

Interaction Patterns with a Classroom Feedback System: Making Time for Feedback

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ABSTRACT

In this paper, we describe two novel patterns of interaction that arose in a study of a computer-mediated feedback system for the university classroom. In both patterns, students gave feedback through the system that they would not have given aloud for lack of an appropriate moment—either because the feedback would be premature or tardy. We describe the patterns themselves and how awareness of the patterns can inform pedagogy and system-building.

Keywords

Educational technology, computer-mediated communication, university lecture

INTRODUCTION

Soliciting student feedback in large, university classes is a critical but difficult task. Feedback informs instructors' teaching and engages students in class [1]; however, large classes tend to lack interaction [2], limiting available spoken feedback.

We developed the Classroom Feedback System (CFS), a computer-mediated feedback system, to facilitate feedback in large classes. We designed CFS to provide an alternate feedback channel that did not require interrupting the instructor (as with spoken feedback) and required little cognitive effort for generating and interpreting feedback. To accomplish these goals, CFS exploits the widespread use of slides in lectures. A public display shows the current slide; student devices show the current and previous slide; and the instructor's device shows the current and surrounding slides. A student gives feedback by positioning an annotation chosen from a small set of options—*e.g.*, “More explanation” or “Example”—directly on a slide. The annotation is neither shown on other students' displays nor on the public display. The instructor's display shows all annotations as anonymous, color-coded marks on the slide (and through several summary views). The instructor can use her device to write on and navigate through the slides. CFS and the design experiment methodology by which it was developed are described in greater detail in other work [3]. Ongoing analysis shows that CFS increased the

amount of interaction in the study class; however, CFS's overall impact is not our focus here.

This paper focuses on two novel interaction patterns that arose with CFS. Both patterns encouraged feedback that students did not give aloud for lack of an appropriate time to give it. These patterns represent exciting new opportunities for feedback and highlight aspects of CFS that enable novel interactions. The next two sections discuss the patterns in the context of the class we studied—an introductory programming class of 120 students, a dozen of whom used CFS for three weeks of the ten week term. Each section begins with an example of the pattern based on data from the study. In the examples, *John* is a pseudonym for the instructor and *Alice* and *Bob* for the students.

STUDENT-GUIDED LECTURE

John begins his discussion of a slide on program structure. As the slide comes up, Alice's eyes are drawn to the unfamiliar term “#include.” She annotates it, asking for more explanation. John sees the annotation but ignores it for now since he hasn't reached that point on the slide. When he does, he circles “#include” and spends extra time defining the term and relating it to program structure.

This example is typical of the “Student-Guided Lecture” pattern: a student annotates ahead of the lecture, and the instructor later folds the annotation into his discussion. Although it is a successful episode of feedback and response, the entire exchange is invisible to most of the class. As the instructor put it when describing his handling of a comment on the word “reference:” “...if I'm smooth enough about it then the rest of the class will just think ‘Oh, he's going to talk about reference now.’ ... [To the rest of the class,] here's something that for some reason I decided to talk about towards the end of the slide.”

We had initially considered students' ability to annotate points on a slide before the instructor discussed them as a weakness. Asking *aloud* about a point that the instructor had yet to reach would be socially unacceptable, and students simply did not voice such questions in the study class. In this vein, many instructors identified early annotations in CFS as a potential problem when we demonstrated the system to them. However, the instructor in our study saw this pattern of interaction—which exploits early annotations—as particularly effective.

The success of this pattern of interaction hinges on the use of a shared document as a context for student feedback.

Students are able to annotate “prematurely” because the context for their annotations, the slide, is available ahead of the discussion. The instructor can rapidly evaluate when to address annotations because the timing of his discussion is tied naturally to the layout of the slide. When he is ready to address the comment, he can publicly annotate the shared document, closing the loop of interaction with the student who gave the feedback and bringing the rest of the class into the discussion. The feedback retains its meaning throughout the interaction because its context, a position on the slide, is persistent. In contrast, interpreting a comment after the fact *without* an anchoring context would require that the instructor recall what was happening at the moment the comment was made. In effect, slide context transforms the communication medium from a synchronous mode which requires careful timing of dialogue to a more forgiving asynchronous mode.

The private nature of annotations also influenced this pattern. Other students in the class were not distracted by premature annotations. Furthermore, privacy (and anonymity) probably helped empower students to make comments that would have been socially unacceptable if voiced.

POSTPONED FEEDBACK

During an example of how to use iterators, Bob is confused by a call to “iter.next.” He doesn’t ask about it quite yet because John is still discussing the slide. When John finishes the slide and moves on to another, Bob decides to ask about “iter.next” and annotates it, requesting more explanation. After a minute, John notices Bob’s feedback and responds to it, returning to the previous slide.

Unlike the “Student-Guided Lecture” pattern, CFS was designed with the “Postponed Feedback” pattern in mind. In prototype studies, we found that some student questions in large lectures are precluded by the pace of the class, a phenomenon we call “feedback lag.” In this phenomenon, students lack the confidence to pose their question until the instructor finishes discussing a point (because the instructor *might* be about to answer the question). By the time it is clear that the instructor has moved on to the next point, the student’s question seems out of place and is left unasked.

In the “Postponed Feedback” pattern, a student whose question has been left behind by the discussion can still ask her question through CFS. The student interface of CFS allows feedback on both the current and previous slide, allowing ample time to leave postponed feedback under most circumstances. Furthermore, the silent CFS feedback does not require a breaking point in the instructor’s discussion as spoken feedback does.

Several students’ feedback followed this pattern, and two students’ descriptions of their strategies for using CFS closely matched the pattern. A post-study survey showed that students who had difficulty giving feedback because of the pace of the class found that CFS alleviated the problem; however, several students mentioned that even having the previous slide was insufficient when the lecture moved especially quickly. The instructor felt that responding to

postponed feedback was important and often deviated from the course of his presentation to respond to these comments, sometimes returning to the previous slide when comments appeared on that slide. However, he found these deviations jarring and feared that they broke up the flow of the class for students. Neither our surveys of the students who used CFS nor of the class as a whole suggest that the students perceived a significant jarring effect. Nonetheless, the instructor’s perception of disjointedness reduced the enthusiasm and probably the frequency with which he responded to postponed feedback.

As with the “Student-Guided Lecture” pattern, the successful aspects of the “Postponed Feedback” pattern stemmed from students’ ability to provide private feedback in a persistent context. Even after discussion of a point had ended, students were still able to express their feedback in a comprehensible manner, and they did not have to interrupt the instructor to do so. However, unlike in the previous pattern, there was no natural opportunity for the instructor to address this feedback. It seems unlikely that a purely technological solution could manufacture this opportunity; however, as the instructor and some students in our study suggested, customs of practice such as setting aside time at the beginning or end of each class period or at the end of each topic to review the feedback might address this problem.

CONCLUSION AND FUTURE DIRECTIONS

We have described two ways the Classroom Feedback System expanded the opportunities for feedback in a class. Our experience with CFS has suggested specific aspects of the system that enable these patterns, especially the use of the class slides as a persistent context: available and comprehensible both before and after discussion of a point. In future work, it would be fruitful to clarify how pace and timing affect students’ participation in a class, to search for new patterns of interaction in the classroom, and to refine CFS or other educational interventions to exploit these patterns more effectively.

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