

Development of Creative and Educational Thinking in Arts Training Teachers: QR Codes

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Abstract

A training model on education in Arts based on the design of QR codes as learning objects has been integrated in the formation of training teachers with the objective that they can apply this technology in their future jobs at school. The study was done on a sample of 99 training teachers of the Primary School Teacher of the Faculty of Education of the Alicante University. The sample was divided into 30 groups, which designed QR codes on a selection of works of art belonging to all of the historical ages.

The results of this training model turned out as positive as it was expected. Indeed, the training teachers included in this study were able to prepare QR codes as learning objects quite well assessed. At the same time, training teachers showed to have acquired a wider and deeper knowledge of Arts through the use of this technology. Finally this study revealed that the factors that strengthened the training teachers' formation and increased their motivation the most were interaction, small group work and collaborative learning. Furthermore, training teachers' knowledge on contents and didactics as well as their critical and creative thinking have improved significantly.

Keywords: Quick Response (QR) Codes, Mobile Learning, Collaborative Learning, Creative thinking, Training Teachers, Arts.

Introduction and theoretical frame

Proliferation of technologies adapted to consumers, as well as design and massive making of new technological tools, have influenced on education — learning and, to a lesser extent, teaching— (Vera, Soriano & Seva, 2011; Howard & Sautter, 2013; Hockly, 2012). Nowadays, the wide possibilities that mobile devices offer have surpassed the traditional methods of learning and teaching, owing mainly to mobile devices provided in this field a remarkable ability to innovation and motivation: learning cannot be merely limited to school, a classroom, a book or a teacher, but also has to incorporate the opportunities afforded by these devices.

The integration of the mobile devices possibilities in the educational strategies is not an easy objective. Indeed, students handle well the mobile devices technology and they keep usually their devices updated. Nevertheless, many teachers have serious deficiencies in this field, show scepticism about the usefulness of these technologic resources (Vera & Pérez, 2004a), or simply feel afraid of using them in the presence of their students (Vera & Pérez, 2004b). There are also teachers that, although having a reasonable knowledge of these resources, have difficulty with applying them efficiently to their teaching methods (Graham et al. 2009; Vera et al., 2011).



Mirsha and Koehler (2009) propose a framework to describe the knowledge that teachers need to use ICT in their classrooms (Technological-Pedagogical-Content-Knowledge, TPACK), in which they include seven areas, being the content knowledge (CK), the pedagogic knowledge (PK) and the technologic knowledge (TK) the basic ones. According to Alayyar, Fisser, & Voogt (2012), the implementation of ICT in teaching should need that teachers acquired a comprehensive knowledge on pedagogy, contents and technology. Several authors have shown that collaborative learning allows training teachers become more competent and creative (Mirsha, Koehler & Zhao, 2007; Koehler & Mirsha 2009; So & Kim, 2009 and Agyei & Voogt, 2012).

All the training teachers that constituted the sample of this study knew in advance the CK, PK and TK areas. We considered convenient that, through the collaborative learning of the training teachers, these areas were integrated into a TPACK framework. Training teachers did design Quick Response (QR) codes for their Primary School students. These QR codes should integrate content knowledge, technological knowledge and pedagogical knowledge, and also should show their authors' creativity by transforming concepts and ideas into actions (Ko, 2004). These QR codes were based on blogs made by groups of training teachers. During these blogs elaboration, collaboration proved to be essential for decision making concerning design, procedures and contents. Indeed, blogs seem to have a high potential as "learning spaces" (Williams & Jacobs, 2004).

