Learning, Culture and Social Interaction 5 (2015) 54–65

Contents lists available at ScienceDirect

Learning, Culture and Social Interaction

journal homepage: www.elsevier.com/locate/lcsi

Framing a topic: Mobile video tasks in museum learning

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ARTICLE INFO

Article history:
Received 19 June 2014
Received in revised form 19 December 2014
Accepted 23 December 2014
Available online 29 March 2015

Keywords:
Museums
Mobile video applications
Interaction analysis
Conceptual learning
Embodiment

ABSTRACT

This study explores the conceptual framing work of a group of upper secondary students as they first collaborate to understand a particular science museum exhibit, and then relate aspects of the exhibit to a larger scientific principle. The task involved producing a video of the groups' explanation to a problem using a mobile device. Applying methods from interaction analysis we examine how the group accomplishes and performs conceptual understanding. The analysis shows the indexical affordances of video as medium in the setting, allowing students to use the exhibit as a visual and physical prop in the film to explain scientific concepts. Moreover, we found that the students' conceptual work was conducted in advance of making the video, and that making the video entailed collaboratively actualizing understandings previously accomplished in the group. Based on our findings, we propose that video tasks may be a productive way to 'frame topics' and orient students to disciplinary aspects of museum exhibits.

1. Introduction

As museum visitors increasingly produce and share media content using mobile devices, educators and researchers are studying how new media practices are intertwined with visitors' learning and engagement with museum exhibits, narratives and artifacts. From the perspective of digital literacy (Buckingham, 2006; Group, 1996; Jewitt, 2006), studies in museums show how taking and editing pictures, making videos, and writing text for cultural-specific social media platforms involves cultural competence, creativity and dialogical skills. New forms of engagement also emerge when visitors use InstaGram to 're-curate' exhibit themes for an intended audience of friends (Weilenmann, Hillman, & Jungselius, 2013), or use Twitter to create an interconnected opinion space that requires joint attention to physical and ambient aspects of communication (Charitonos, 2011; McCullough, 2013).

In the learning sciences, there is interest in how the performative and interactional aspects of producing different kinds of media content may be translated into pedagogical designs for specific formal and informal learning settings (Charitonos, 2011; Pierroux, 2009; Pierroux, Krange, & Sem, 2010). Numerous mobile learning projects have been developed for school field trips to museums and science centers (Frohberg, Göth, & Schwabe, 2009), many of which include functionality for students to record videos. The activity of producing digital videos has been found to have many positive features, promoting students' creative and active learning (Loveless, 2002), and increasing disciplinary talk and social interactions among students (Goldfarb, 2002). Studies report that students gain an increased feeling of responsibility for the final outcome and that the learning experience is seen as rich, authentic and memorable (Kearney & Schuck, 2006). A number of studies in museums have analyzed final videos, and how students use these in post-visit learning activities in classrooms (Hsi, 2002; Moland, 2014; Pierroux et al., 2010; Vavoula, Sharples, Rudman, Meek, & Lonsdale, 2009). However, less attention has been paid to the actual process of producing videos in the museum space, and how "task and tool" may be matched to support interactions with exhibits in ways that are productive for students' learning (Lund & Rasmussen, 2008;

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http://dx.doi.org/10.1016/j.lcsi.2014.12.001
2210-6561/

Mercer & Wegerif, 1999). Given the popularity of video recording features in mobile devices and systems, relatively few studies have explored how producing videos may impact learning science during schools visits to museums.

This paper explores how a mobile learning application designed with video-making tasks becomes a resource for a group of upper secondary students visiting a Norwegian science center on a school field trip. The study aims to contribute insight into the collaborative, disciplinary aspects of producing video content in a learning context. We pose the following questions: How do students structure, coordinate and enact responses to video tasks on science museum field trips? In which ways are the exhibit, the problem formulation, and other resources made relevant in the students' learning?

To explore these questions, we analyze how a group of four students solve a video task dealing with the topic of energy transfer. Using interaction analysis as method (Derry et al., 2010; Jordan & Henderson, 1995), we focus on the processes through which the students conceptually frame their interactions. The data were collected as part of a larger, nationally financed research project that explored how digital technologies can support students' learning of science across contexts of schools and museums.

