VideoTraces: Rich Media Annotations for Learning and Teaching

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ABSTRACT

This paper describes a computer-based video annotation environment with a variety of uses for learning and teaching. The *VideoTraces* system allows users to capture and annotate digital video, thus representing their ideas in a unique way. The system is based on research about the embodied nature of human knowledge and collaborative learning. In this paper, we report on two pilot uses of the system in very different settings (a science museum and a university dance course). We describe a range of ways in which people represent their ideas with *VideoTraces*, and argue that the system may be a general tool to support collaborative learning.

Keywords

Interaction, video, annotation, embodied knowledge

INTRODUCTION

Over the last two decades, ethnographically based field studies have described naturally occurring cognition and learning in a variety of settings. These studies argue against exclusively mentalistic conceptions of knowledge; knowledge needs also to be understood as *embodied*. Embodied knowledge is knowledge that is literally in the body—in the eyes and the hands of the knower (Stevens & Hall, 1998; Goodwin, 1994; Ochs et al., 1996; Suchman, 2000). Close analyses of interaction in which learning and teaching occur demonstrate a marvelous degree of coordination between participants, who used embodied representational resources of speaking, pointing, gesturing, and (sometimes) drawing. Joint attention, synchronous coordination of saying and showing, and turn taking are primary resources that make these moments what they are as contexts for learning. Given that these sorts of teaching and learning situations can be hard to come by in many settings, are there ways to support expanded opportunities for these kinds of encounters between people through technology that build upon a principled understanding of human interaction and embodied knowledge?

THE VIDEOTRACES SYSTEM

This article offers a provisional and affirmative reply to this question by describing uses of a technology-based activity system called VideoTraces. The VideoTraces system was conceived of a number of years ago (Stevens & Hall, 1997), but became technically and economically feasible only with recent innovations in digital video technology. Through a simple computer interface, the system allows users to capture a piece of rich digital media (a video segment, an image, a piece of music), and to annotate it by talking and gesturing (using a pointer to record gestures), coupling descriptions of embodied experiences with the things they describe. The resulting "video traces" are then saved and can then be viewed, exchanged, and commented on by one's self and others.

VideoTraces is a system for people to *make* things with—in particular, to make representations of their experiences, embodied skills, understandings, and questions. It is also a system for people to learn with, both personally and collaboratively. Personally, people may learn by capturing, reflecting upon and re-presenting their own activities and ideas. Collaboratively, people may learn through conversation with the video traces produced by others.

This paper argues that this relatively simple system has a wide variety of possible uses for learning and teaching and in particular supports collaborative and distributed learning in new ways. Examples from two cases of pilot work, in which the rich media object that is annotated is a short segment of video, are presented here.

CASE 1: VIDEO TRACES AND INTERACTIVE LEARNING CENTERS

In Interactive Learning Centers like science museums, learning opportunities occur through interaction at exhibits and are often occasioned by observing the interactions of other visitors. These interactions are however ephemeral and usually too short for sustained inquiry to occur (See Stevens & Hall, 1997 for further details on these learning environments). VideoTraces provides an opportunity to encourage inquiry and support new interactions by allowing visitors to represent their own ideas and to leave a trace of these ideas with which other visitors can engage.

The VideoTraces system was tried at three science centers in United States. In these Interactive Learning Centers, visitors used the VideoTraces system to represent their ideas, explanations, questions, and perceptions about scientific phenomena modeled by exhibits. Our analyses suggest that visitors can use the system to make many types of traces that could be put to many different collaborative uses. The types of traces range from recognizable discourse genres such as well-formed questions and explanations to more informal conversational ones.

One way that VideoTraces provides for collaborative learning is in the joint production of the traces by multiple people. The other way it provides for collaborative learning is through distributed inquiry: visitors view, respond and link new traces to those made by other visitors. With this sort of viewing and linking capacity, visitors to science centers are able engage in inquiry with people they don't know and who could have visited a science center on a different day, month or even year. A third opportunity for collaboration addresses the "Field Trip Problem" - how to arrange experiences in the museum which connect with inquiry activities in classrooms. VideoTraces offers a way for students to make durable their ideas while in the museum that can then support further rich discussion and inquiry in the classroom (see Stevens & Hall, 1997 for elaboration of this possible use).

CASE 2: VIDEO TRACES AND DANCE COMPOSITION

Our second experiment with VideoTraces was with an undergraduate choreography class at the University of Washington. VideoTraces seemed like a natural fit with dance—a field in which people use their bodies to represent ideas and in which they make frequent use of videotape to document their work. VideoTraces provided learners with an opportunity to use video not simply as a medium for documentation, but as an interactive tool that supported reflection and the development of new ideas over time.

Students used VideoTraces in a number of ways to represent their ideas, including planning for rehearsals, documenting aesthetic intentions for the dance, and making connections between formal concepts and practice. Students used the pointer to indicate new potential pathways for movement or uses of the performance space.

There are a number of ways that VideoTraces can support collaborative learning in dance and other communities of practice. Choreographers could use VideoTraces to communicate with their dancers between rehearsals, allowing more effective use of rehearsal time. VideoTraces can also be used to comment on and critique the work of others. VideoTraces may also have a potential to significantly affect communication between students and instructors. Dance instructors rarely have a way to collect representations of students' *process* of creating a dance, and students' work is usually judged on the basis of what is successfully communicated in their final presentations. VideoTraces could be used by students to get feedback when they run into trouble while creating their dances and as a new form of assessment that encourages reflection and iterative refinement.

FUTURE DIRECTIONS

The significant differences in the two settings explored here suggest that VideoTraces may be a *generalizable* representational system that draws on peoples' everyday resources of watching, speaking, and pointing. Currently we also are experimenting with VideoTraces in a number of other learning environments where the embodied nature of knowing and learning are central. In addition to an expanding set of research settings, we will be pursuing the collaborative practices in the science centers and dance that we have described here.

CONCLUSIONS

Everyday interaction as a resource for learning and teaching needs neither repair nor augmentation. However, technologies such as the VideoTraces system that build upon a principled understanding of these resources can provide possibilities for intriguing new collaborations across time and space. Though we are still early in the life span of the project, we expect to count VideoTraces system as a successful tool if members of different communities continue to find in its generality and accessibility the capacity to represent the widest possible range of specific practices and ideas by which their communities are characterized and renewed.

REFERENCES

Goodwin, C. (1994). Professional Vision. *American Anthropologist* 96(3): 606-633.

Ochs, E., P. Gonzales, P. & Jacoby, S. (1996). "When I come down I'm in the domain state": Grammar and graphic representation in the interpretive activity of physicists. *Interaction and grammar*. E. Ochs, E. A. Schegloff and S. Thompson. New York, Cambridge University Press: 328-369.

Stevens, R. and R. Hall (1997). Seeing 'Tornado': How *VideoTraces* Mediate Visitor Understandings of (Natural?) Phenomena in a Science Museum. *Science Education* 81(6): 735-748.

Stevens, R. and R. Hall (1998). Disciplined perception: Learning to see in technoscience. *Talking mathematics in school: Studies of teaching and learning.* M. Lampert and M. L. Blunk. New York, Cambridge University Press: 107-149.

Suchman, L. (2000). Embodied Practices of Engineering Work. *Mind, Culture & Activity* 7(1 & 2): 4-18.