Although QR codes are considered a tool in the educational context, they do not ensure learning by themselves. However they provide a wide range of opportunities to improve the learning process focused on the student. The QR codes stand out as one of the tools that better promote knowledge, dissemination and processing of information and therefore Cubillo, Martín & Castro (2011) argued that QR codes become part of one of the five new technologies groups that can be used in m-learning and are making a change in the way we interact with the environment. QR codes are two-dimensional codes that can storage different types of data such as textual, visual, audio information, URLs, etc. Users of new technologies applied to education have observed that mobile devices pose five important qualities: portability, social interactivity, context sensitivity, connectivity and individuality (Klopfer, Squire & Jenkins, 2002)

QR codes are considered as Intelligent Objects as they are capable to link virtual and real environment. They convey not only data by recording information related to a particular item but also they can generate emotions and feelings. At the same time, their easy and fast readability foster communication and collaborative work (Cubillo et al., 2011; Rikala & Kankaanranta, 2013; Martínez-Graña, Goy & Cimarra, 2013). Although mobile devices have been used in the educational environment recently, they have changed the meaning and significance of learning (Traxler, 2009), not only in school learning environments but also in lifelong learning situations (Cubillo et al., 2011; Rikala & Kankaanranta, 2013).

Rikala (Rikala & Kankaanranta, 2013) has reviewed literature regarding the use of QR codes and mobile devices in classroom. Although published studies on this subject are still few (Law & So, 2010) she has pointed out that QR codes are mainly student-focused (Chang, 2014), since they concern mainly outdoor learning and they are adapted to a particular context and scenery (Lai et al. 2013). Rikala also argues that QR codes link informal and formal learning as well they link creativity and innovation and that mobile learning provides contextualized, participatory and situated learning scenarios. Rikala agrees with Kearny (2012) in the fact that the learning process is situated, personalized and authentic. Rikala & Kankaanranta (2013, 2) have point out that, by using these innovative tools, the students are able to:

- Retrieve contextual or location-aware information (Osawa et al., 2007)
- Implement innovative systems based on the paradigm of just-in-time learning and collaborative learning (De Pietro & Fronter, 2012)
- Connect digital resources to printed text.
- Increase their motivation as these enriched materials serve students with different learning needs (Cheng, Teng & Lee, 2010)



- Enrich their learning experience and provide them with authentic tasks that take place in real-world settings.
- Learn in a personalized, situated and authentic way.

Also, these authors grouped five main categories of ways of using QR codes in education:

- Treasures hunts or trail activities (Law & So, 2010)
- Outdoor or field activities (Lee et al.,2011, Law & So, 2010)
- Paper-based tasks (Law & So, 2010)
- Learner generated content (Mikulski, 2011)
- Working instruction (Walker, 2010)

Concerning the above-mentioned advantages for students, does the mobile learning enhance educators' skills? Does it enrich their ongoing training or hinder their daily teaching tasks? In other words, does this innovative tool benefit teachers? It is a common belief that there are many teachers who show little interest for their professional development as they do not get any sort of immediate academic appreciation or monetary recognition. Yet, they must become aware of the fact that their teaching practices must be oriented and adapted to their students' digital needs (McLean, Cook, Crowe, 2008; Vera et al., 2011). The question stems from the reluctance to use new technologies in the classroom. This fact, known as digital breach, hinders the integration of technology into the curriculum. According to Powell (2010) a teacher's virtual recycling could solve this problem. Fisher, Higgins & Loveless (2006) found that little research had focused on how teachers learn *with* digital technologies, but rather there was research on how they learn *about* technologies, or how they use them to teach.

Chen & Choi, 2010 presented a multimedia platform that integrated technologies with classroom activities to help students learning history. They showed that learning history was brought near to classroom environment and that the integration of these new technologies improved the history knowledge, and the reflexive and collaborative learning: the class is not a traditional teaching space any longer, but it is a group learning community. Doppen (2004) studied the attempts of teachers of History to use this technology in the classroom, and verified the impact that the beliefs of the teacher about the efficiency of its use in class exert on their students.

The research carried out by Vera et al. (2011) showed that most social studies teachers are familiar with technologies; the problem lies in the fact that teachers still do not know how to use this digital knowledge in their daily teaching practice. There is incongruity between what they are able to do in class and what they actually do. To ensure a successful education experience teachers must consider the application of technological skills as a major part of their professional development.

