

A semiotic-pedagogic framework for the design of a virtual museum of Byzantine art

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Abstract. This paper presents the semiotic-pedagogic framework which assists the design of a virtual museum of Byzantine art. The proposal explains how the framework helps the design process by clarifying issues around the multifaceted problems concerning the knowledge required to use technology for educational purposes and the interpretation of signs and sign processes. The framework takes into consideration the affinity of important principles from cultural semiotics and semiotic aesthetic theories with Vygotsky's "signs" and "tools" and the symbolic function of Byzantine art.

Keywords. Semiotics, Pedagogy, Virtual Museum, Byzantine art, Culture

Introduction

Byzantine art is a form of Christian religious art with a well recognized style that has been formalized during the times of Byzantine Empire. To the present day various kinds of artifacts, such as Byzantine icons, are usually found in physical form in churches, homes and museums. According to the term "icon" an inexhaustible cause of semantic meanings [1] can be said that Byzantine art is a symbolic language of art composed of a system of signs that can be learned. The intention aimed to be fulfilled with this project is to promote the interpretation of the meanings of Byzantine artifacts inside an immersive virtual environment.

The design of the virtual museum is part of an ongoing research study which is done to represent the real museum at the Monastery of Saint John Lampadistis (UNESCO World Heritage Site) [2] and a running project with an aim to create an interactive virtual icon restoration tool that can aid restorers and curators by providing tools for trying various scenarios during virtual restoration [3]. However, the main purpose of the present paper is to propose a combined semiotic-pedagogic framework to guide the design of the virtual museum of Byzantine art. The proposed framework aims to assist the pedagogy and the didactic mediation of this form of cultural heritage holding that the representation of Byzantine art in a virtual environment could be an ideal option-medium for the interpretation of its language by young users.

The framework is twofold. It consists of the “three-dimensional” semiotic model-“Case study Semiosphere” (see Figure 1) that is combined and correlated to the articulated by Mishra and Koehler (also three-dimensional)-Technological Pedagogical Content Knowledge framework (TPACK) [4] (see Figure 2). The Case study semiosphere abstracts the processes related to the generation of meaning from signs (semiotics) and the TPACK the skills (pedagogy) to use technology for educational purposes. By correlating the fields of TPACK with those of Case study Semiosphere; the Content Knowledge (C) to Byzantine culture and art, the Technology Knowledge (T) to Virtual Heritage application and the Pedagogy knowledge (P) to Users-Interpreters we explore the means in which pedagogy informs semiotic theory (and vice versa) in a combined framework.

The overall framework involves the affinity of the symbolic function of Byzantine art with the semiotic approaches from Yuri Lotman-Cultural Semiotics [5] and Charles Morris-Semiotic Aesthetics [6] together with Vygotsky’s foci on “signs” and “tools” within his overall pedagogic theory. The goal is to achieve the interpretation of artifacts in a process of psychological development of young users [7] (Vygotsky’s theory applied for the virtual museum design) by evaluating and transforming children development inside virtual environments by using “signs” (cultural artifacts) and “tools” (virtual tools). The framework is anticipated that can assist further the research for immersive cultural representation in the field of Virtual Heritage [8].

The Case study semiosphere

The concept of the “Semiosphere” is the chief concept of Cultural Semiotics; the field of study specializing on the signs and signs processes of culture. Semiosphere allows the understanding of the interplay between different sign systems and the role of signs in culture in a holistic way considering both part and the whole. The semiosphere was coined by Lotman to be applied in cultural semiotics [5]. In our work, we have devised the “Case study semiosphere” which is a semiotic model consisted from three semiospheres (see Figure 1) containing different kinds of signs interacting with each other. These are: ❶ Byzantine culture and art, ❷ Virtual heritage application and ❸ the Users-Interpreters. Each semiosphere explains the dialogic process where signs of ❶ are communicated with the help of a virtual heritage application ❷ to the Users-Interpreters ❸. A virtual heritage application refers to the use of electronic media in recreating or interpreting cultures as they are today or as have been in the past [8].

The Case study semiosphere is a three-dimensional “borromean knot” [9] which describes the most important principles of cultural semiotics like that cultures have marks (or signs) and that are always sign systems or that cultures have boundaries that abut non-cultural space [5]. The Case study semiosphere owes its inspiration from the “biosemiosphere” bearing Lotman to Peirce’s sign theory and his Categories [9] but furthermore to the ancient theories of Aristotle, Plato and the early Church fathers who studied the phenomenal world experience and the perception of signs [10].

