

COMPUTER SCIENCE 160 • USER INTERFACES

# CONTEXTUAL INQUIRY & TASK ANALYSIS

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Interviewer, Interface Design  
Task Analysis, Overall Concepts  
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Interviewer, Interface Design, Problem/Solution

**Note:** Additional figures are available on the Swiki.

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## OVERVIEW

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### USER GROUP

Our project is aimed towards university (1) instructors who prepare and give lectures, and (2) students who take notes, communicate with instructors, and study.

**INSTRUCTOR A** teaches a moderate-sized class of 40 to 50 people in chemistry. She earned her Ph.D. doctorate from UC Davis. She prioritizes her family above all, ensuring that her job never interferes with time for her children, yet she is the sole breadwinner. Her next priority is taking care of her students and student tutor employees. Our interviewee organizes her life, from structured lecture agendas to binders of teaching material categorized by semester. She also likes Belgian chocolate. She dislikes disruptive students and dark classrooms. We chose Instructor A because of her extensive teaching experience. Her computer illiteracy made her a good candidate for our project, since she represents typical non-computer science users.

**STUDENT A** is a gregarious Molecular and Cell Biology fourth-year student at Berkeley who enjoys Bible studies, church activities, dining out, traveling, and meeting new people. She harbors venomous hatred towards waiting in line, rudeness, overconfident people, and lazy people. Student A wishes to save lives as a doctor; as a pre-med student, she must successfully compete against hundreds of other brilliant students, making her an ideal interviewee for our project. The Berkeley brand of Biology is an intense field of study, and her classes include an eclectic mix of visuals: handwriting on the blackboard, dissection slides, and chemical reactions.

**STUDENT B** is a third-year student at Berkeley who claims to have a terrible memory. To compensate for this, she constantly takes pictures and jots down random notes anywhere she finds room (including on her left hand). During lectures, she sits in the front row (for leg room) prepared with her notebook and pens (one blue, one black). Student B hopes to attend law school after receiving her degree. She fills up her extra time with various events including ushering, attending culinary classes, and hiking (despite her bad left knee).

### PROBLEM AND SOLUTION OVERVIEW

In any college-level class, instructors have many sources of information and use *many different mediums to transfer* knowledge to students (please see figure 1 next page). Some instructors spend inordinate amounts of time preparing for lectures based on previous semesters' and professors' materials. Within the lecture alone, the professor typically uses visual diagrams and handwritten text to supplement his speech. In addition to these, the students must also juggle paper handouts, their own written notes, books, readers, lab work, homework, newsgroup postings, e-mail notifications, and archived documents from previous semesters. The proposed design will *unify the different mediums into one seamless interface* that professors and teaching assistants can use to organize and pass along information to the students, who also use the system for their note-taking and organizational needs (figure 2).

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## CONTEXTUAL INQUIRIES

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We performed a contextual inquiry for each interviewee. We first interviewed to learn about their life background for our user personas, and to ask what tasks they carry out on a regular basis with preparing for lectures, during lectures, and after lectures. We then explained that we would silently observe them performing these tasks, but may interrupt to ask questions to clarify their actions.

We conducted the two student inquiries in large rooms seating more than 75 students: student A in her biology class in 2060 VLSB, and student B in her EE class in 277 Cory. Both classrooms contain modern AV equipment and ancient blackboards. Both students wrote comments upon lecture notes from the Internet. They marked them with colors to prioritize information and distinguish their importance — boxes around important notes, arrows and circles, and bright colors to highlight words.

Due to the fast pace of the lecture, the instructor could not handle all of the students' questions. Student A later emailed her questions to her GSI, but did not appreciate the delay since she was no longer in the context of the lecture; she preferred to have an instant response to her question. We realized that our system could expand interaction among the students with a built-in digital discussion board.

Both students straggled to lecture late, and decided to copy someone's notes in lieu of the missed lecture portion. This is inconvenient because the symbols and abbreviations that other students use may not be comprehensible. Student A would have preferred to view the lecture online, but webcasts are not available. This incident validated our proposal to capture all lecture media in one accessible location.

Instructor A prepared for her lecture in about twenty minutes: she looked at her notes in the course reader, modified a lecture agenda from a previous semester, and made copies of her handouts and diagrams from the book. She used to take her source textbooks to class to show the diagrams, but decided to photocopy them to avoid carrying a huge burden of books. Here, a central location from which she could pull her materials would help avoid a trip to the copy machine. She also mentioned that, in the worst case, she prepares for several hours if she dislikes the lecture from the previous semester. In this case, she restructures her lecture by combing through textbooks and other lecturers' materials.

