Ten Techniques for Better Learning

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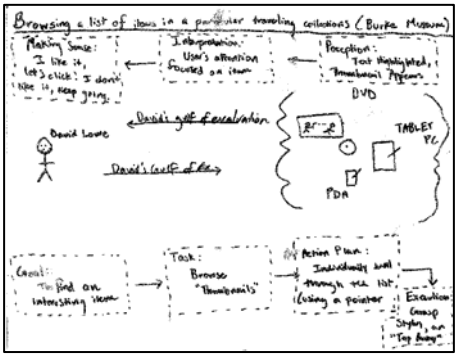
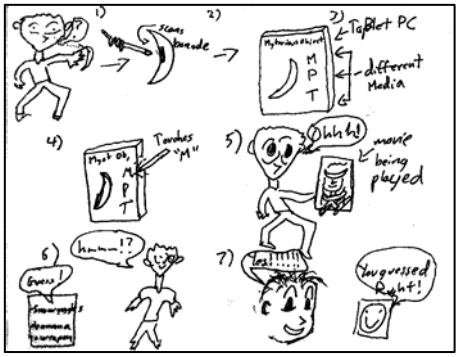
I. Mix it up in the classroom. I generally design classes to include a mixture of media, including PowerPoint, video, guest speakers, and in-class activities. As I teach more, I find that I use PowerPoint less and the whiteboard more. With classes of approximately 30 students and lasting 1hr. 50min., I try to maintain student interest by using different methods of varying durations and orders in each class. I believe that this helps to keep students engaged because they cannot anticipate exactly how the class will unfold.

II. Sketch and talk. I sometimes hand out pens and transparencies and ask students, working in groups of 2 or 3, to sketch solutions to short problems. Then, I ask for volunteers to present the sketches and answer our questions, always finishing with a show of appreciation for the presenters. These sketches, done during class, show the application of Donald Norman's model of the Gulfs of Evaluation and Execution to a class project





III. Use Lego to simulate design processes. I frequently give in-class activities that require students to "do" something then "reflect" on what unfolded. Sometimes these activities simulate complex phenomena within the classroom. For example, the *Lego Design Process Activity* simulates a design process. In this activity, I divide the class (approximately 30 students) into three groups: Four observers, four manipulators, and the remainder of the class, which is called "the brain." On a table in the center of the classroom I place a box of Lego blocks and I prompt the class to "organize the blocks" under the following three rules:

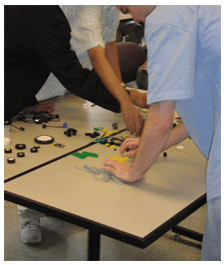
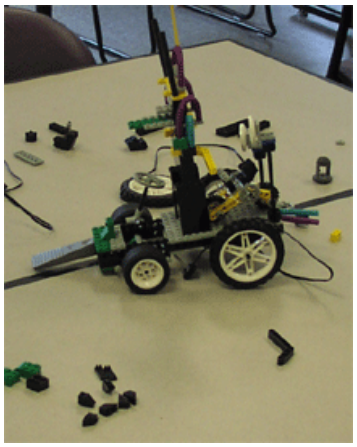
- The observers must watch the activity and keep notes
- Only the four manipulators are allowed to touch the blocks
- Decisions on what to do must be made by the brain.

After ten minutes of work, we pause and I ask the observers to comment on what they have seen. I repeat this cycle three times. We end the activity with a general discussion of the process and then focus

the discussion on the meaning of *wicked* and *tame* problems, concepts that students read about prior to the lab[*].

I have found this lab to be helpful in introducing some key aspects of design, including:

1. Vague problem statements can lead to interesting outcomes;
2. The merits of pushing back, in a responsible fashion, on non-essential external constraints;
3. Design processes unfold in stages with each stage enabling new possibilities to be seen;
4. The value of cycles of action-and-reflection, of forming intentions, of keeping to a discipline, and the virtues of emergent opportunities;
5. The need to coordinate effort and the challenge of collecting and judging many potentially valuable ideas;
6. Design processes can be considered at varying levels of time (even a 30min design activity in class has a beginning, middle and end with relatively characteristic properties).

IV. Make classroom discussions rigorous. To improve class discussions, I ask students to write about a class reading. I vary the type of question, from requiring students to summarize facts, to defending a particular position, to proposing a question and answering it for themselves. I ask that students submit these statements by e-mail the day before class. Then, I grade the statements and return them at the beginning of the class, and use the statements to structure class discussion and sometimes the organization of the whole class. I have found this approach to be extremely effective in graduate seminar classes (~10 students), graduate classes (~30 students), and also quite effective in undergraduate classes of 35 students.

V. Demonstrate your interest in the work. When returning assignments, I often excerpt and discuss student work (with permission). This allows me to show that I value a diversity of approaches and to highlight salient features of strong work. Students, as well, learn to discuss work in a critical though constructive manner.

[*] Rittel, H.W. J. & Webber, M. M. (1973). Dilemmas in general theory of planning. *Policy Sciences, 4*, 155-169.

VI. Grade for participation because it matters. I often grade for participation. In undergraduate classes, my syllabi state:

> *It is important to the instructor and teaching assistant that you help make this course fun, interesting, and challenging. With spirit and a professional manner, we can create a supportive and rewarding learning environment. Among the things you can do are: …*

I request that students prepare a one page statement on how their participation improved the class for all. I use these statements to help judge students' contributions.

VII. Use exams to simulate job interviews. I believe that the demands of studying for exams prepare students for job interviews where, for example, you are asked to solve problems at a whiteboard.

VIII. Design activities to promote "Ways of Thinking". When knowledge and skills are best imparted by practice, I give problem-oriented assignments, projects, and labs. For example, Batya Friedman and I developed seven activities that seek to guide students to design from different stances, including Design as Reflection, Design as Social Process, Design as Dialog, Design as Hierarchical Decomposition, Design as Composition and Pattern Matching, and Design for Human Values[*]. One activity for engaging Design as Hierarchical Decomposition, called *Decomposing Swapping in Microsoft Word*, was selected as "editor's choice" at the Human-Centric Computing Education Digital Library (http://hcc.cc.gatech.edu/) and shown in front page (April 07, 2006 - April 03, 2007).

IX. Use projects to promote "Problem Finding". In recent years, I have developed several significant projects, including the *Burton Acres Shell Midden: Visualizing its History, Social Bookmarking Project*, and *History Places*. With *History Places*, for example, the root concept is an information system that enables people to submit photographs, and other media such as audio files, of places so that people can perceive how a building, view, landscape feature, or artifact has changed over time. I describe this project in detail, giving teaching notes and discussing my experiences with it during the past four years[†].

A key aspect of these projects is the careful use of ambiguity. The project brief, for example, contains statements that require students to take a point a view and maintain a discipline and when I guide students as their projects unfold I admit uncertainty about the best approaches, I tend to give several competing answers to questions, I promote discussions where students talk through pros and cons, and so on.

X. Allow students to value their learning. To give undergraduate students an opportunity to freely value and reflect upon their learning, I make the last lab of project-based courses optional and say, "come to the optional lab if you would like to talk about your project—we are interested in what you've done." I typically invite two or three friendly outsiders to respond to student demonstrations and to ask questions.

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[*] Activities included in syllabus, http://faculty.washington.edu/dhendry/portfolio/insc598.pdf

[†] Hendry, D. G. (2007). History Places: A Case Study for Relational Database and Information Retrieval System Design. *ACM Journal of Educational Resources in Computing, 7*(1), Article 3, 20 pages. http://doi.acm.org/10.1145.1227846.1227849