We're taking you on a tour of Educational UI today. The scope is so vast that we could be studying this room's arrangement or how textbooks have evolved in the past centuries... For today, though we'll just explore a few online education platforms and focus on discussing the kind of UI decisions the designers had to make.

This overview is no way an exhaustive picture on online education either, but rather a few handpicked examples I've handpicked because we think they illustrate well some of the concepts seen in class this term.

Those examples were also chosen with having in mind that the conclusions we can draw from their analysis will provide us with valuable insights, well beyond the field of educ. UI
Starting w/ our candidate for hall of Fame or Shame.
More specifically, let's focus on the left sidebar, the threadlist:

- Learnability: external consistency w/ email client (we almost saw this example): almost direct mapping between email. User can start using piazza without any training. and this so it makes a lot of sense, w/ how tags are represented.
- Efficiency: Red background for response required or bold red text for unresolved followup (internal consistency). Filtering functionality and very useful for TAs in order to find unresolved stuff but you notice it? Nice use of display variables (tags: color, position, type of answer: position, color).
- Safety: filtering provides limited indication that we're filtering records.
Users and Goals

What user classes do we encounter in online ed?

Learners and Staff/Teachers (note: a teacher in real life can be a learner online). Main Goal for learners could be to improve/facilitate their learning experience. Main goal for Teachers is to facilitate their teaching experience (material diffusion, getting feedback about what learners know and don't know).

We're software engineers not education specialists, so before we continue we need to get a few “ground truths” in terms of what factors are considered to improve learning in general.

If you've Taed before, you might be w/ the TLL (http://mit.edu/tll)? Open to anyone in the community who's interesting in improving their teaching skills.
Guidelines on Learning that Inform Teaching at MIT

http://mit.edu/tll

In particular, if you visit their site you can download this brochure which contains a summary of techniques that promote effective learning, so for us UI designers, that's probably a very good starting point.
So I encourage you to read this in detail but here's the overview. They did a litt review and extracted 16 points, that they organized around those 5 themes. The ones will discuss mostly are:

* in I: In order to promote active learning it help to make you participate: Effective learning is supported when students are actively engaged in the learning process. How?
  - Create a climate of inquiry. Challenge your pre-conceptions
  - Challenging, interesting, and Have fun!
  - Structured occasions for reflaxions (cf: HallOrFameOrShame).
* in III: students learn in different ways so important to use multiple teaching methods and modes of instructions: we'll come back to that later when looking at usages of multimodal techniques for content delivery.
Promote Effective Learning

*A few examples*

Now that we've had a glimpse of theory, let's take a look at some research projects that were aimed at promoting effective learning.
eClass

- Formerly classroom 2000.
- Late 90's early 2000s at GA Tech and others
- Large deployment (100s of classes)
- Undergrad: 24h / week in lect, lab, and recitation!
  - How to improve teaching methods and contents available to students?

A reference in this field is the eClass (formerly Classroom 2000), developed in the late 90s and early 2000 at GA Tech.
eClass captures the audio and video contents from the classroom in addition to the slides, and makes them available from a browser. (revolutionary, at the time !)
Results:
+ shorter notes (less scribe effect), but still meaningful
+ student didn't skip class
- requires specialized equipment
- salvaging:
  -> important design decision: index key sequences.
    Allow random/annotated access rather than linear
- side effect: privacy
  - less participation
  - “take this off the record”
Students and instruct. enhance Powerpoint slides with digital ink annotations taken during the lecture, using a Tablet PC. Can be used in classroom to present slides in a more interactive fashion or to initiate participatory exercises: Students draw their answer on their Tablet PC. Those answers are visible by the faculty, who can in turn present them to the whole class, a typical design studio practice.

Results: surprising fact: how much digital ink used as *attentional mark*. The TIMING of these marks was an important help for the student (cf: p5 multimodal techniques).

- system features very parsimoniously: prefer to use the commands that required the fewest steps, albeit not the optimal ones for their task.