All of her notes, handouts, and agendas were organized by semester; she preferred that it be organized by topic since she reuses much of the material so often. Even then, her topics would still need to be organized in lectures, which is a challenge since lectures have different time allocations each semester. Within a semester, she has trouble juggling two sections: One section may end at a different part than the other, and she might not consistently cover the material in both sections. She expressed interest in a system that flexibly catalogued things according to content, lecture, and lecture section.

We could not interrupt Instructor A while she lectured, but made notes on what she did for later follow-up. As she hit different points in the lecture, she orally explained her concepts, wrote the same words on the board, drew any accompanying diagrams, and waited for her students to finish writing. She also marked off the times it took to cover each subject on her agenda for future reference.

The interviews with the students made clear the fact the learning new materials is *not just about note-taking*; it also involves interactions between student and instructor, and discussions among students. The instructor expressed worries about using computers for teaching (among those, she does not want to be embarrassed when she cannot work the audio-visual equipment), but emphasized that organizing the materials would expedite the preparation process and help her keep track of her lecturing progress.

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## TASKS

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### TASK ANALYSIS QUESTIONS

**1. USERS:** Our primary users are students who want to find a way to organize and easily take notes, and instructors lecturing at large universities.

**2. CURRENT TASKS:** (1) The instructor prepares the lecture material. (2) The material is presented during a lecture. (3) Students take notes on the material and then review it.

**3. DESIRED TASKS:** Both professors and students want to archive and organize previous presentation materials (including audio, slides, diagrams, video, and boardwork), organize student notes, capture handwriting, display media on a projector, facilitate interaction between students and the instructor, and transition seamlessly between different media.

**4. LEARNING TASKS:** Instructors can learn to use the program from previous experience from other presentation software, a help agent, software documentation, and practice with trial and error. Students can learn through practice with trial and error, reading instructions, and word-of-mouth through friends. Both users should already be familiar with (1) taking notes and (2) computers and desktop metaphors.

**5. WHERE IT IS USED:** Instructors prepare for lectures in their home and office. Instructors lecture and students take notes in classrooms — large lecture halls or smaller rooms equipped with audio-visual equipment. Students typically review notes at home, in the dorm, in study lounges or in the library, wherever a computer can go.

**6. CUSTOMERS AND DATA:** Instructors can protect lecture material from access by students or the general public. Students can access unprotected lecture material and protect their own personal notes from viewing by other students.

**7. OTHER TOOLS USED:** Students also use cell phones, computers, paper, pencil, pen, and voting device. Professors use overhead projectors, microphones, slides, DVD/LaserDisc/VHS players, computers, textbooks, and websites.

**8. USER COMMUNICATION:** Instructors can send questions to students and poll for their responses. Students can share notes with each other. Students can send comments and private messages to instructors. Instructors can share lecture material with each other.

**9. HOW OFTEN IS IT USED:** Students and instructors use this every day school is in session. Student usage of the device peaks before exams.

**10. TIME CONSTRAINTS:** Instructors want to minimize lecture preparation time, and, during lecture, must present and teach material within the limited time allotted for lecture (one to two hours). Student time is also limited, as they must take notes while the instructor is presenting within this hour. Time is also limited for reviewing, depending on the student's activities and other workload. Thus, organization of information is key.

**11. WHEN THINGS GO WRONG:** If the device crashes, a recovery system remembers where the user last worked, and must power on and load quickly. If the device breaks, the user can use another computer since operation is performed via a centralized server. If a saboteur (say, malicious, cheating students) breaks into the system, it should be adequately protected via encryption and backed up nightly. Users may not know how to use it, in which case our help agent can answer the user's questions and guide the user.

## ANALYSIS OF NEW AND EXISTING TASKS

**DIFFICULT: Organizing lecture presentations and having them ready for reuse at a later date** is done through a content management system that keeps a record of information and creates a user viewable map of its structure. This structure map helps organize presentation in production as well as import content from older presentations.

**MODERATE: Entering new lecture material into this system by pen** is done in the same interface as is presentation organization. Similar import functionality as well as presentation creation tools are included.

**EASY:** During lecture, instructors that use the board must deal with not only the act of writing but also **managing things already written**. Written information must stay on the board for a period of time sufficient to let the average note-taker finish their notes, and then be erased to make room for new information. The interface used in this system will utilize the relatively easy manipulation of information (scaling, moving) possible in digital presentation software to simplify the task of managing board information. It will also eliminate the need of erasing to make room for new information since the user can simply scroll down to make more room, and scroll up to review previous material.