The model together with its cultural significance illustrates the contemporary key idea of Morris that the meaning and valuation in art springs from what Morris distinguished to be syntactics (the relations between the signs), semantics (the relations between the signs and what they designate or denote) and pragmatics (the relation of the signs to their creators and interpreters) [6]. Morris first composed a systematic semiotic aesthetic theory analyzing the semiotic role of the art holding that artifacts

entail the potential to act as sign vehicles in virtue to be interpreted as signs; according to their syntactic, semantic and pragmatic ways of functioning for their observers. In this sense we can use the model to better understand the construct of the aesthetic experience of Byzantine art taking in mind the interaction of the involved sign systems but also integrate it with the TPACK framework.

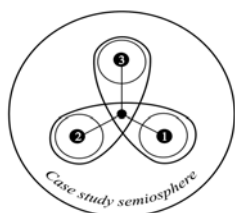


Figure 1. The “Case study semiosphere”

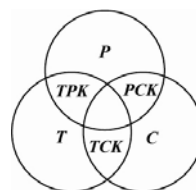


Figure 2. The “TPACK” framework

The Technological Pedagogical Content Knowledge (TPACK)

Similarly to Case study semiosphere, the TPACK (Figure 2) contains three fields but from its own perspective is used to clarify the principles of the complex relationship of integrating education and technology indicating the kind of knowledge required by the teacher who uses technology. Based on the epistemological concept of Pedagogical Content Knowledge (PCK) proposed by Shulman [4]; Mishra and Koehler articulated the notion of TPACK which includes the three knowledge domains; Content (C), Technology (T), and Pedagogy (P), leading to three pairs of integration and one triad.

With the addition of Technology domain (T) were introduced two new pairs and one triad. Besides the Pedagogical Content Knowledge (PCK) the two new pairs are Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and the triad: the Technological Pedagogical Content Knowledge (TPACK). The definitions about the three domains of knowledge, the pairs of integration and the triad are quoted as follows from the work of Mishra and Koehler [4]:

- Content Knowledge (C) is the “knowledge of the actual subject matter that is to be learned or taught”.
- Technology Knowledge (T) the “skills required to operate particular technologies”.
- Pedagogical Knowledge (P) is the “deep knowledge about the processes and practices or methods of teaching and learning and how it encompasses, among other things, overall educational purposes, values, and aims”.
- Technological Content Knowledge (TCK) is the “knowledge about the manner in which technology and knowledge are reciprocally related”.
- Technological Pedagogical Knowledge (TPK) the “knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings, and conversely, knowing how teaching might change as the result of using particular technologies”.
- Pedagogical Content Knowledge (PCK) “includes knowing what teaching approaches fit the content, and likewise, knowing how elements of the content can be arranged for better teaching”.
- Finally TPACK is defined as “an emergent form of knowledge that goes beyond all three components (Content, Technology and Pedagogy)”.

Correlating the TPACK with the Case study semiosphere

The purpose of correlating the TPACK with the Case study semiosphere is to clarify issues around the multifaceted problem about the knowledge required to use technology for educational purposes and the interpretation of signs and sign processes. The affinity between the two models is specifically determined from the correlations between the Content Knowledge (C), the Technology Knowledge (T) and the Pedagogical knowledge (P) respectively to the semiospheres ❶, ❷, and ❸.

Firstly the Content Knowledge (C) is correlated to semiosphere ❶ to stress the fact that the knowledge of this specific subject matter-Byzantine art requires pedagogues who must be equipped with the deep knowledge and understanding for it; secondly the Technology Knowledge (T) is correlated to semiosphere ❷ to show that the knowledge about the technology used (virtual technology) is important for the transmission and the interpretation of Content Knowledge (C); and thirdly the Pedagogy Knowledge (P) is correlated to semiosphere ❸ to emphasize the need for applying pedagogical strategies to help users interpret the symbolic language of Byzantine art.

Based on the approach used in the formulation of the TPACK where the pairs of the triadic integration are analyzed thoroughly, similarly we can analyze the interaction of the Case study semiospheres in their relation with TPACK. The otherwise “fused interaction” of the semiospheres can be explained using the pedagogical principles of TPACK and the pairs of the TPACK can be informed from the semiotic principles of the Case study semiosphere. This is done by focusing on the integration pairs of the TPACK and introducing the semiotic relations with Case study semiosphere.