=> minimalist design.
Reality check

**Lumped Elements**

Lumped circuit element described by its $vi$ relation

Power consumed by element = $vi$

Resistor

\[
\begin{align*}
\text{Voltage source} & \quad i \\
\text{+} & \quad i \\
i & \quad i
\end{align*}
\]

Course notes that you can download from 6.002x
- Count attentional marks (10): Help create an immersive experience where the narrative of the class is being told.

- Besides attentional marks, notice that unannotated notes are incomplete: lecturer completes them at lecture time (more narrative).

- Going back to Piazza: might explain their decision at add the “replay feature” to posts: had you noticed the slider on top of the screen.
Reality check

Now listen to the lecture to see how well the attentional marks get merged into the narrative.

www.youtu.be/yspa4Lx1Cuw
Design issues specific to Students

So far, we've taken a look at learners in general. We've argues that students are one specific class of learners:
- Learning often is main activity.
- Learning happens in an academic context (classes, campus).

What classes of problems may arise when you try and deploy an online education framework in an existing academic environment?
Compete vs. Complement

- In-class activities
- Discussions, Study groups.

WebAnn [Bernheim Brush and al. CSCL 2002]

How a tool is introduced and integrated into the class ecosystem plays a primary role into its adoption and to how it affects this ecosystem ("Trojan mouse" effect).
ActiveClass (U. Colorado): Encourage student participation during lecture. Each student gets a PDA, either submits anonymous question or rate classmates qns. Everyone can see questions and their popularity ratings in real-time. Faculty can decide to address a question at any time during the lecture. Study: unclear whether ActiveClass helped “shy” students ask (more) questions, changes noticeably the class “ecology”:

1. Students asked more diverse and well-prepared questions than if had to say them in front of the whole class.
2. Students who wouldn’t dare ask questions could still participate by rating their classmates’ questions. Questions with high ratings would have more chances to be answered by the lecturer or a TA.
3. Instructor able to decide whether and when to address a question, see questions that students would find most relevant, and decide to reply to a question after the lecture.
4. Instructor alleviated from answering the questions that the TA could answer online, thereby not taking any of the lecture’s time.
5. It enabled both students and staff to have an archive of questions.
Knowledge assessment or...
How do you know that you know?

Now that we've examined content delivery, let's switch gears and wonder about assessment: How to effectively assess what students understand (and don't understand) in online education frameworks?
Bloom's Taxonomy of learning

- Knowledge: Recall data or information.
- Comprehension: Understand the meaning. State a problem in one's own words.
- Application: Use a concept in a new situation or unprompted use of an abstraction. Applies what was learned in the classroom into novel situations in the workplace.
- Analysis: Separates material or concepts into component parts so that its organizational structure may be understood.
- Synthesis: Builds a structure or pattern from diverse elements. Put parts together to form a whole, with emphasis on creating a new meaning or structure.
- Evaluation: Make judgments about the value of ideas or materials.

Knowing the subject can mean different things...
6.002x midterm question (shortn'd)

- Apologies: we had to remove screenshot b/c we realized that 6.002x midterm submission was still open.
- Students enter their answers to each question in regular textbox (typically answers consists of one number)
- Very easy to grade automatically, but hard to know what students don't understand.
Some framework (ex: Coursera) let you submit your code or results from functions.

Multiple choice questions can be designed to get an better idea of what the students understands:
- A few wrong choices choices designed to be picked by students that have no clue about the material.
- A few wrong choices designed to be picked by students who read the material but don't know how to apply it to a new situation.
- The right answer, which requires student to know the material AND to know how to apply it to a new situation.

Even better diagnostic framework (courtesy of Sanjoy Mahajan): Give 10 tokens to allocate between a few possible answers. Let instructor see what student hesitate and infer what they don't understand.
BeSocratic

- Demo:
  - http://www.youtube.com/watch?v=xcz8ANqErgc
- Natural interaction:
  - Closer to typical interaction w/ staff during recitation.
  - Assessment happens at same time as student makes progress.
- Creating activities still a lengthy process.
  - http://www.youtube.com/watch?v=hDuA-J5dwZk
  - Challenge: Use AI to reduce number of things that need to be explicit by the instructor.

A very promising alternative: beSocratic (U Colorado and Clemson University). The program tries to make the students aware of the points that are misunderstood by asking questions.