**MODERATE: Switching between mediums** is a task traditionally costly in terms of time and lecture atmosphere. The integration of multiple mediums into a single presentation interface minimizes switching time.

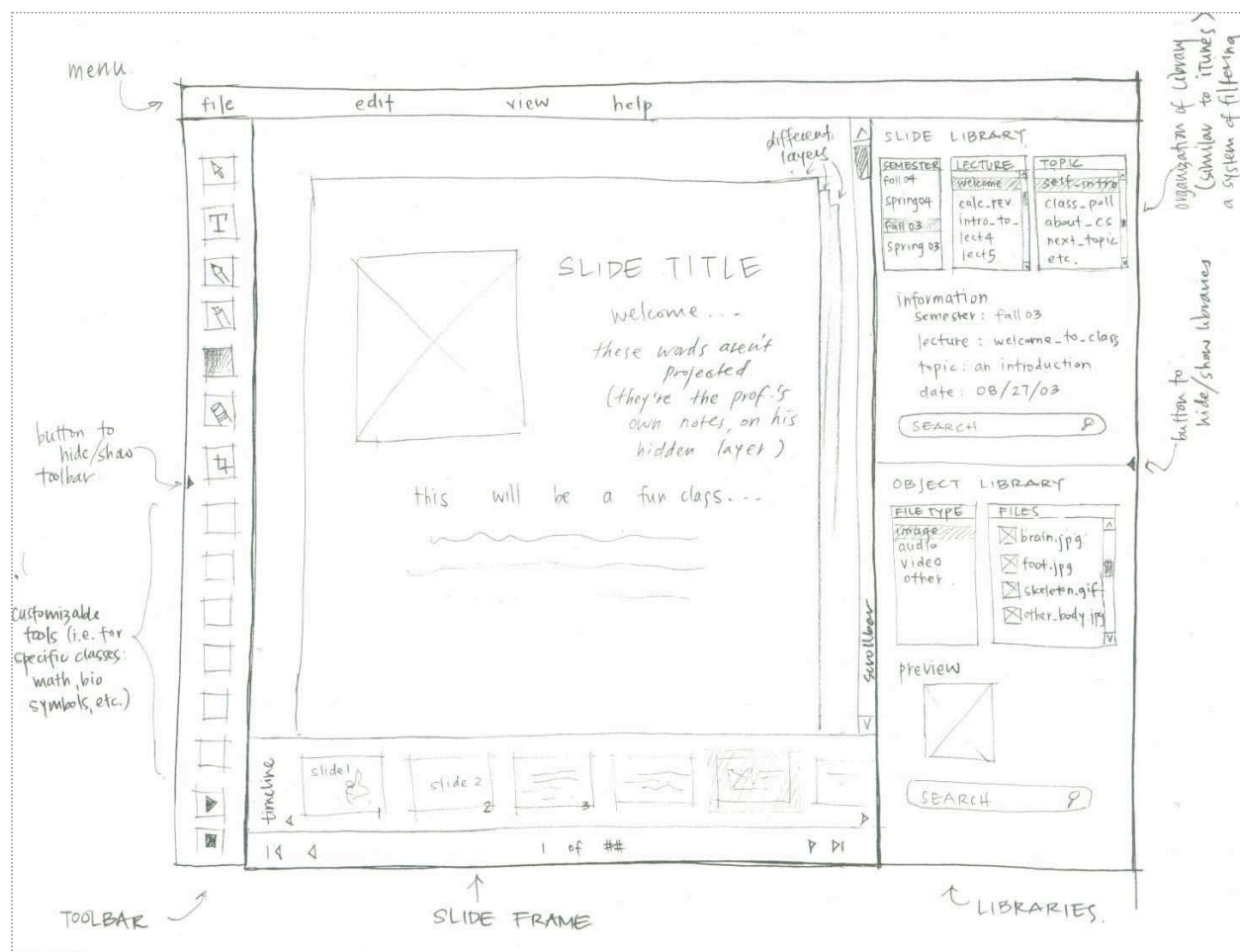
**EASY:** For students, **note-taking** is reduced to a bare minimum; the system archives digital boardwork and presentation material, and also stores the lecturer's voice. Audio is recorded and digitally annotated with information relating it to the slides that were active during which it was spoken.

**DIFFICULT:** This has the twofold advantage of (1) allowing students to concentrate more on the presentation and less on note taking and (2) making it simpler for students to locate relevant audio segments by topic when **reviewing archived presentations**.