2. Worksheets and video tasks

Extensive research has been conducted on school field trips to museums (DeWitt & Storksdieck, 2008), an educational practice that contains both formal and informal aspects of learning (Bonderup Dohn, 2011). Findings from the field trip literature tell us that *choice* is essential for engaging students' interest and motivation (Bamberger & Tal, 2007), and that students learn best when guided by a clear agenda and scaffolding that supports knowledge integration across contexts and over time (Falk, Moussouri, & Coulson, 1998; Steier & Pierroux, 2011). Paper-based worksheets are one 'mobile' means of orienting students to a disciplinary domain in a museum setting, and this widely used approach has been shown to produce modest learning effects (Mortensen & Smart, 2007). Worksheets are shown to be most effective when the tasks provide a moderate amount of structure, intermediate levels of support (Bamberger & Tal, 2007), and are combined with opportunities for students to freely explore an exhibition (DeWitt & Storksdieck, 2008). In an analysis of 12 worksheet types, Kisiel (2003) identified eight characteristics that have implications for students' learning: task density, orientation, level of choice, level of development, site specificity, information source and response formats that may be written/non-written and verbal/non-verbal. Mortensen and Smart (2007) used these characteristics to develop 'worksheet design criteria' that reflected a free-choice learning perspective (Falk & Dierking, 2000). They recommended open-ended tasks that allow students choice in where and how to solve them, and which foster group discussions and shared object observations. Also, worksheets should offer a variety of response formats, and focus on conceptual thinking rather than gathering facts. The structure of the activities in this study was designed based on these and other findings in field trip research, characterized as a *guided exploratory learning* approach (Hauan & Kolstø, 2014).

In recent years, there have been numerous studies of ways to integrate museum learning research, effective worksheet designs, and mobile applications for field trip use, often modeled on inquiry learning perspectives that prompt students to develop scientific questions and hypotheses, make observations, collect evidence and communicate findings (Frohberg et al., 2009; Marty et al., 2013). The option of making videos using cameras in mobile devices is often included in the educational design of such 'multimodal worksheets.' In the *MyArtSpace* project (Vavoula et al., 2009), students were encouraged to take pictures, write notes, and record short video clips that were accessed and annotated on a website in post-visit learning activities. In the *Gidder* project, a mobile blogging function was integrated in a wiki-based learning environment that contained interpretive tasks and curated information for art museum field trips (Pierroux et al., 2010). Both studies found that producing videos deeply engaged students in interpreting art in the museum, and that these interpretations fostered further disciplinary engagement in post-visit classroom activities (Moland, 2014).

Video-making tasks require literacy skills related to documenting, organizing and presenting information about an event. Weilenmann, Säljö, and Engström (2013) applied interaction analysis methods in a study of young people learning to produce videos in a science center. They found that while the participants struggled with both the technology and what to display in the videos, the problems they encountered prompted discussions and solutions that fostered learning. In a different setting, a study looked at how nurses at a Swedish hospital videotaped the use of technical equipment for knowledge sharing. The study showed that the process of producing video material for other nurses shaped and strengthened participants' arguments of how to do a particular procedure (Brandt, Hillgren, & Björgvinsson, 2004). These studies suggest that producing videos *in situ* can support what Engle and Conant (2002) termed *productive disciplinary engagement* across learning contexts, that is, actions and talk that include terms and concepts from a discipline or subject matter. Interestingly, a recent study found that video is the least used media type for user-generated content in such location-based learning applications (FitzGerald, 2012). Moreover, there have been relatively few studies of *how* tasks involving the making of videos in museums and science centers may frame and support students' learning. Our study thus contributes to research on students' learning when making *in situ* video productions, and on how conceptual understanding develops through embodied interactions in a science center exhibit.

3. Perspectives on conceptual understanding

Our investigation of how students co-construct conceptual understanding in a science center is grounded in sociocultural perspectives, which entail the study of human interactions as situated in and mediated by tools and language in particular cultural, historical, and institutional settings (Vygotsky, 1978; Wertsch, 1991). In science museums, students' interactions are thus understood as mediated by a range of semiotic resources that may include worksheet tasks but also language, gestures, gaze, exhibits and digital technologies. The potential to combine resources with diverse properties expands the repertoire of possible actions for participants to engage in, for example, solving learning tasks (Streeck, Goodwin, & LeBaron, 2011). Goodwin (2000a) describes this realm of possible actions