
MUSETECH: A WEB APP TO ENHANCE 21ST CENTURY SKILLS THROUGH HERITAGE EDUCATION

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State of the Art

As stated in the scope of the conference an urgent need for “people with new, enhanced skills is growing. The volume of information produced and shared in all fields is overwhelming. Building the data economy became part of the EU Digital Single Market. Powerful and sophisticated ICT is part of everyday life, and the world of learning is not an exception.” New ways of enhancing learning are more and more demanded by contemporary society.

The use of digital tools in the field of arts and cultural heritage represents a real innovation challenge: new areas in museum education may be explored to introduce technology and, simultaneously, new teaching and learning methodologies may be developed, especially for the younger generation of users.

With the advance of technology, many types of jobs might appear to be anachronistic, some jobs might even disappear, other jobs continuously change while new roles come into being. These facts clearly testify to how today’s society and job market are completely different from those of the last century. While in the 19th century people were trained to perform a permanent job throughout their professional career, nowadays constant changes require the education system to be no longer only focused on technical skills, which rapidly develop, but rather on competences. The latter are to be interpreted as the set of transverse knowledge, skills and attitudes a person can use throughout life.

These competences, which are referred to as the 21st century competences, are extensively debated by scholars at international level. Many different institutions, ranging from the European Union to the Organization for Economic Co-operation and Development (OECD hereafter), from national research centres to national and local government bodies, tried to provide a quantitative and qualitative description of these competences. The great interest and debate this topic generates is closely connected with a “new” approach to education and learning which inevitably affects the present and the future of the whole social system.

Arts and cultural heritage prove to be valuable tools to encourage the development and use of the skills people need to adapt themselves to a continuously changing context like today’s society. In this light, the following paragraphs provide an overview of active citizenship and describe how it can be promoted and developed especially in primary schools

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The advent of new technologies carries remarkable implications for education due to the different nature of the cultural mediation education is based on. Parry (2007; p.9), an eminent English scholar who often examined the relationship between technological innovation and museum education, makes reference to McLuhan and starts from what he calls *the rudiments* of media theory in order to explain how and to what extent the digital dimension of museums affects the activities and experiences museum audiences are offered. In the postmodern age we live in, Parry's view, which may be agreed with or not, basically concerns the influence that the medium exerts on the message. Indeed, as he states:

Far from being a passive and putative vessel merely carrying content, the medium used (be it television or telephone, t-shirt or text) has a vital role to play in the construction of any communicated message.

According to Parry, every communication technology entails a series of associations and consequences for the audience. In other words, users assign a number of personal meanings to the medium, which are later connected to the very message conveyed; thus, it is necessary to carefully select the medium to convey meaning.

The research group, based at Roma Tre University, which took part in the Erasmus Plus DICHE project, "Digital Innovation in Cultural Heritage Education", carried out its research on the main objectives of the project, which were primarily focused on informing primary school teachers, including both in service and in training teachers, of new education practices which employ technologies and also include the evaluation of their effectiveness in learning.

Roma Tre University Museum Education Centre was in charge of the design of pilot activities taking into consideration the theoretical model of the DICHE project and some of the core activities were devoted to the creation of a web app devoted to integrate technology in heritage fruition within primary school education.

Issues concerning the use of new technologies in teaching and learning have called the attention of policymakers and educators at global level in recent years. The Italian National Plan for Digital Education, which was launched in 2008 and which later served as a central pillar of "La Buona Scuola" school reform (Law 107/2015), promotes the experimentation with new teaching methods, the use of innovative tools, the dissemination of good practices, the development of school curricula, and the increase of laboratory activities. The latter are considered to be central to classroom teaching and learning.

Before providing schools with expensive technology equipment, which rapidly becomes obsolete, it is of paramount importance to enable teachers to use technology and digital tools in general in order to effectively introduce them in courses.

As previously mentioned, the national guidelines for primary school issued by the Italian Ministry of Education in 2012 stress the importance of studying arts and cultural heritage in the early years of schooling, especially in the context of experiential education where children learn about the world through a multisensory approach, based on different techniques:

“Children’s encounter with art allows them to look at the world with different eyes. Exploring materials through the senses, experimenting with new techniques in the school laboratory, observing places (squares, gardens, and landscapes) and works of art (paintings, museums, and architectures) help children to improve their perceptive skills and nurture the pleasure of enjoying and creating art, thus bringing art and cultural heritage closer to children.”
(Italian Ministry of Education, 2012; p.20)

In this light, the Roma Tre research group developed a digital menu of possible teaching scenarios, which includes the use of technologies for cultural heritage enjoyment and which later became an application for mobile devices, which was used by a considerable number of users and evaluated, as discussed in the following paragraphs.

Research design and methodology

The menu is the digital tool which comprises all the theoretical contributions offered by DICHE partners and which translates the methodological approaches to basic skills’ development into teaching scenarios through cultural heritage enjoyment and technology use. The menu (<http://www.diche-project.eu/resources>) is an online database which contains best practices and education tools for teachers.

