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

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The Classroom Feedback System (CFS)

Goal:

Understand and expand the role of student interaction in large classes through technological interventions.

We believe student interaction and engagement are critical to learning. Therefore, we designed CFS to study and encourage one step of the interaction process: soliciting feedback. By providing a radically different feedback mechanism from hand-raising, CFS creates the opportunity to understand patterns of interaction that are usually suppressed in large classes.

Method:

Engineer a learning environment through iterative design, intervention, and study.

Using Ann Brown's "design experiment" methodology, we designed CFS for large, university classes. Our design process is detailed in the following table:

Class	Data	System	Participants
Intro Comp. Science	Observation	None	N/A
Fluency in Info. Tech.	Observations, artifacts, instructor interview	Pen-and-paper prototype	1 day, 9 students
Fluency in Info. Tech.	Observations, artifacts, instructor interview, logs, student survey, focus groups	Pen-and-paper + computer protos.	1 day, 14 students
Intro Comp. Science	Observations, artifacts, instructor interview, logs, student survey, focus groups, class-wide survey	Full system	3 weeks, 12 students

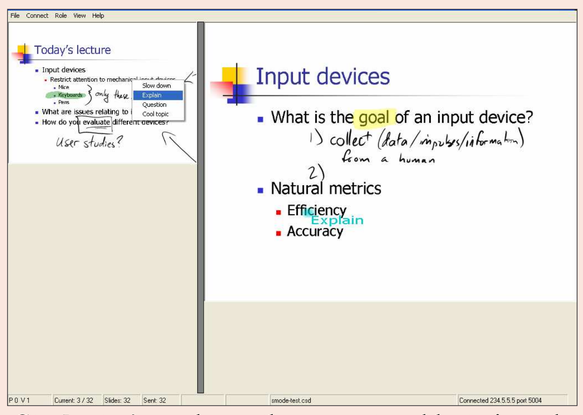
Designed system:

*a classroom feedback system supporting **simple**, **contextual**, **student-initiated** feedback*

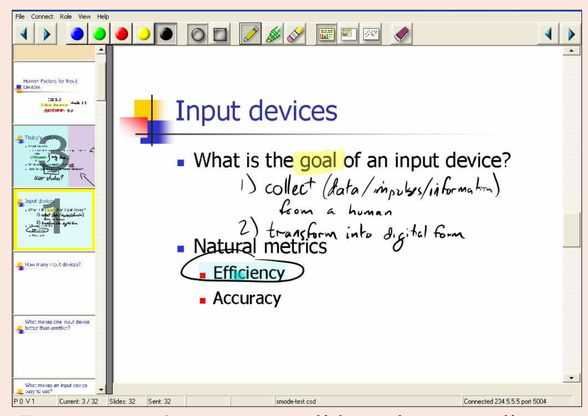
Simple: feedback is drawn from a fixed list of options designed by the students and instructor.

Contextual: annotations are attached to a stable, shared context: a location on the class slides.

Student-initiated: like hand-raising but unlike poll/quiz-based computer-mediated systems, students decide when to contribute.



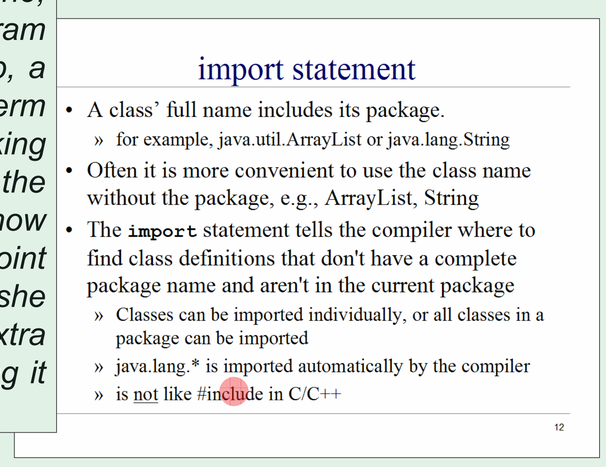
Student view: shows the current and last viewed slides. Here, the student gives feedback on the last slide.



