

How to Learn About Art in a Museum Setting Using Multitouch Technology: Providing Affordances for Collaboration and Comparison

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Abstract: In the present study we investigated the process of collaborative meaning making of art using multitouch technologies. Dyads of students first visited an art exhibit, where they were instructed to pick their most favorite artworks from the exhibit by marking them in an iPod App. Subsequently, they explored their collection of favorites, which were displayed as high-resolution images on a large multitouch table and which could be moved and resized on the display using multitouch gestures. In a control condition, no instructions were given on how to explore the artworks, whereas in the experimental condition students were instructed to compare artworks to gain a deeper understanding of them. Moreover, automatic suggestions for comparing artworks between students' selections were presented. The goal of the instruction was to help students identify commonalities and differences among the artworks along four art-relevant dimensions: epoch, symbolism, method of production, and genre. After the exploration students filled in various posttests that assessed their understanding of art. Data collection has just been finished and results from the interaction data (audio and video recordings) and performance data will be reported at the conference.

Keywords: learning in museums, computer-supported collaborative learning, comparison, multitouch technology

1. Introduction

One of the central motives for visiting a museum's art exhibit is aesthetic experience. Aesthetic judgments, however, are not just an affective response; rather, they result from a variety of cognitive processes (Leder, Belke, Oeberst, & Augustin, 2004). These processes involve classification (e.g., identifying an artwork's epoch) and interpretation (e.g., identifying an artwork's theme). Positive aesthetic judgments are more likely if a beholder can derive a basic understanding from the artwork. However, most museums provide only little support for visitors to engage in meaning making. Typically only small labels with the artist's name and period of living are provided. Extended information provided via audio guides is often too complex, the usability is often limited, and because of the need to carry headphones communication with others is restricted. Therefore, many visitors refrain from using audio guides, thereby leaving their information needs unsatisfied. This may be one reason for why visitors often spend only a few seconds on studying a piece of art (Hein, 1998). In the present paper, we describe one approach to helping visitors in meaning making by using modern technologies, namely, large multitouch tabletop displays (MTT). We sketch a first study evaluating whether the MTT's interface supports collaborative engagement and, as a consequence, better understanding of art. This study is part of a larger project (EyeVisit).

1.1 The project EyeVisit

EyeVisit combines psychological research with innovative technological developments and makes them applicable in real-life situations such as (informal) learning in museums. At the heart of the project is a large MTT that allows displaying high-resolution images, videos, and audio and written text files. Multiple users can simultaneously interact with these objects by activating, resizing, and moving them

using multitouch finger gestures. Additionally, an iPhone/iPod visitor App allows retrieving an interactive map of the museum and background information on each artwork as well as marking one's favorite artworks to explore them in more detail at the MTT after an exhibit visit. Once a user puts the mobile device onto the MTT, his or her selected favorites will be automatically displayed. Currently, the EyeVisit system is used in the Herzog Anton Ulrich Museum (Braunschweig, Germany) under real-world conditions by the museum's visitors, and at Knowledge Media Research Center (KMRC) for running experimental studies. For the latter purpose, KMRC additionally simulated a museum context in its facilities by arranging high-resolution copies of the museum's most liked artworks (i.e., 44 paintings and objects from Renaissance, Baroque, and Rococo) in a museum-like setting.