# INTERFACE DESIGN

## FUNCTIONALITY SUMMARY

The visual design of the interface (Fig. 3) is organized around the **Slide Frame**, the main canvas for presenting information and taking notes. At the bottom of the Slide Frame, there is a navigation bar that allows the user to jump forward and back between slides. Above this is a timeline that has a sequence of slide thumbnails. The main area of the Slide Frame is the slide itself. Slides are of variable length. Each slide may have different layers so that users may tailor the slide to specific audiences (e.g. an instructor may create a layer that is projected for student viewing, and a layer for his/her own oral notes that is not shown to students).



**Figure 1** General overview of the interface.

From the Slide Frame, different bars are projected from the side. Any sidebar can be hidden or shown by the user (Fig. 4) according to the desired use.

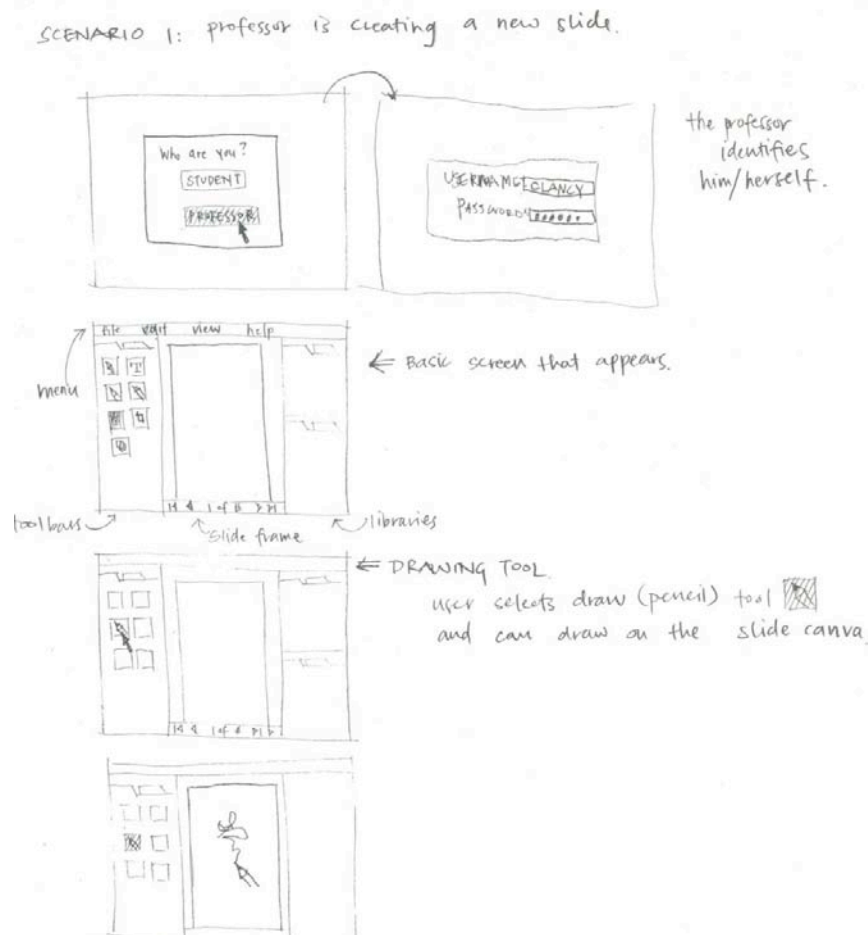
The **Toolbar** contains editing tools. Similar to Photoshop, it allows the user to select objects, draw (pencil tool), highlight, choose different colors, write (text tool), erase, and crop. It also leaves space for tools that users can customize to their needs (perhaps for math symbols, commonly used biology symbols,

etc.). At the bottom of the toolbar are play and stop buttons that are used to begin/stop recording lectures for webcast.

The **Libraries** bar is divided into two libraries that are organized similarly to iTunes (multiple columns organize files by semester→lecture→topic that filter the files; so if 'fall 2004' is the highlighted semester, only lectures from that semester are shown). The top library contains other slide files that can be imported from other lectures. Below these columns are a brief summary of the slide. A Search edit box allows the user to easily type in key words describing the slide he/she wants to retrieve.

There is also an **Interaction** sidebar that allows students to send questions and give feedback to the instructor during lecture.