The seminar organized to promote teaching training in technologies abilities and their application in class (Vera et al., 2011) revealed that collaborative work is highly effective to train qualified teachers in digital technology. The main reason is that reiterative peer competence is left aside in favor of collaborative work. Besides, collaboration between teachers fosters dialogue (Vera et al., 2013; Friel et al., 2009) and reduces isolation. However, an added difficulty regarding mobile technologies is that most teachers do not yet consider them as innovative tools that can and must be used in class. In this sense, it is necessary to invest in mobile high technology and training that let teachers introduce new technological tools in class. One of the aims of the present paper is to train teachers able to use mobile technologies as a relevant part of their academic development. According to Kukulka-Hulme (2012) students use frequently those technological devices in their learning processes. On the contrary, they think that only a few teachers feel confident when using mobile technologies in class and that many of them are reluctant to use mobile devices as their use requires great effort and continuous updating. Despite all that, these authors assert that the use of mobile devices is emerging in higher education as a major source of information and educational resources, and that its use must be integrated in class (Pitt, 2013).



The use of QR codes has spread widely in developed countries such as Japan (Chaisatien & Akahori, 2007), USA (Matei et al. 2007; Martín & Ertzberger, 2013) or China (Huang, Wu & Chen, 2012). These studies state that mobile devices are a very useful tool in class, m-learning or situated learning since it is a motivating and easy to use tool. Nevertheless, these authors pointed out that, in order to generalize its use, education institutions should provide the required means and opportunities.

Ramsden (2008, 8), from the University of Bath, presents four educational scenarios in which QR codes can be used:

1. A student subscribing to an RSS (Really Simple Syndication) news feed
2. Integration of QR codes within printed material
3. Integration within an alternate reality game
4. Accessing just in time information in the lecture

The advantages and drawbacks of this tool when used in the educational context should be analyzed.

Chaisatien & Akahori (2007) think that, even when many instructions have to precede its use, QR codes, increase student's interest and motivation. From the teacher's point of view the misuse of the mobile phone in class can lead to uncertain or wrong results. However, its application in higher education seems to be necessary. According to Susono & Shimomura (2006) QR codes are not only able to easily store vast amounts of information but also to allow teachers to evaluate teaching and learning processes after class surveys. At the same time, students are able to know at every moment the assessment's results.

Martin & Ertzberger (2013) argue that smartphones have enriched the concept of *here and now* learning which becomes into *here and now* mobile learning. Some of the new functionalities that mobile devices offer to the students are geospatial technologies (GPS chips, 2D and 3D codes, etc.); visual search; use of camera and social networking. Indeed, students have access to certain information at all times that significantly improves their situated learning process and context-based learning.

In a recent study; Moreno & López (2013) assert that the use of QR codes in secondary and higher education still can be handicapped by the lack of technological resources in class (access to Internet) and the digital illiteracy that still exists in the teaching community. As compensation, their use has fostered enormously motivation, collaborative work and the quality of academic works.

Research objective and questions

The aim of this paper is to design an active learning of Arts through QR codes, and analyze how QR codes affect the learning process, the collaborative work and the motivation and the emotions of training teachers. In order to reach this objective the following questions should be raised:

1. Is it possible to learn Arts contents and create didactic resources through QR codes?
2. Do QR codes prompt creativity in training teachers?
3. Are the resources included by training teachers in the QR codes adequate and valuable?
4. Are training teachers able to work in small groups in order to reach collaborative training results?
5. Is research and problems-solving in Arts education by using QR codes motivating for training teachers?
6. Is it feasible to convey emotions or transmit values through QR codes

Methodology

This paper is a work in qualitative research in which the QR codes made by a sample of training teachers on a selection of works of art are descriptively analyzed and evaluated. The sample was a group of training teachers (77 female and 22 male) of the third year of Primary School Teacher of the Faculty of Education of the Alicante University. All of them had smart mobile devices capable of reading QR codes, as well as computers or tablets allowing them to create QR codes. The sample was divided into 30 two-training teacher



sets, 12 three-training teacher sets and 3 single training teachers. All of them were instructed on the preparation of a QR code having content didactic in nature. Whenever possible, collaborative learning was encouraged, so that each of the sets took their own decisions after appropriate discussion. Each one of the training teacher sets should elaborate a minimum of the three QR codes.

