIA 2003--World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 432–435). Honolulu, Hawaii, USA: Association for the Advancement of Computing in Education (AACE).

Ben-Ari, M. (2001). Constructivism in Computer Science Education. *Journal of Computers in Mathematics and Science Teaching, 20*, 45–73.

Biasutti, M. (2017). A comparative analysis of forums and wikis as tools for online collaborative learning. *Computers & Education, 111*, 158–171.

Bradford, P., Porciello, M., Balkon, N., & Backus, D. (2007). The Blackboard Learning System: The Be All and End All in Educational Instruction?. *Journal of Educational Technology Systems, 35*, 301–314.

Caballé, S., Daradoumis, T., & Xhafa, F. (2007). A Generic Platform for the Systematic Construction of Knowledge-based Collaborative Learning Applications. In C. Pahl (Ed.) Architecture Solutions for E-Learning Systems (pp. 219–241). New York, USA: IGI.

Caballé, S., Daradoumis, T., Xhafa, F., & Conesa, J. (2010). Enhancing Knowledge Management in Online Collaborative Learning. *International Journal of Software Engineering and Knowledge Engineering, 20*(4), 485–497.

Chen, S.J., Caropreso, E.J., Hsu, C.-L., & Yang, J. (2012). Crosscultural collaborative online learning: if you build it will they come?, *Global Partners in Education Journal, 2*, 25–41.

Chen, X., & Choi, J.H. (2010). Designing Online Collaborative Location-Aware Platform for History Learning. *Journal of Educational Technology Development and Exchange, 3*(1), 13–26.

Crompton, H., Burke, D., & Gregory, K.H. (2017). The use of mobile learning in PK-12 education: A systematic review. *Computers & Education, 110*, 51–63.

Dickey, M.D. (2007). Brave new (interactive) worlds: A review of the design affordances and constraints of two 3D virtual worlds as interactive learning environments, *Interactive Learning Environments, 13*, 121–137.

Dougiamas, M., & Taylor, P. (2003). Moodle: Using learning communities to create an open source course management system. In *Proceedings of the World Conference on Educational Multimedia, Hypermedia and Telecommunications* (pp. 171–178), Chesapeake, VA, USA.

Ellis, R.K. (2009). Field Guide to Learning Management Systems, ASTD Learning Circuits, 2009.

Farmer, J. (2004). Communication dynamics: Discussion boards, weblogs and the development of communities of inquiry in online learning environments. In R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds.), *Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference* (pp. 274–283), Perth.

Hadjerrouit, S. (2005). Constructivism As Guiding Philosophy for Software Engineering Education. *ACM SIGSE Bulletin, 37*(4), 45–49.

Han, I., & Shin, W.S. (2016). The use of a mobile learning management system and academic achievement of online students. *Computers & Education, 102*, 79–89.

Hoburg, J.F., & Davis, J.L. (1983). A Student-Oriented Finite Element Program for Electrostatic Potential Problems. *IEEE Transactions on Education, 26*(4), 138–142.

Hornos, M.J., Hurtado, M.V., Fernandez-Sanchez, M., Lopez-Martinez, A., Benghazi, K., Rodriguez-Almendros, M.L., & Abad-Grau, M.M. (2012). Hierarchical role-based design of web-based educational systems for blended learning in higher education. *Journal of Research and Practice in Information Technology, 44*, 223–242.

Huang, W., Kaminski, B., Luo, J., Huang, X., Li, J., Ross, A., Wright, J., & An, D. (2015). SMART: Design and Evaluation of a Collaborative Museum Visiting Application. In *Proceedings of the International Conference on Cooperative Design, Visualization and Engineering* (pp. 57–64). Mallorca, Spain: Springer, Cham.

Jeng, Y.-L., Wu, T.-T., Huang, Y.-M., Tan, Q., & Yang, S.J.H. (2010). The Add-on Impact of Mobile Applications in Learning Strategies: A Review Study. *Educational Technology & Society, 13*(3), 3–11.