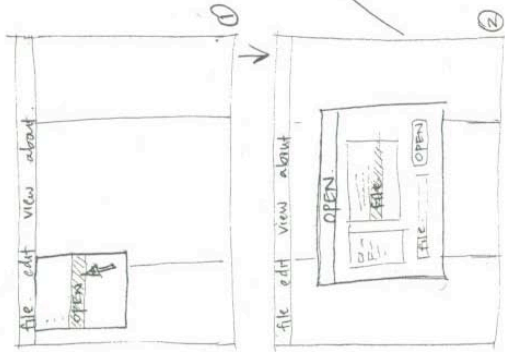
## SCENARIOS



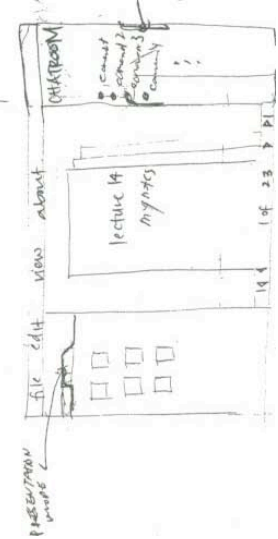
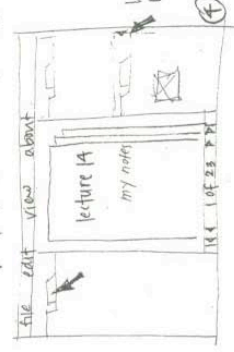
**Figure 5a** Scenario I: Professor (a type of instructor) is creating a new slide. (continues on figures 5b-5c online)

SCENARIO 2: Professor is beginning a presentation during lecture

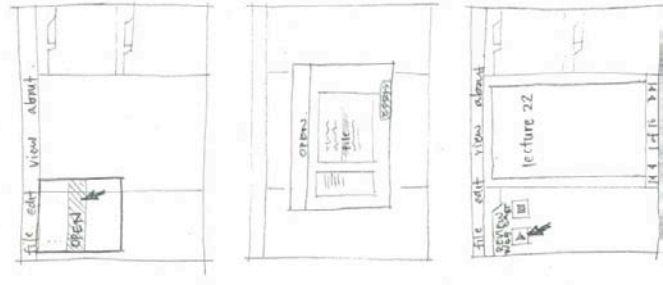
open an existing file.



viewed by professor on tablet.

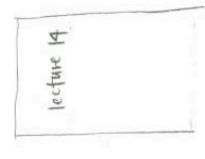


SCENARIO 3: a student reviewing a lecture at home



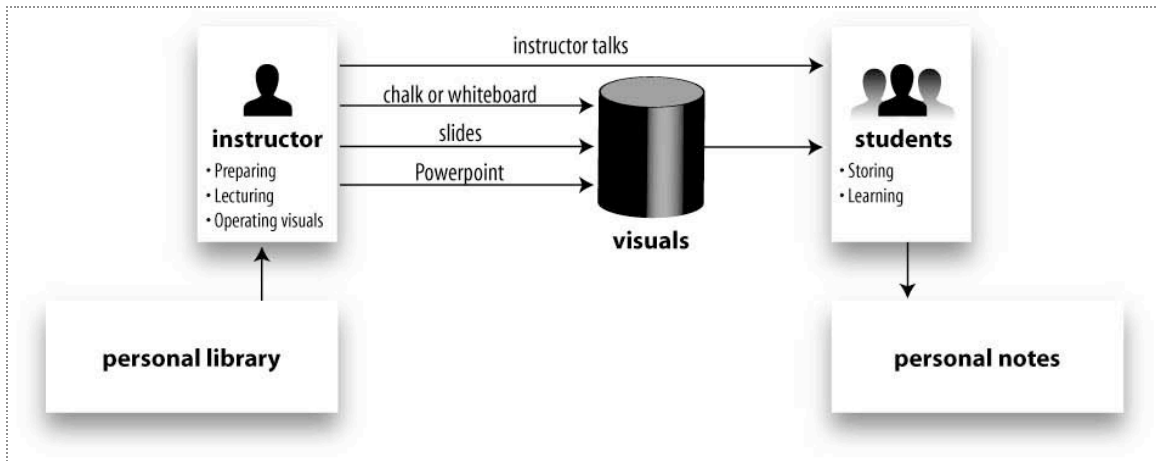
'open' window pops up  
 user selects file to open  
 (maybe by providing info like date,  
 class, semester, etc. instead  
 of searching through folders)  
 goes to 'review webcast' tab  
 and presses play to begin lecture

