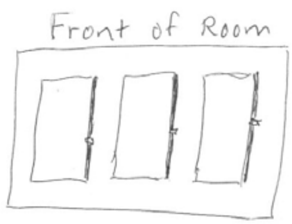
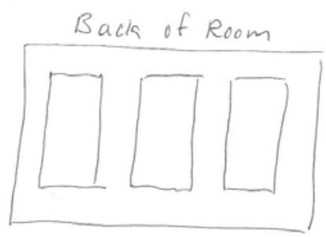
Redesign of Lighting Interface for Room 202

The current lighting controls for room 202 South Hall lack good perceived affordances and map poorly to the physical configuration of light sources in the room. Light switches should look like they have the capability of being used in the way they are intended to be used, but these do not. For starters, the switches used to toggle lights off and on do not look like toggle switches. They are rectangular and flat, with the long edge along the vertical axis, like many rocker switches in modern homes. Even better disguised are the dimmer switches on the master controls (in the front of the room). It is easy to completely overlook them. When beginning this assignment, I wanted to discover how the dimmer capability of the lights was controlled. To the casual observer, there appears to be a switchplate with three rectangular switches in the back of the room and one just the same in the front of the room. After looking closely at the controls in the back of the room and finding no dimmers, I assumed the master controls were in fact the same and also had no dimmers. I assumed the advertised dimmer capability was not exploited in any of the controls until a fellow student pointed out the dimmers to me. They are small rectangular sliders that move along the right edge of each switch, and they are hardly wider than the track in which they run.



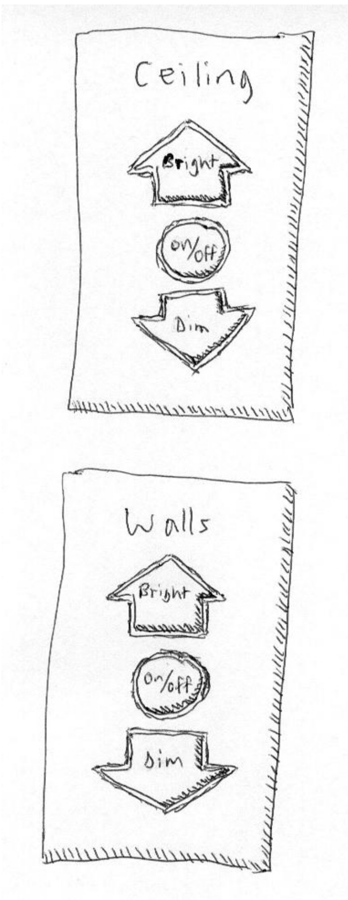


Besides the lack of perceived affordances, the switches are arranged in a manner that bears no relation to the arrangement of the light sources they control. This lack of good physical mapping requires users to test every switch in order to find the one that controls the lights in which they are interested. The effect is compounded by the odd logic employed. For each set of controls, two switches change settings for alternating lights high up on the walls. Many users are at first confused by this, not readily seeing the difference between the results of throwing the two switches. Worse, in order to set a desired dimmer level, one must consider the settings for both groups of lights. If you want the brightest setting, you need to put both switches up to full. If you want something in between, you have to balance the two or turn one off.

The third switch changes settings for the light fixture in the ceiling. All three switches look the same and are set side-by-side in the switchplate. There is no labeling on the switchplate whatsoever, so trial and error is the only method of discovering which switch does what, and memory is the only aid. Considering the complicated logic of the wall-mounted lights along with the visual roulette of switches, the cognitive load is much too high for a task that users expect to be simple.

The scenario suggested for this redesign is of a graduate student interviewing for a job who needs to make a presentation in room 202. The user's goal is to bring the lights down at the beginning of the talk and bring them up at the end without looking like a fool. With the current lighting interface, the stress of making a presentation as part of a job interview could easily lead to disaster for our poor interviewee, even if she investigates the lights in advance.

To ease the cognitive load of memorization and create a lighting interface that makes useful lighting configurations easy to invoke without prior knowledge, I suggest a new set of switches. The controls would be arranged one above the other, with the ceiling controls on top and the wall controls below. This creates a direct mapping from the physical world, since the ceiling light is higher than the wall lights. I would also employ labels to reinforce the physical mapping. The labels will be subtly backlit, so that the words can be read in low light.



Since the independent switching of alternating lights does not easily yield useful differences in room lighting, I have elected to combine the two wall switches into one. The lighting fixtures still perform the same duties as before, but the new control is wired in such a way that one set of lights is only brought up when the level is set above the maximum for the first set alone. This yields a continuously variable brightness control from which the level can be selected with a single setting instead of fiddling with two independent dimmers.

The controls for the ceiling fixture and the wall lights each consist of two arrow-shaped dimmer buttons and a circular on/off button. Up and down arrows were chosen because they offer good transfer effects, being readily recognized as symbols to increase or decrease. Because the logic requires synchronization between the sets of controls in the front and back of the room, all switches are invoked only by pressing. All "give" a little while pressed and return to their original state as soon as pressure is removed. In this way, the feedback to the user about lighting levels is all based on the ambient light in the room rather than the switches themselves, and the lights in the back of the room will never appear to be dimmed a certain way when they are not.

The two sets of controls are identical and perform all the same functions. The on/off button turns the corresponding lights off when they are on, from either switchplate. When the lights are off, the button turns them on to the last used dimmer setting or, if the lights were dimmed below a cutoff threshold (3% of full), to the 3% level. Thus, the on/off switch can be used to toggle a reasonably low setting on and off without resetting the dimmer level. To prevent confusion when the dimmer is set low enough to be mistaken for being off, the lights come on to 3% when the last dimmer setting was below that level.

The up and down arrows serve to brighten and dim their corresponding lights, respectively. The up arrow button acts as an "on" button if the lights it controls are off. If hit quickly, it turns the lights on to the previous dimmer setting or 3%. If pressed and held, it will turn the lights on and then begin to brighten. This helps users whose mental models cast the up arrow button as a control for increasing brightness regardless of the on/off state. (This notion can easily be transferred from a correct mental model for dimmers that turn on and brighten in one motion.) If the lights are already on, the up arrow button only brightens, even if pressed for a very short time. When lights are on, arrow buttons pushed quickly will raise or lower the lighting level in proportion to the time of contact (felt by the user as the "give" of the switch). If pushed and held for a longer time, the lights will dim or brighten for a longer time. The down arrow button, if held down for a long time, will eventually turn the lights off. Again, this matches the mental model of a dimmer that dims and turns off in the same movement, as such dimmers require the user to dim the light before turning it off.

In our scenario with the graduate student, the student stands at the front of the room, ready to begin. When people are seated, he goes to dim the lights. He wants to dim them slowly, so that people have time to stop talking, so he goes for the down arrow in the lower set. He sees that this only affects the wall-mounted lights and the ceiling fixture is still as bright as ever. Quickly guessing that the higher controls apply to the higher fixture, he dims the ceiling light with its down arrow. When he is done with his talk, he wants to bring the lights up again. Remembering the mapping from the correspondence to the physical lights, he hits the up arrow for the wall-mounted lights.