In order to store all data associated to each QR code, every student created an educative blog using web software like Blogger or Wordpress. In this way students were able to enter in this blog not only the QR but also all the didactic and information they considered necessary to support and complete the QR.

Each one of the QR codes had to be related to one work of art from a set of 43 ones belonging to the Ancient Age (Greece and Roma), the Middle Age (Romanic and Gothic), Modern Age (Renaissance and Baroque) and Contemporary Age (Neoclassicism, Romanticism, Impressionism, Avant-garde movements, Pop Art and Performance). Resources to be included in each QR code were selected freely, but they had to be established by a consensus into the group. A total of 180 QR codes were presented.

Two parameters have been considered in the data collection process. On the one hand, behaviour and didactic strategies that training teachers implemented were born in mind. On the other, the QR codes contents that showed the training teacher's proficiency on the work of art. The data collection process has consisted of the following stages:

Stage 1. Design and preparation of a registration form for each work of art, in which the resources selected as well as the criteria used in their selection are included.

Stage 2. Monitoring of the blogs (planning, design and organization) created by the training teachers.

Stage 3. Analysis of each work of art contents (identification, formal characteristics, context, style, chronology and author) as well as analysis of richness and variety of the didactic resources used.

Stage 4. Registration of the most relevant aspects regarding the group collaborative work, such as meetings, reflections, suggestions and decision-making processes.

The data extracted from stages 1, 2 and 4 were subjected to a qualitative analysis, whereas matters related to stage 3 were analyzed quantitatively. In all cases the program AQUAD 6 (<http://www.aquad.de/en/>) was used. This open-source program software was prepared to combine qualitative and quantitative analysis in such a form that a statistical handling of the data was allowed. One of its advantages is that can support a wide range of different data types (texts, audio-data, audiovisual-data and images).

Results and discussion

The 180 QR codes presented have been classified into four categories (from good to excellent) according to the content quality and the number of didactic resources included. In turn, the resources appeared in the QR codes have been classified into five groups (images, texts, audiovisual resources, sound resources and scenic arts), and a detailed analysis of the types of resources within each group has been carried out. Finally, a particular search for the presence of civic and emotional values in QR codes has been made, and the results of the same have been discussed critically.

Richness of content and resources

In order to assess the richness of the QR codes presented they were categorized, according to the analysis and identification of the work and the number of explicative elements. Concerning the analysis and identification of the works of art, every QR code has met the features mentioned in Stage 3. About the resources included the QR codes have been divided into the texts, images, documentaries, films, biographies and video, contained in each one, into the following groups: *Poor*, applied to QR codes containing three or less items since this



number of items has been considered scarce. *Medium*, applied QR codes containing four items. *Good*, applied to QR codes containing between 5 and 7 items. *Excellent*, applied to QR codes including between 8 and 15 items. It has been considered that the QR codes of the last group offers a wider perspective to students.

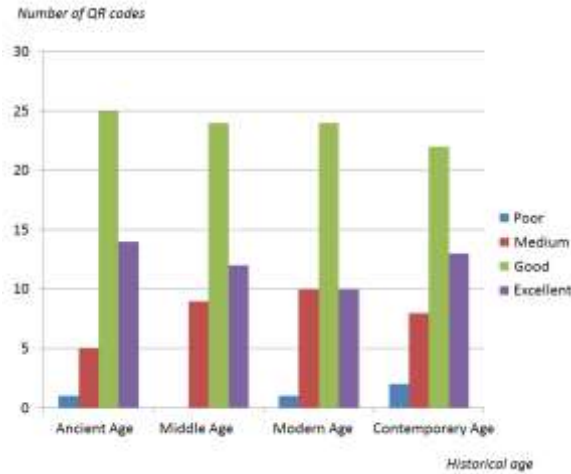


Figure 1. Categories resulting from the assessment of the QR codes presented in each historical age.