projected on screen/student PC

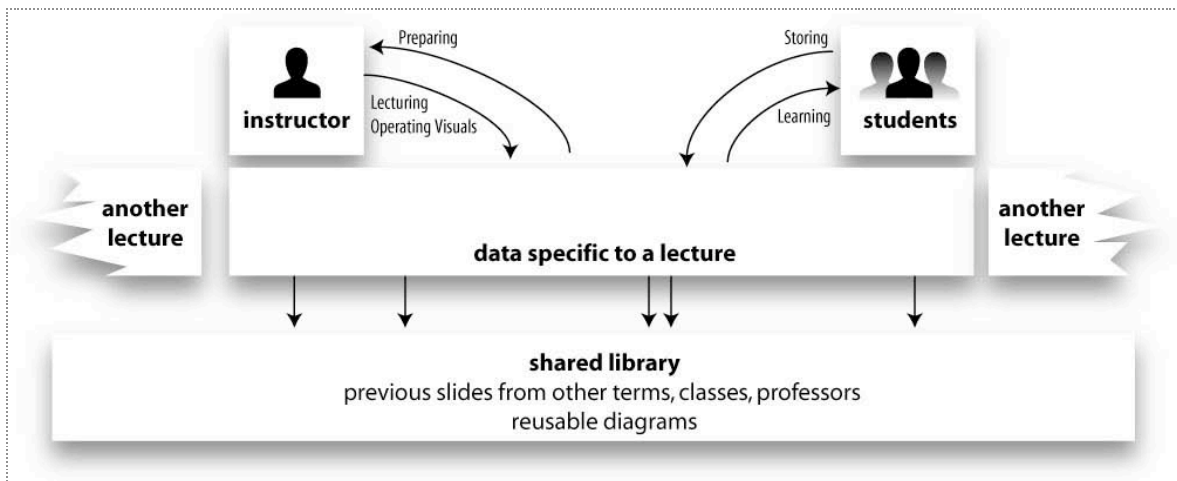




## ADDITIONAL DIAGRAMS



**Figure 1** Instructors use multiple mediums to transfer information to students, who in turn consolidate these streams into their own handwritten notes.

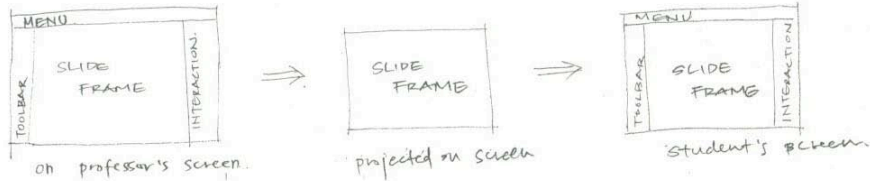


**Figure 2** The proposed system facilitates preparation of lectures by organizing already-created materials, facilitates note-taking by allowing students to capture all of the lecture material and their notes, and allows seamless transition between multiple forms of visual and aural media.

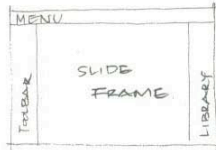
### ORGANIZATION OF INTERFACE

- MENU (file, edit, view, help, etc.)
- SLIDE FRAME (main area of screen) contains timeline
- TOOLBARS (allows for editing, can be hidden)
- LIBRARIES (can be hidden)
- INTERACTION (may be used during lecture to allow students + professor to talk)