Instructor view: current slide and surrounding slides (miniature) summarize student feedback including feedback from the figure to the left.

Prospective Feedback: Student-Guided Lecture Pattern

Scenario: *The instructor, Jane, begins her discussion of program structure. As the slide comes up, a student notices the unfamiliar term "#include." He annotates it, asking for more explanation. Jane sees the annotation but ignores it for now since she hasn't reached that point on the slide. When she does, she circles "#include" and spends extra time defining the term and relating it to program structure.*



Pattern: a student annotates early (ahead of lecture), and the instructor later folds the annotation into her discussion. Though a successful episode of feedback and response, the exchange is invisible to most of the class.

We initially considered early annotations a weakness because giving *spoken* feedback early would be socially unacceptable.

However, the instructor found this pattern effective. He described his response to an annotation on the word 'reference':

> "…if I'm smooth enough… the class will just think 'Oh, he's going to talk about reference now.' … [To them,] here's something that for some reason I decided to talk about towards the end of the slide."

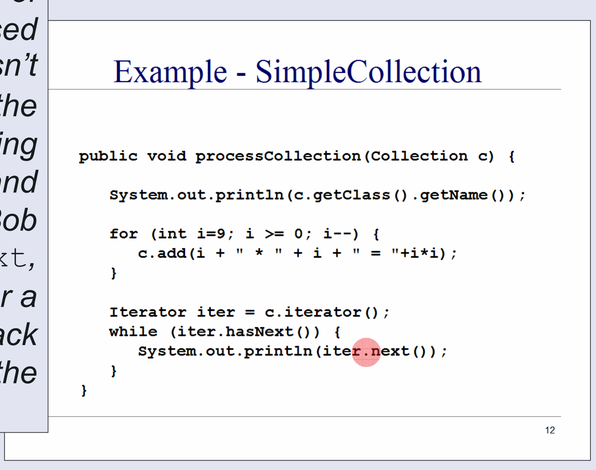
Key enabling features of CFS:

- ❖ Context available to students early: The slide is revealed early enough to make this pattern possible.
- ❖ Context shared with instructor: The instructor can understand the context of annotations quickly. Furthermore, he can decide whether to postpone responding based solely on the geometry of the slide.
- ❖ Mechanism to close the feedback loop: The instructor can write on the slide, closing the loop of interaction with the student who gave the feedback and bringing the rest of the class into the discussion.

The computer-mediated feedback system enabled a novel pattern of interaction which would be impossible without intervention.

Retrospective Feedback: Feedback Lag Pattern

Scenario: *During an example of iterators, Bob, a student, is confused by a call to* `iter.next`. *He doesn't ask about it quite yet because the instructor, Jane, is still discussing the code. When she finishes and moves on to the next slide, Bob decides to annotate* `iter.next`, *requesting more explanation. After a minute, Jane notices the feedback and responds to it, returning to the previous slide.*



Feedback lag: a student delays her question until the instructor concludes his point (because he might be about to answer the question). But once he has clearly proceeded to the next point, the question seems out of place and is left unasked.

Pattern: a student whose question has been left behind simply annotates the previous slide. The instructor sees the annotation on his slide summary (left of the figure above) and decides when and whether to go back and address the question.

Early observations/studies suggested feedback lag inhibited interaction (e.g., 3 of 12 students in one survey felt the fast pace left their questions behind).

In response, we designed CFS to allow feedback on the previous slide and show that feedback to the instructor.

Students' response in latest study:

- ❖ CFS helped all who suffered feedback lag
- ❖ 2 others suffered feedback lag *with* CFS
- ❖ 2 students reported "feedback lag" strategies (e.g., "My strategy was to let him talk about a bullet point completely before I clicked.")

Instructor's response in latest study:

- ❖ Felt late feedback was important and often responded (sometimes on previous slides)
- ❖ Found it upset his normal pacing

Persistently available context for questions exposed feedback that was previously unvoiced but did not effectively weave it into the class discussion.

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