Classroom Critical Incidents

John M. Carroll
The Pennsylvania State University, USA

Dennis C. Neale
Virginia Tech, USA

Philip L. Isenhour
Virginia Tech, USA

INTRODUCTION

Evaluating the quality and effectiveness of user interaction in networked collaborative systems is difficult. There is more than one user, and often the users are not physically proximal. The "session" to be evaluated cannot be comprehensively observed or monitored at any single display, keyboard, or processor. It is typical that none of the human participants has an overall view of the interaction (a common source of problems for such interactions). The users are not easily accessible either to evaluators or to one another.

In this article we describe an evaluation method that recruits the already-pervasive medium of Web forums to support collection and discussion of user critical incidents. We describe a Web forum tool created to support this discussion, the Collaborative Critical Incident Tool (CCIT). The notion of "critical incident" is adapted from Flanagan (1956), who debriefed test pilots in order to gather and analyze episodes in which something went surprisingly good or bad. Flanagan's method has become a mainstay of human factors evaluation (Meister, 1985). In our method, users can post a critical incident report to the forum at any time. Subsequently, other users, as well as evaluators and system developers, can post threaded replies. This improves the critical incident method by permitting follow-up questions and other conversational elaboration and refinement of original reports.

In the balance of this article, we first describe the project context for our study, the development of a virtual school infrastructure in southwestern Virginia. We next describe the challenge of evaluating usability and effectiveness in this context. These problems sparked the idea for the Collaborative Critical Incident Tool (CCIT). We discuss the design of the tool as used during two academic years. We illustrate the use of the tool with sample data. Finally, we discuss the design rationale for the CCIT, including the design tradeoffs and our further plans.

BACKGROUND: THE LiNC PROJECT

Our study was carried out in the context of the "Learning in Networked Communities" or LiNC Project. This project was a partnership between Virginia Tech and the public schools of Montgomery County, Virginia, U.S. The objective of the project was to provide a high-quality communications infrastructure to support collaborative classroom learning. Montgomery County is located in the rural Appalachian region of southwestern Virginia; in some schools, physics is only offered every other year, and to classes of only three to five students. Our initial vision was to give these students better access to peers through networked collaboration (Carroll, Chin, Rosson, & Neale, 2000).

Over six years, we developed and investigated the virtual school, a Java-based networked learning environment, emphasizing support for the coordination of synchronous and asynchronous collaboration including planning, note taking, experimentation, data analysis, and report writing. The central tools were a collaborative notebook and a workbench. The notebook allowed students to organize projects into shared and personal pages; it could be accessed collaboratively or individually by remote or proximal students. The software employed component archi-

tecture that allowed notebook "pages" of varying types (e.g., formatted text, images, shared whiteboard). The workbench allowed groups including remote members to jointly control simulation experiments and analyze data. The virtual school also incorporated e-mail, real-time chat, and video-conferencing communication channels. (See Isenhour, Carroll, Neale, Rosson, & Dunlap, 2000; Koenemann, Carroll, Shaffer, Rosson, & Abrams, 1999).

MULTIFACETED EVALUATION

Some of the greatest challenges in the LiNC Project pertained to evaluation. In the situations of greatest interest, students were working together while located at different school sites, some more than 15 miles apart. Usability engineering and human factors engineering provide many techniques for evaluating traditional single-user sessions—observing and classifying portions of user activity, non-directively prompting think-aloud protocols, logging session events, interviewing, and surveying. The problem in the case of the Virtual School is that the "session" is distributed over the whole county.

Our approach to this challenge was to gather many sorts of traditional evaluation data and to try to synthesize and synchronize this data into a coherent multifaceted record. We transcribed video records from each school site, directly incorporating field notes made by observers during the activity re-

Figure 1. Main page for Collaborative Critical Incident Tool. A statement of purpose and definition of critical incident are displayed permanently with a key to special symbols (new comment or incident, more comments added to an incident report already posted, additional instances of a critical incident). Below this orientational information is the list of critical incidents currently posted — listed by their author-supplied names (only the top of the list is visible in the figure). At the bottom of the list is a link to add a new critical incident.