The results obtained are shown in Figure 1. Most of the QR codes are assessed as good or excellent. Indeed, each one of the Historical Ages considered contains from 20 to 25 QR codes qualified as good, and from 10 to 14 ones qualified as excellent (as an example of these ones, see de QR code 1). A number from 5 to 10 QR codes in each Historical Age have been qualified as medium, while the QR codes considered poor were 2 or less in each Historical Age.



QR code 1: Campbell's Soup.

Groups of resources used

The resources included by training teachers, grouped according to the Historical Ages, are shown in the Figure 2.

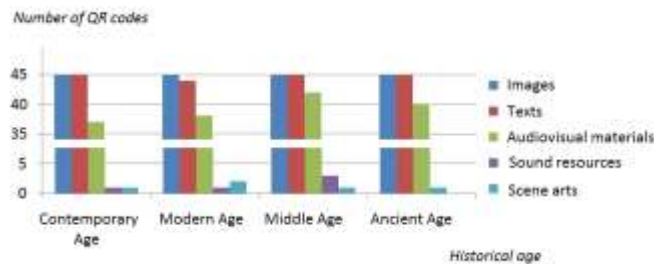


Figure 2. General distribution of the groups of resources used in the QR codes according to the historical age.

All the QR codes presented incorporate *images*, since the codes refer to visual culture and plastic arts. *Texts* on the features of the works of art appear in all the QR codes presented. Only a QR code on a work of art in the Modern Age includes a text indirectly, as a link to a specialized web.

Although training teachers are working in the field of new technologies, the way in which they include images and texts is similar to the customary one of textbooks. However, as it can be seen in figure 1, the simple textbooks format has been exceeded by including other resources that make QR more attractive to the users.

Audiovisual resources are not present in all the QR codes, but they appear in many of them (more than 35 in each of the Historical Ages dealt with them). These kinds of didactic resources are mainly informative videos or documentary focusing on some relevant aspects of the work of art, the author or the context.

Sound resources and *scene arts* have a scarce presence in all Art history ages. This could be due to the absence of these materials in a traditional class of Art History.

A detailed analysis of each one of the groups of resources found in the QR codes is made in the following section.

Images

The information supplied by the use of images proves to be quite attractive because of the great variety of typologies covered, as shown in figure 3.

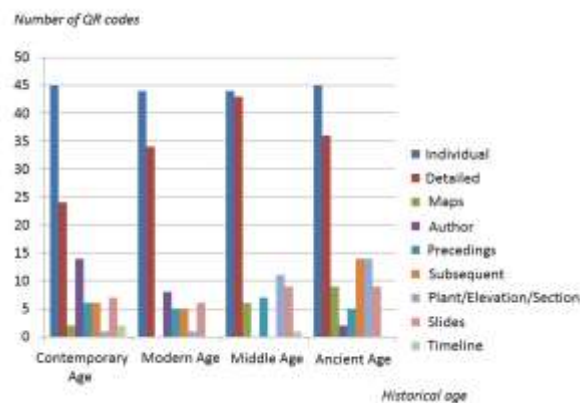


Figure 3. Distribution of the types of images used in the QR codes according to the historical age.

Two types of images concerning the works of art have been found: *individual* images showing an overall view of the work of art, and *detailed* images offering a more specific analysis of particular plastic features not identifiable in the individual images.

Other elements appeared in QR codes with a lesser frequency. Thus, location maps in the Ancient and Middle Ages obtained mainly from the sources Google Maps, Google Earth or tourist leaflets. Other images related to historical building such as the ground plan, elevation or sections have been also found in QR codes.

From the Renaissance onwards, most of the works of art belong to known authors. This fact facilitates the use of other works of the same author to complete the analysis of a particular work of art. This occurs with the QR codes related to the Modern and Contemporary Ages. Other images related indirectly to the work of art



studied or to its author have also been found. Thus, some *preceding* works have been included in QR codes referred to all Ages, whereas *subsequent* works appear mainly in the QR codes of the Ancient Age.

Texts

Concerning to the texts, a high number as well as a great variety of them has been found (Figure 4).