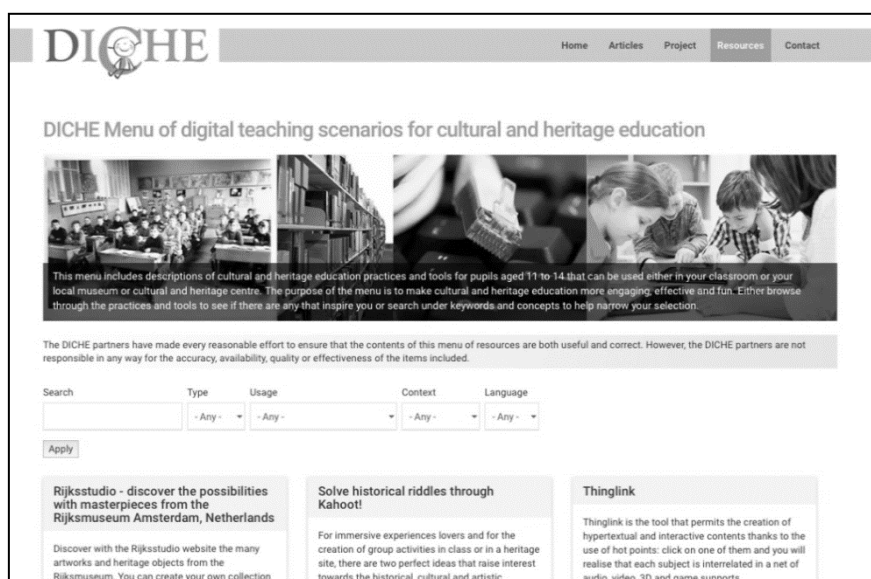


Figure 1. The menu of teaching scenarios of the DICHE project

The menu’s target users are primary and secondary school teachers, together with museum educators, who want to design, create and evaluate innovative programs for students aged between 11 and 14 years, in formal and informal education contexts. The description of teaching practices and digital tools is available in English, Italian and Dutch, to increase the number of potential users.

Research can be carried out by either selecting options inside the menu and typing keywords or filtering the different types of resources (teaching scenario or digital tool), uses (tracking,

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mapping, routing; presenting, reporting; exploring, researching, inquiring; instruction, assignment; recording, collecting), contexts (classroom; museum; heritage site; home) or the language of the digital resources (app, software, website).

The database can also be accessed to read its contents and/or to adapt them to the educational needs of the real-world context of use, and of the tools available.

The menu of teaching scenarios was used during the project pilot phase by Italian and Dutch partner institutions to assess the database effectiveness, the theoretical structure of reference for the project and also the fruitfulness of the teaching scenarios created.

In particular, Roma Tre researchers developed a specific tool for the pilot phase: The *MuseTech* web app (available at: <http://www.musetech.it>).

MuseTech web app

The name of this web application derives from the combination of the words *museum* and *technology* which represent the foundations of the DICHE project. The idea of designing a web app came into being from the need for a unique application which could be used on different mobile platforms and operating systems, without the need to be installed on devices and/or continuously updated. By simply accessing the Internet, MuseTech allows users to enter the DICHE menu of teaching scenarios and, simultaneously, to evaluate and share their contents.

The introduction of a social dimension in the project is indeed a value which MuseTech adds to the menu: an increasingly higher number of users can be reached, the audience gets wider and wider, and this creates a network of researchers, teachers, students and museum educators / pedagogists / education professionals in general orbiting around the project tools and practices. Like other famous web apps and Internet services (such as, among others, TripAdvisor® and Yelp!®), MuseTech allows users to vote for the contents they find in the menu and like the most thanks to a five-star rating system. Moreover, users can share the contents they voted for on social media platforms such as Facebook®, Twitter®, and Google+® which favour communication and interaction within the community.



Figure 2. Examples of usage scenarios of MuseTech web app

MuseTech was used by students of the degree course in Primary Education Sciences and by primary school teachers Roma Tre University involved in the project pilot phase, as well as by all participants in the events Roma Tre researchers organized for dissemination purposes.

Analysis of Results and Findings

In order to assess the impact of the Musetech webapp the research group created a *corpus* made by the Wordpress® comments inserted by the users. The table below lists all the resources included in the webapp and summarizes the quantitative evaluation that users expressed while evaluating the tool.

The size of the corpus is 122,962 words, of which 6,762 unique tokens.