#### LECTURE MODE



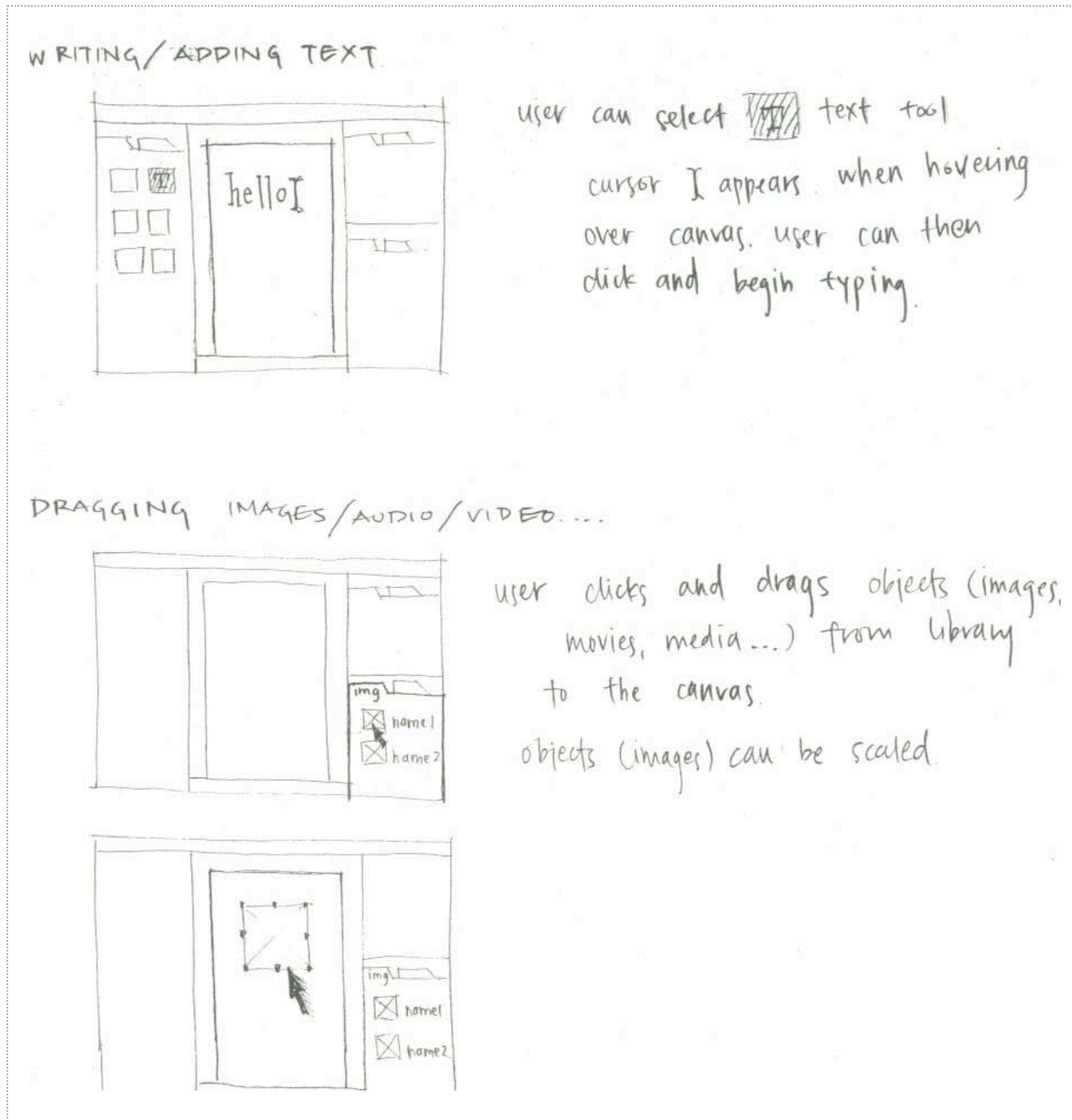
#### WORK MODE (editing/creating slide)



these are only how we anticipate users setting up at these different times. they can adjust it accordingly (hide/show sidebars).

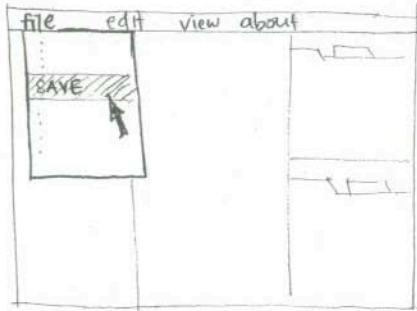
**Figure 4** Interface organization

## SCENARIOS

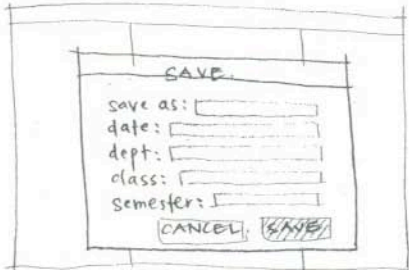


**Figure 5b** Scenario I (cont'd): Professor is creating a new slide.

SAVING A FILE.



user ends by saving  
FILE → SAVE.



Window appears asking user to  
specify information about the  
file that the program can then  
use to organize it in the library

**Figure 5c** Scenario I (cont'd): Professor is creating a new slide.

SCENARIO 2: professor is beginning a presentation during lecture.

open an existing file.