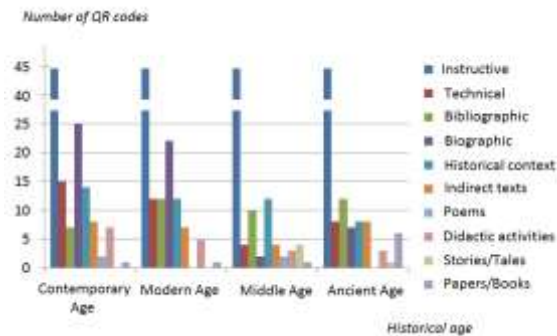


Figure 4. Distribution of the types of texts used in the QR codes according to the historical age.

Instructive texts include formal and stylistic analysis. They emphasize the structure of the work and other particular features. Texts are present in all ages of art history as well as in all the QR codes, excepting one.

QR codes on works of art from Modern and Contemporary Ages include also *technical files* similar to the brief information given usually in exhibitions and museums, and *biographic texts*, in which the knowledge of the life of the authors is related which the artistic features of the work.

Although less numerous, texts on the *historical context* appear regularly in all the ages. These texts concern to contemporary historical events, the art school to which the author belongs or the main features of the artistic movement in which the work of art is included.

Secondary or *indirect texts* can be references of descriptions of other authors, art critics or specialists, as well as inscriptions made by the author or by contemporary artists in the work of art or in some related objects.

Other texts not directly related to the analysis of the work of art, as *tales*, *poems* and *stories*, as well as *scientific papers* and *books* also appeared in some QR codes. *Stories* and *tales* are often related to works of art of the Ancient and Middle Ages (*the Alhambra*, *the Cathedral of Nôtre Dame*, *the Coliseum*). *Poems* have appeared in some codes on the *Alhambra* and the *Guernica*.

The presence of *scientific papers* (linked to PDF files) or *books* (linked to Google Books) in the QR codes, although rather scarce, extends to all the historical ages.

Finally, some QR codes include *didactic activities* addressed to primary school students.

Audiovisual resources

Audiovisual resources have a remarkable presence in most of the presented QR codes (figure 5).



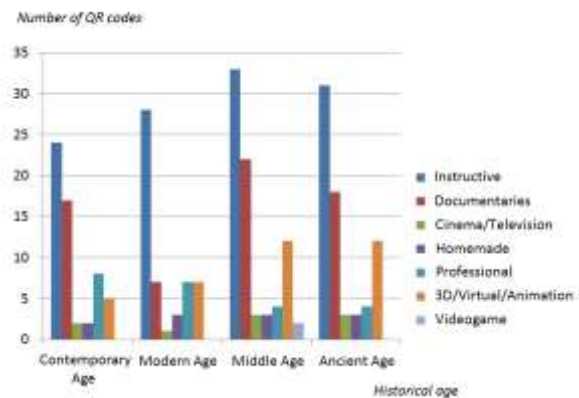


Figure 5. Distribution of the types of audiovisual resources used in the QR codes according to the historical age.

Videos, mainly instructional ones dealing with technical, stylistic, structural, iconographic, biographic or contextual subjects stand out among *audiovisual resources*. These are usually attractive and complete resources which enrich the analysis through overall and detailed images together with spoken explanations. This last element is highly useful for sight-disabled students. Some documentaries include videos either to reinforce the analysis or to bring the user the possibility of choice the way of using the QR code. Documentaries have usually some functions as instructional videos, although the former currently includes information on the author, the context or the perception of the art work.

Other type of audiovisual resources refers to virtual 3D-videos and rebuildings, often as 3D-reconstructions of architectural works of the Ancient Age, such as the Pantheon, the Coliseum, the Erechtheion or the Parthenon. As most of them are now seriously damaged, the 3D rebuildings allow us to know their primitive appearances. Also there are increased-reality videos in which two-dimension works of art of the Modern and Contemporary Ages, as the Guernica or the Garden of Earthly delights pictures are presented as 3D images.