Kong, X.T.R., Chen, G.W., Huang, G.Q., & Luo, H. (2017). Ubiquitous auction learning system with TELD (Teaching by Examples and Learning by Doing) approach: A quasi experimental study. *Computers & Education, 111*, 144–157.

Koukopoulos, Z., Koukopoulos, D., & Jung, J.J. (2017). A trustworthy multimedia participatory platform for cultural heritage management in smart city environments. *Multimedia Tools and Application, 76*(24), 25943–25981.

Koukoulis, K., & Koukopoulos, D. (2016). Towards the Design of a User-Friendly and Trustworthy Mobile System for Museums. In *Proceedings of the Euro-Mediterranean Conference EuroMed 2016: Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection* (pp. 792–802). Nicosia, Cyprus: Springer, Cham.

Kreijns, K., Kirschner, P.A., & Jochems, W. (2002). The sociability of Computer-Supported Collaborative Learning Environments. *Educational Technology & Society, 5*, 8–22.

Kuflik, T., Wecker, A., Lanir, J., & Stock, O. (2015). An Integrative Framework for Extending the Boundaries of the Museum Visit Experience: Linking The Pre, During And Post Visit Phases. *Information Technology & Tourism, 15*(1), 17–47.

Kukulska-Hulme, A., & Traxler, J. (2005). Mobile Learning: A Handbook for Educators and Trainers, New York, USA: Taylor & Francis.

Laverde, A.C., Cifuentes, Y.S., & Rodriguez, H.Y.R. (2007). Toward an instructional design model based on learning objects. *Educational Technology Research and Development, 55*(6), 671–681.

Lin, C.-B., Young, S.S.-C., Chan, T.-W., & Chen, Y.-H. (2005). Teacher-oriented adaptive Web-based environment for supporting practical teaching models: a case study of "school for all". *Computers & Education, 44*, 155–172.

Martin, F., & Ertzberger, J. (2013). Here and now mobile learning: An experimental study on the use of mobile technology. *Computers & Education, 68*, 76–85.

Mayer, R.E., & Moreno, R. (2002). Aids to computer-based multimedia learning. *Learning and Instruction, 12*, 107–119.

McGreal, R. (2004). Online Education Using Learning Objects. New York, USA: Taylor & Francis.

Monahan, T., McArdle, G., & Bertolotto, M. (2008). Virtual reality for collaborative e-learning. *Computers & Education, 50*(4), 1339–1353.

Montero, S., Aedo, I., & Díaz, P. (2002). Generation of personalized web courses using RBAC. *International Conference on Adaptive Hypermedia and Adaptive Web-Based Systems* (pp. 419-423). Malaga, Spain: Springer, Berlin, Heidelberg.

Osuna, C.A., & Dimitriadis, Y.A. (1999). A framework for the development of educational-collaborative applications based on social constructivism. In *Proceedings of the String Processing and Information Retrieval Symposium and International Workshop on Groupware* (pp. 254–261). Cancun, Mexico: IEEE Press.

Park, Y. (2011). A pedagogical framework for mobile learning: Categorizing educational applications of mobile technologies into four types. *The International Review Of Research In Open And Distributed Learning, 12*, 78–102. http://dx.doi.org/10.19173/irrodl.v12i2.791.

Parsons, D. (2014). The Future of Mobile Learning and Implications for Education and Training. In M. Ally and A. Tsinakos (Eds.) *Increasing Access through Mobile Learning* (217-229). Vancouver, Canada: Commonwealth of Learning and Athabasca University.

Pea, R.D., & Gomez, L.M. (1992). Distributed Multimedia Learning Environments: Why and How?, *Interactive Learning Environments, 2*, 73–109. http://dx.doi.org/10.1080/1049482920020201.

Pujol, L., Katifori, A., Vayanou, M., Roussou, M., Karvounis, M., Kyriakidi, M., Eleftheratou, S., & Ioannidis, Y. (2013). From personalization to adaptivity. Creating immersive visits through interactive digital storytelling at the Acropolis Museum. In *Proceedings of the 9th International Conference on Intelligent Environments* (pp. 541–554). Athens, Greece: IOS Press.