1.2 Rationale of the present study

The goal of the present study was to identify ways of facilitating visitors' meaning-making process of art by directing their attention to commonalities and differences among artworks. In research on meaning making of art contextual and social factors are emphasized. That is, a single artwork is not understood in isolation; rather, meaning is derived from comparing different pieces of art to each other. Ideally, this process is facilitated by a curator's deliberate design decision for an exhibit regarding the spatial arrangement of artwork (Krukar, 2014). Moreover, museum visitors often explore exhibits in groups (e.g., as a family, couple, or friends); therefore, communication about artwork plays a vital role in meaning making (explanatory engagement; Leinhardt & Crowley, 1998). The relevance of comparison is also reflected in the learning sciences research literature. Comparison of elements with respect to their commonalities and differences is one of the pivotal mechanisms of learning through abstraction (Markman & Gentner, 1998). In particular, comparing elements that share many (superficial) similarities while thereby highlighting the few, distinct differences important to understanding enhances learning (Scheiter, Gerjets, & Schuh, 2004). Correspondingly, in collaborative learning scenarios it has been shown that slightly different knowledge backgrounds, views, or opinions can trigger curiosity, controversial discourses, and better learning (Doise & Mugny, 1978), particularly if learners are provided with information on their learning partners' views or knowledge (Bodemer, 2011). Accordingly, asking visitors of a museum to collaboratively compare pieces of artwork that appear highly similar in some respects (e.g., their epoch) but differ in important other aspects (e.g., their genre) should support their meaning making and collaborative elaboration. This assumption was tested in a study using the technological affordances of the MTT to support comparison processes during informal collaboration.

2. Study

Seventy-six students were assigned to two groups. In the instructed-comparison group, students working in dyads were explicitly prompted to compare pieces of art while exploring their favorite artworks using the MTT, whereby they received support in the selection of to-be-compared pieces. In the control group, students explored their favorite pieces of art at the MTT without any instructional support. Initially, students filled in a questionnaire assessing their prior knowledge and interest in art. They then received a 3-pages, written introduction to the interpretation of art according to which artwork can be described along four dimensions: epochs (e.g., Renaissance, Baroque, and Rococo), symbolism (i.e., themes such as power, science, religion), methods of production (e.g., paintings, sculptures), and genres (e.g., landscapes, portraits). These dimensions were also the ones we wanted students to learn about. Subsequently, students were asked to explore KMRC's art exhibit for 15 minutes (see first panel of Figure 1) and to mark their nine most favorite artworks using the iPod App (second panel). Afterwards, dyads put their iPods onto the MTT (third panel) to display their selected pieces of art (fourth panel). Students in the control group were instructed to explore their selection for 15 minutes by using multitouch gestures. Students in the instructed-comparison group were informed about the potential benefit of comparing elements and supported by automatic suggestions for comparing artworks between students' selections. The software's algorithm was based on a similarity matrix of all artworks, whereby such comparisons were prompted that involved objects that differed only with respect to one or two of the dimensions addressed in the introduction, but else were identical. Suggested objects were color highlighted upon touching a displayed artwork.



Figure 1. Materials and set-up: KMRC museum; iPod App; multitouch table with artwork display; selection of artworks from a dyad with highlighted elements (from left to right).

After the exploration at the MTT, students were asked to individually fill in a posttest, which consisted of three parts: In the first multiple-choice test students were asked to rate for 30 pairs of artwork from the exhibit whether they were similar or dissimilar regarding epoch, symbolism, methods of production, and genre, and to select the correct option for each dimension and artwork. In the second task, students were asked to compare another 10 pairs of artwork in an open format. Finally, to test their memory of the artworks, they were given a 60-item multiple-choice test that asked them to identify pictorial details from the various pieces of art. Finally, students were debriefed.

3. Preliminary Results

So far, only the items of the first multiple-choice test have been analyzed. They show that students still found it difficult to identify the correct epochs for the artworks (40.2% accuracy), whereas the other dimensions of art interpretation were somewhat easier (symbolism: 60.3%; methods of production: 83.9%; genre: 67.9%). There were no differences among conditions regarding this test. However, a first inspection of the video and audio recordings during the exploration at the MTT suggests that there is large variability in students' interaction and communication patterns both between the two groups as well as within groups. For instance, some dyads sort the artworks based on the insights achieved from comparing them in a very systematic fashion, whereas others hardly engage in any deeper reflection. Thus, it is expected that the coding of this data (currently ongoing) will yield a more valid predictor of students' understanding of art than the actual assignment to experimental groups. Results from these analyses will be reported at the conference.

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