Table 1: MUSETECH resources and their evaluation rates

Title	1 star	2 stars	3 stars	4 stars	5 stars	Avg. stars	# of comments
SMartART	0	0	4	10	21	4.5	31
Digital Storytelling	0	0	2	7	3	4.1	9
MOOVLY – animated videos and presentations	0	1	1	9	3	4.0	18
Heritage App	0	2	0	4	3	3.9	5
News school report – creating and writing a news report, supported by BBC	0	1	2	3	9	4.3	16
StoryWriter – A digital tool for collaborative storytelling	0	0	2	4	1	3.9	7
Audacity – Free software for audio recording	0	0	0	2	2	4.5	4
WeVideo – Cloud-based video creation platform	0	0	2	1	2	4.0	4
InHerit, heritage interpretation course materials	0	0	2	3	3	4.1	7
Kamp Amersfoort	0	0	1	1	4	4.5	5
Scatt-Arte – Photos of art	0	1	0	0	10	4.7	11
Augmented Reality for orientation	0	0	0	2	0	4.0	4
Toolbox with 4 basic Heritage tools	0	0	0	1	0	4.0	1
Radio Local – make a radio report of a local interesting place	0	0	2	2	2	4.0	9
Around the church – making an animation after local church visit	0	0	0	0	6	5.0	9
Participatory mapping with Story Map	0	0	1	2	1	4.0	5
Edublogs – The largest education blogging platform on the web	0	0	0	0	2	5.0	2

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Popplet – A mind-map tool to organize ideas	0	0	0	3	2	4.4	7
Answer Garden – A minimal feedback tool to get attention	0	0	0	0	0	0.0	1
Newsela – Online reading platform to develop critical thinking skills	0	0	0	2	3	4.6	8
Huntzz – Treasure hunts and tours across the UK and Europe to experiment gamification	0	0	0	0	0	0.0	0
My Culture Quest – An interactive site to travel across the world	0	0	0	0	3	5.0	5
SMARTART: When the Images Speak of Art	0	0	0	2	3	4.6	4
The history of a village comes to life	0	0	1	1	0	3.5	2
Present history your digital way!	0	0	0	0	0	0.0	0
Use of Padlet in a lesson about the Dutch East Indies	0	0	0	0	0	0.0	0
CSI Leiden – film report of 18 th century crime in Leiden	0	0	0	0	0	0.0	0
The Internet Archive	0	0	0	0	1	5.0	2
The Michelangelo project, an overview of the European Fine Arts	0	0	0	0	0	0.0	0
Dutch Arts and Culture Search Engine	0	0	0	0	0	0.0	0
TimeGlider: creating timelines	0	0	1	0	1	4.0	0
Capzles: social storytelling	0	0	0	0	0	0.0	0
Minecraft, create your own world	0	0	1	0	0	3.0	0
12 art and culture lessons for Audiovisual education and Media-art	0	0	0	1	0	4.0	0
Powtoon	0	0	0	2	0	4.0	2
Boomwriter	0	0	1	1	1	4.0	3
Kahoot!	0	0	0	1	3	4.8	4
Thinglink	0	0	1	1	0	3.5	3
Between museums and creativity	0	0	0	1	1	4.5	1
Rijksstudio – discover the possibilities with masterpieces from the Rijksmuseum Amsterdam, Netherlands	0	0	1	0	0	3.0	0
Lupus in Fabula! Discovering animals in Ancient Rome	0	0	1	2	1	4.0	2
Mass communication in Roman Times	0	0	1	0	1	4.0	1
Aqueducts and Baths	0	0	0	1	0	4.0	0
The “Tablets” of days gone by	0	0	2	0	0	3.0	1
The Techno side of Empire	0	0	1	1	0	3.5	3

Gods for a day	0	1	14	68	58	4.3	152
Solve historical riddles through Kahoot!	0	1	9	44	58	4.4	126
MOOCs, critical thinking and museum education	0	2	33	91	42	4.0	185
Recreating artwork through Flash mobs and living pictures	0	0	11	56	118	4.6	208
Creative writing and museum objects	0	5	41	79	39	3.9	183
The Critic Globus experience	0	2	20	52	74	4.3	169
Object Based Learning and 3D Printing	0	2	13	69	63	4.3	171
Travelling Planetarium	1	1	20	66	105	4.4	220
Europeana	0	7	43	47	25	3.7	137
Art Stories FACES	0	8	51	57	39	3.8	177
ArtPlanner – creating a trip planner	0	4	24	77	56	4.1	184
Cardboard, a VR app for Android smartphones	2	3	34	34	25	3.8	116
SMARTART – WHEN THE IMAGES SPEAK OF ART	1	3	23	63	46	4.1	160
TOTAL	4	44	366	873	840		2384

In the app 2127 votes were collected (5 rating system) divided as follows: 4 votes for 1 star rating, 22 for 3 stars rating, 366 for 3 star rating, 873 for 4 stars rating and 840 for 5 stars rating.

The following table instead summarises the characteristics of MuseTech webapp in terms of number of resources, commenters, comments, votes and level of rating.

Table 2: Summary of the webapp content

# of resources	58
# of commenters	204
# of comments	2384
# comments per commenter	12
# comments per resource	41
# votes	2127
# 1 stars	4
# 2 stars	44
# 3 stars	366
# 4 stars	873
# 5 stars	840
resource more commented	Travelling Planetarium (220)

Most frequent words used in the comments are: “a lot”, molto (1746); “interesting” interessante (1293); “children” bambini (1098); “way” modo (740); “useful” utile (579).

Authors

A. Poce coordinated the research presented in this paper. Research group is composed by the authors of the contribution that was edited in the following order (A. Poce (State of the Art, Research Design, Methodology and Conclusive remarks), F. Agrusti (Analyses and findings), M.R. Re (MuseTech webapp)).