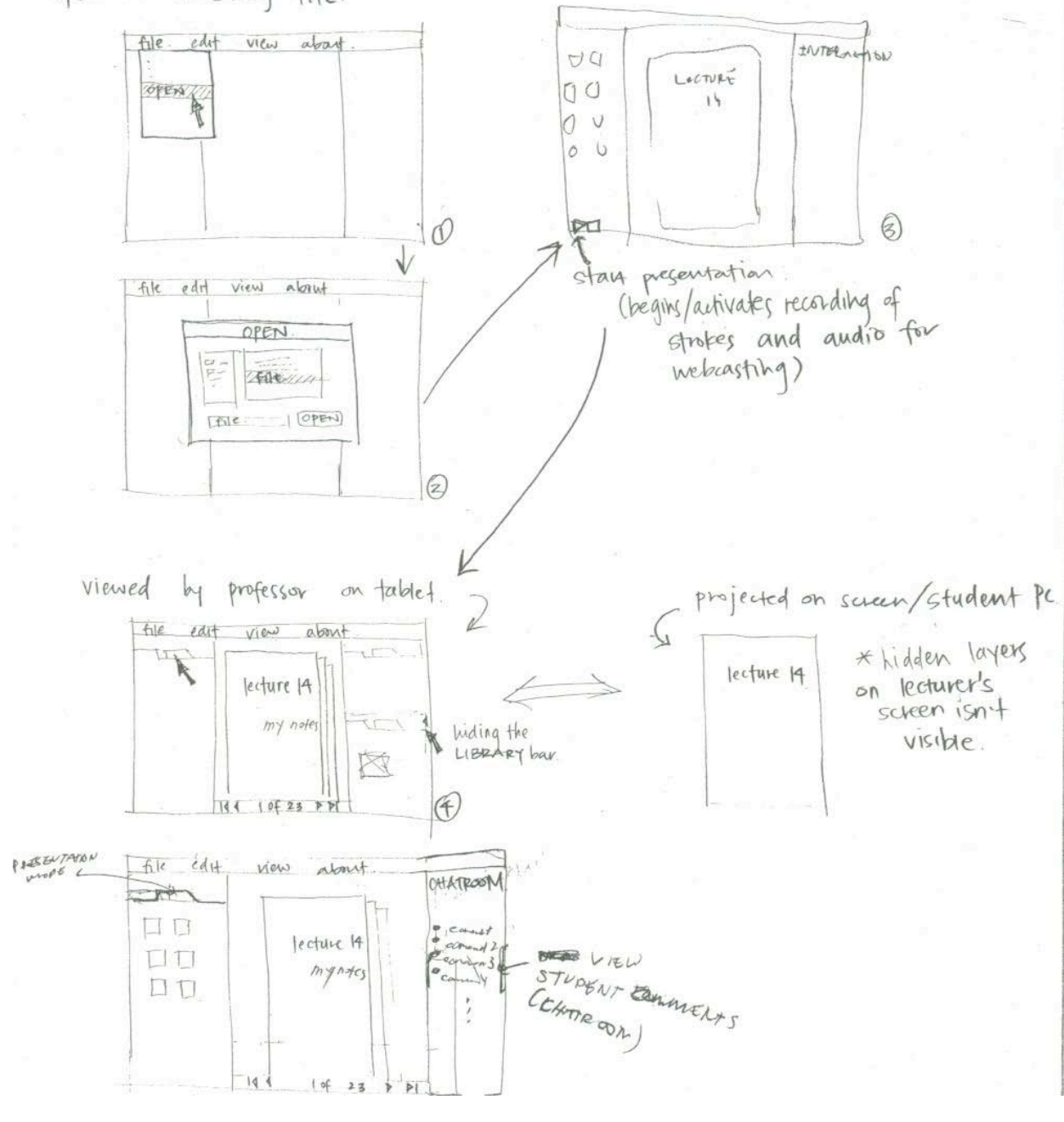
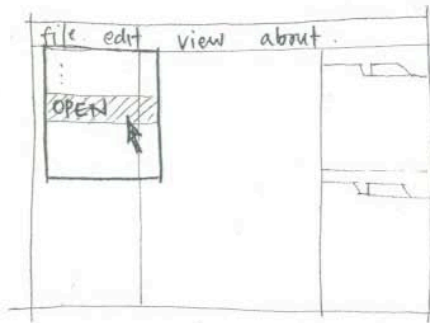
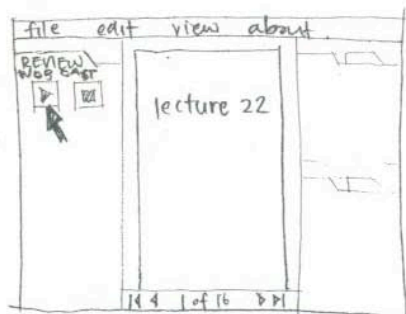


Figure 6 Scenario II: Professor (a type of instructor) is beginning a lecture.

SCENARIO 3: a student reviewing a lecture at home.



'open' window pops up.  
user selects file to open  
(maybe by providing info like date,  
class, semester, etc. instead  
of searching through folders)



goes to "review webcast" tab  
and presses play to begin lecture

**Figure 7** Scenario III: A student is reviewing a lecture at home.