The videos included in the QR codes can be distinguished according to the nature of their production. Thus, there are *homemade* as well as *professional* videos. Some of the homemade videos are quite useful for sculpture works, since they show not only a static frontal image, but the complete image of the work. On the other hand, professional videos contain usually some comments related to restoration processes, in which the experts analyze either the whole work of art or certain details that are difficult to appreciate. (QR code 2).



QR code 2. *The Garden of Earthly Delights*.

It attracts considerable attention the scarce amount of audiovisual resources related to leisure and cultural expressions coming from television, cinema or videogames, as they usually arouse great interest from young people.



Sounds and Scenic Arts resources

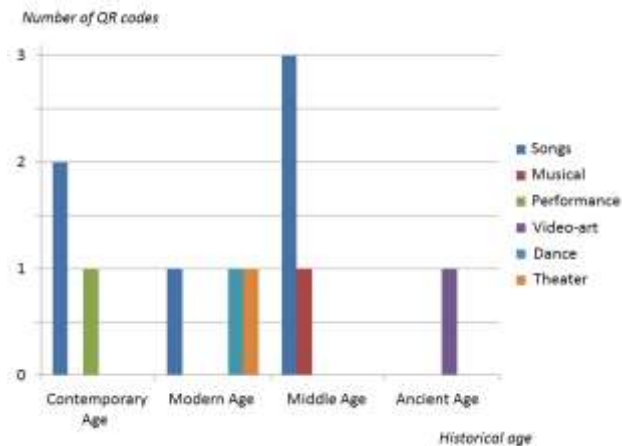


Figure 6. Distribution of the types of sound and scenic arts resources used in the QR codes according to the historical age.

The use of these two types of resources is shown in Figure 6. Among the audio resources, songs are the most used, they coming mainly from contemporary pop-rock -*John Lennon, The Velvet Underground or El Barrio*-, all of them taken from *You tube*, and one MP3 recorded directly from a bells concert in the *Cathedral of Notre Dame* of Paris. Although strongly present in the life of young people, music is surprisingly almost absent of the QR codes. Scenic Arts are also poorly represented in the QR codes: the Yoko Ono performance *Cut Piece* (Contemporary Age); a piece of theater and one piece of dance related to *The Garden of Earthly Delights* (Modern Age); musical comedy related to *Notre Dame* of Paris (Middle Age); and, finally, a video-art piece, *Fucking Hell*, in which some skeletons show the horrors of the war, was joined to resources explaining *The Trajan's Column* in Roma (Ancient Age).

There have not been found sound resources specifically assigned to sight-disabled students, nevertheless an explanatory video on Gaudí and *The Casa Batlló* which used a sign code specifically assigned to hearing-disabled students as been presented (QR code 3).



QR code 3. The Casa Batlló.

Values and emotional perceptions

The presence of civic and emotional values in the QR codes is shown in Figure 7.



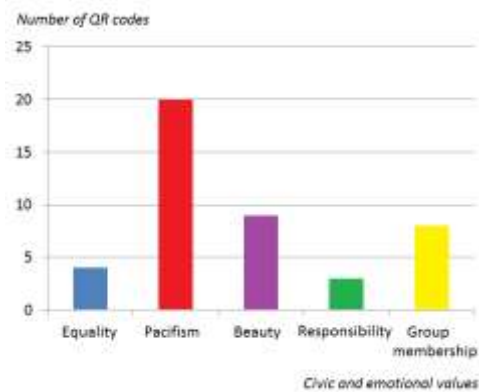


Figure 7. Values and emotional perceptions detected in the QR codes.

The value most frequently noticed is pacifism, joined to works of art related with war, as the Picasso's *Guernica*, the *Trajan's Column* or the Goya's *Executions of the third of May*. These types of QR codes have been carried out mainly by groups of male training teachers. An only direct reference to peace is present, related to *The Ara Pacis*. They can be found also references to emotions related to beauty: the ideal of woman beauty and the kindness, delicacy or respect feelings. Most of these QR codes (80%) have been made by female training teachers, probably owing to their higher sensitivity to these values.