For instance the Technological Content Knowledge (TCK) is a valuable source of knowledge which informs us how the content changes by the application of technology in a reciprocal relationship between content-technology. Similarly though, we have the relationship sign-technology for which we shall refer to sign (representamen) as something which stands to somebody for something in some respect or capacity [11]. According to the definition of the sign the handling of content with technology shall be studied as handling signs or sign systems (semiospheres) of changing meaning and not only as content (signs) constrained only in certain disciplines.

For example research specific to the correlation between TCK and semiosphere ❶ (Byzantine culture and art) can be directed in testing the implementation of software-hardware (i.e. virtual software, Desktop PC, CAVE, HMD technologies) to handle the semiotic mediation of the content. The flexibility of disseminating the specific subject matter with new ways of representation using virtual technology in accordance to the semiotic changing of the content-meaning is regarded of crucial pedagogic importance. In our case, the development of a virtual museum is carried over the virtual environment platform ScienceSim [12] where we examine its semiotic functionality in respect to the handling of the mediated content and the respective context. Only the use of hypertext is an example of semantic functionality highly regarded as beneficial to the representation of cultural heritage but which much be well thought out.

On the other hand the Technological Pedagogical Knowledge (TPK) including the knowledge about the opportunities of taking into advantage certain technological tools and providing the affordances to accomplish certain educational tasks can be researched inline with semiosphere ❷. In this advance the functionality and efficacy of certain technologies-tools can be researched towards mediating content with pedagogic practices. In semiotic terms this could mean for example the study of the semantic and

symbolic functionality of virtual technology to affect users-interpreters after applying pedagogies explicitly intended for virtual worlds [13].

The third integration, the Pedagogical Content Knowledge (PCK) includes the ways in which content could be transformed for educational purposes excluding the use of technology. Relating PCK to semiosphere ③ the (Users-Interpreters) can be translated for example into research that may involve traditional pedagogic practices; for example the study of collaborative activities analyzing pedagogically the meaning of the Byzantine artifacts (i.e. in religious studies) [14] or the theoretical examination of the problems that concern the development of the virtual icon restoration tool [3].

Designing the virtual museum. A Vygotskian perspective.

Incorporating Vygotsky's ideas to the proposed semiotic-pedagogic framework is important because Vygotsky like Morris and Lotman has a holistic-semiotic view on culture and art but most precisely an educational view of art pertinent with the applied potential of artifacts becoming meaningful and emotional devices [15]. A central aspect of his educational theory is that the use of children's cultural sign systems together with psychological-pedagogical tools (such as language, writing, artworks and technical tools) can transform their development [16]. What's most important from Vygotsky's theory that applies for our case is his approach that children development is socially constructed with the usage of psychological "signs" and "tools" existing in the environment of potential learners, a theory which is inline with the proposed pedagogical framework but also the symbolic function of Byzantine art itself (Byzantine artifacts functionality intends to the development of human culture).

One of the basic premises of an evaluation experiment examining the possibility of the formulation of rules for the communication of Byzantine art to young spectators with multimedia-virtual applications is that users should be scaffolded in their understanding of Byzantine art [17]. The initiated problem for the formulation of guidelines for the specific problem of the communication Byzantine art using new media is seen in the proposed approach that could be traced in its foundation from the distinctions indicated between the semiotic-pedagogic relations.

Further research on this direction involves also Vygotsky's theory on the "zone of proximal development", aspects of the pedagogy of play (edutainment) [7] and the study of applying design techniques for the mediation of cultural content (i.e. Non Photorealistic rendering) [18]. Currently these possibilities are researched within the potential of the proposed framework and the development of the virtual museum on the virtual environment platform Sciencesim [12].

Conclusions

This paper proposes the semiotic-pedagogic framework in a means to guide the design process of the virtual museum of Byzantine art. Inspired from relevant semiotic theories we developed the Case study semiosphere which we correlated to the Technological Pedagogical Content Knowledge framework (TPACK) and examined its affinity with Vygotsky's theory. A design based on the raised semiotic-pedagogic considerations is expected that will make us wiser integratively on a theoretical, methodological and pedagogical level providing many possibilities. Based on the tenets

of the framework we plan to research further the possibilities for evaluation and communication of Byzantine art and culture within the field of virtual heritage.

Acknowledgements

This work was supported by the Cyprus Research Promotion Foundation and the European Union Structural Funds (project TIE/ΠΑΗΡΟ/0609(BIE)/05). Thanks are extended to the supporters of the "ScienceSim Land Grant Program" for the provision of free space for the needs of the project.

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