Reeda, J.A., & Afjeha, A.A. (1998). Developing interactive educational engineering software for the world wide web with Java. *Computers & Education, 30*, 183–194.

Romero, C., Ventura, S., Zafra, A., & de Bra, P. (2009). Applying Web usage mining for personalizing hyperlinks in Web-based adaptive educational systems. *Computers & Education, 53*(3), 828–840.

Ronen, M., Kohen-Vacs, D., & Raz-Fogel, N. (2006). Adopt & adapt: structuring, sharing and reusing asynchronous collaborative pedagogy. In *Proceedings of the 7th International Conference on Learning Sciences* (pp. 599–605). Bloomington, USA: International Society of the Learning Sciences.

Rosa, G.P.J., Ogata, H., & Yano, Y. (2005). A multi-model approach for supporting the personalization of ubiquitous learning applications. *IEEE International Workshop on Wireless and Mobile Technologies in Education* (pp. 40–44). Tokushima, Japan: IEEE Press.

Ruotsalo, T., Haav, K., Stoyanov, A., Roche, S., Fani, E., Deliai, R., Mäkelä, E., Kauppinen, T., & Hyvönen, E. (2013). SMARTMUSEUM: A mobile recommender system for the Web of Data. *Journal of Web Semantics, 20*, 50–67.

Sarrab, M., Elgamel, L., & Aldabbas, H. (2012). Mobile learning (M-Learning) and educational environments. *International Journal of Distributed and Parallel Systems, 3*, 31–38.

Shee, D.Y., & Wang, Y.-S. (2008). Multi-criteria evaluation of the web-based e-learning system: A methodology based on learner satisfaction and its applications. *Computers & Education, 50*(3), 894–905.

Su, A.Y.S., Yang, S.J.H., Hwang, W.-Y., & Zhang, J. (2010). A Web 2.0- based collaborative annotation system for enhancing knowledge sharing in collaborative learning environments. *Computers & Education, 55*(2), 752–766.

Syvänen, A., Muukkonen, J., & Sihvonen, M. (2009). Are the open issues of social software-based personal learning environment practices being addressed?. In *Proceedings of the 13th International MindTrek Conference: Everyday Life in the Ubiquitous Era* (pp. 142–148). Tampere, Finland: ACM.

Virvou, M., & Alepis, E. (2005). Mobile educational features in authoring tools for personalised tutoring. *Computers & Education, 44*(1), 53–68.

Wang, H.C., & Chiu, Y.F. (2011). Assessing e-learning 2.0 system success. *Computers & Education, 57*, 1790–1800.

Wang, Q. (2009). Design and evaluation of a collaborative learning environment. *Computers & Education, 53*(4), 1138–1146.

Wheeler, S., Yeomans, P., & Wheeler, D. (2008). The good, the bad and the wiki: Evaluating student-generated content for collaborative learning. *British Journal of Educational Technology, 39*(6), 987–995.

Wong, L.-H., & Looi, C.-K. (2011). What seams do we remove in mobile-assisted seamless learning? A critical review of the literature. *Computers & Education, 57*(4), 2364–2381.

Xu, Z., Yin, Z., & Saddik, A.E. (2003). A Web services oriented framework for dynamic e-learning systems. In *Proceedings of the IEEE Canadian Conference on Electrical and Computer Engineering* (pp. 943–946). Montreal, Canada: IEEE Press.

Yücel, Ü.A., & Usluel, Y.K. (2016). Knowledge building and the quantity, content and quality of the interaction and participation of students in an online collaborative learning environment. *Computers & Education, 97*, 31–48.

Zhang, S., Liu, Q., Chen, W., Wang, Q., & Huang, Z. (2017). Interactive networks and social knowledge construction behavioral patterns in primary school teachers' online collaborative learning activities. *Computers & Education, 104*, 1–17.