Some QR codes contain explicit references to gender values, as gender equality in the Yoko Ono's *Cut Piece* or in the Van Eyck's *The Arnolfini Couple*. Other QR codes focus on collective identity values, referring to either a broken family nucleus -as the Munch's *The Scream* or to family faithfulness and values of responsibility and solidarity, as the David's *The Oath of the Horatii*.

Concerning the identification and diversity of the resources used, the contents of the QR codes resulted to be quite complete. Although many of the training teachers have exported, probably in an unconsciously way, the traditional textbook format into the field of technologies, they did not restrict the resources simply to texts or images. Actually, the training teachers also included other items compatible with QR codes, such as audiovisual resources, sound and scenic arts. The variety and richness of these resources fostered highly the training teachers' creativity (Ko, 2004).

Critical comments



The present experiment showed that training teachers were able to integrate, through QR codes, the three types of knowledge that are necessary for an efficient use of technologies in education (Mirsha & Koehler, 2009; Alayyar, Fisser & Voogt, 2012).

Surprisingly, all the QR codes covered conceptual, procedural and attitudinal contents. Indeed, through these tools, the training teachers showed to be able of conveying knowledge and procedures, as well as emotional and civic values such as equality, solidarity, and collective identity. At the same time, the planning of these educational tools efficiently increased the pedagogical knowledge of the training teachers. Moreover, group working strategy improved interaction as well as collaborative work and, consequently, educational ability (Mirsha, Koehler & Zao, 2007; Koehler & Mirsha, 2009; So & Kim, 2009), creativity (Ko, 2004) and critical thinking (Orlich, et al., 1995).

Regarding the technological ability acquired by the training teachers, the quantity, variety and richness of the resources included in the QR codes were considered to be effective indicators.

Other lessons could be also drawn from this work. Thus, the use of technological tools helps to reduce the gap between knowledge of the past and teaching in the classroom (Chen & Choi, 2010), and that they have proved to be highly efficient for technological capacitating with educational purposes (Vera et al. 2013). Indeed, the use of these tools improves the collaborative and reflective learning versus isolation (Kukulaska-Hulme, 2011), situated learning versus knowledge in the classroom (Martin & Ertzberger, 2013), and quality of academic results versus routine and simplicity (Moreno and López, 2013).

Conclusions

It has been shown that the training teachers are able to elaborate QR codes to use them as a tool for studying works of art. Indeed, the group of training teachers has supplied as a whole 180 QR codes related to different works of art. The contents of the QR codes have arisen from a collaborative learning through small groups which have taken their own decisions after proper discussion and consensus.

Owing the great amount of information contained in the QR codes presented, these QR codes can be considered as very useful tools in the classroom. The most frequent educational elements included were texts and images. The training teachers unconsciously have transferred the traditional textbook format to the field of new technologies. The texts were mainly instructional in nature, either on the historical context or biographic, and the images were referred mainly to individual works of art and their details.

Many of the QR codes presented contains audio-visual resources, which could be considered as an attempt of overcoming the traditional ways of teaching Art, this standing out a high creativity in many of the training teachers.

A lower presence of sound and scenic contributions (music, theater and video-art resources) in the QR codes has been noted.

According to the educational criteria previously fixed, the didactic orientation of the resources presented can be considered mostly satisfactory.

It should be also remarked that training teachers have been able to transmit through the QR codes some civic and emotional values as equality, responsibility, solidarity and collective identity. Thus, in works related to war (QR made mainly by male training teachers) anti-war emotions appeared, while many women were rather interested in works of art where the feminine beauty ideal appeared. These different trends suggest a remarkable feeling of gender identity.



Training teachers have acquired a wider and deeper knowledge of Arts by designing QR codes. Furthermore, training teachers' proficiency qualification through the elaboration of QR codes has proved to be highly useful for acquiring scientific, educational and technological contents, and for developing critical and creative thinking. The most influential factors on these improvements were interaction, small group work and collaborative learning.

From the authors' viewpoint, this search has become a motivating experience that leads to the idea that the use of the QR codes in teaching and training Arts is not only a useful tool but also an interesting path worth of exploring.

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