Celine Leung
Kiana Duggal
Xiaomo Han
Yushan Xian
DSGN 1: Design of Everyday Things
5pm Studio

# Project 3

## Data Collection

### Methodology

For our interviews, we interviewed college students living on and off the UCSD campus to get diverse insights on how different light switch designs influence user interactions, identify common errors, and how we can redesign existing ones to reduce these errors and improve student's everyday life.

Before the interview, we set up constraints to make sure our interview process stays consistent. We limited our observations to only the living room space (including kitchen if they are merged). In addition, all questions were set up on our shared google sheet to  ensure our process and data collection looked the same across interviews. This standardized process ensured consistency across all interviews and made it easier to compare findings during analysis.This made sure that we have a clear structure and smooth flow to prevent distractions during the interview or confusion during our analysis.

Interviews were all done in person, at participants' homes to make sure we understood the context of their room and light switch layout as we studied their behaviors and listened to them describing their experiences.

**How We Structured Our Interviews:**

*Task 1*: Please enter the room and *turn off* a specific light. Record time (in seconds), number of tries, and additional notes on interviewee behavior.

1. When you turn lights on or off, what is your usual process?
2. Can you recall a time when you had to try more than one switch to find the right one?
    a. If so, could you describe what happened? If not, why do you think that has been the case for you?
3. When there are several switches in one place, how do you decide which to use first?
    a. Are there any clues that help you?
4. If you could change one thing about this setup, what would it be?
5. If you could keep one thing about this setup, what would it be?
6. Is there a switch you do not usually use? If so, why?
7. Does light switch design being consistent/inconsistent in your home/apartment influence interaction?

8. On a scale from 1-5 (1 being never and 5 being always) how often do you think you use the correct light switch on the first try?
    a. Please explain your answer to the previous question.
9. On a scale from 1-5 (1 being never and 5 being always) describe how much you consciously think about your actions turning on/off lights.
    a. Please explain your answer to the previous question.
10. On a scale from 1-5 (1 being the least and 5 being the most), how confident do you feel operating a light switch?
    a. Please explain your answer to the previous question.

*Task 2*: Please enter the room and *turn on* a specific light. Record time (in seconds), number of tries, and additional notes on interviewee behavior.

**Why We Structured It This Way:**

**Opening Statement:**

We started off each interview by saying, "you are the expert on how you use the light switches in this room (living room/kitchen area), and I would love to learn from you." This is utilizing the **master-apprentice model**, where we make it clear that there's no expected answers and we are here to learn from each individual's experience. This is meant to make them comfortable during the interview and increase their confidence so we can get more natural and insightful responses. We also made sure to leave **white space** as we learned previously in class and practiced in Project 2. This allows participants to elaborate on their thoughts and prevent bias in the process.

**Task #1, Task #2, & Question 1:**

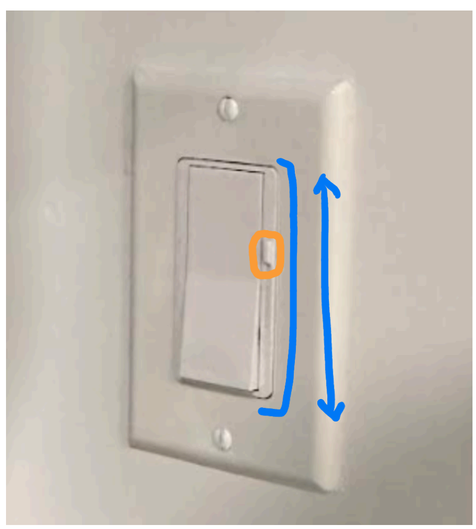


Figure 1. Brightness level slider in Participant #6's dorm

We asked people to do task 1 (turning off the lights) and task 2 (turning on the lights) at the beginning and end of the interview. This is to see the different ways participants would interact with their light switch since their actual actions might be different than what they think. We also intentionally spaced out the timing of tasks so participants would not be doing something really similar back to back which can give inaccurate insights and unnatural behaviors. However, we also asked participants to describe this experience verbally in question 1 so we can understand the motives and descriptions behind their actions from the tasks.

Through this we learned that users rely heavily on perceived **affordances** and will interact with all available elements they associate with completing a task. For example, Participant #6 would naturally adjust the brightness of her room without being asked as she turns the light on (See Figure 1). This means that if there's a brightness level slider that **affords** being moved up or down by the finger, that would become integrated into the user's **mental model** and the task feels incomplete until that element is interacted with.

Similarly this concept is supported by Participant #5 who instinctively turned on and off all light switches available on one board. She later revealed that she would not remember what each switch is for when there's multiple switches, therefore she would always turn on and off all that **affords** toggling to achieve her goal.

**Questions 2 & 3:**

We asked questions 2 and 3 to learn how users make decisions when there are multiple switches. Through this we were able to learn if there were any **signifiers** (worded in question 3 as "clues" in a user-friendly language) that helped them come to these decisions and if these clues have misled them to any common **errors** in the process.

**Questions 4 & 5:**


Figure 2. The left switch controls light while the right switch controls power outlets.

The next two questions helped us learn what existing design elements of the light switches are working and not working. We asked for both positive and negative experience to keep the interview unbiased and open-ended. This also helped revealed **tradeoffs** such as when Participant #2 mentioned the distinct coloring on different switches helped their memory more for functionality purpose, while Participant #4 used the same switches and complained about the inconsistent look of the distinct coloring in an aesthetic sense (See Figure 2).

**Questions 6 & 7:**

The last two qualitative questions are trying to study how **design consistency** in **affordances**, **signifiers**, and **feedback** influences usability, and to explore if certain characteristics would cause avoidance behaviors. We asked participants to describe how consistent or inconsistent light switch designs affected their willingness to interact with them and whether they ever chose to avoid certain switches altogether. Through this, we found that several participants consciously avoided using switches they found confusing or unpredictable. For example, one participant mentioned that a particular switch "never did what I expected", so they simply stopped using it altogether. Others reported avoiding panels with too many identical switches, preferring to rely on one or two they were confident about.

**Questions 8, 9, & 10:**

We ended the interview off with 3 quantitative questions to help us quantify our findings to visualize trends and correlations which will be discussed later in this paper. These questions allowed us to measure confidence, accuracy, and cognitive skills associated with light switch use. Early results showed a trend where lower consistency in switch layout and design correlated with lower reported confidence and higher cognitive effort. Many participants who rated themselves low in confidence also noted inconsistencies in their living spaces. Conversely, participants who reported higher conscience often had consistent layouts or visible **signifiers**, indicating that **predictability** and **feedback** strongly influenced both perceived and actual **usability**.

## Proof of Data

To keep our data organized and consistent, we created our [Design 1 Project 3 Data Sheet] that our interviewers, interviewees, participant demographics, and each interview question with its corresponding responses. This document helped us more easily compare feedback across participants and identify key patterns and differences to analyze later in our project. It also allowed us to examine participant demographics to better understand whose perspectives were represented in the **feedback**. In addition to the interview sheet, we created quantitative graphs to visualize trends in participant responses, making it easier to spot overall patterns and draw insights.

## Contributions

Each team member was responsible for conducting three to five interviews. Kiana completed the first four, Celine completed interviews five through seven, Yushan conducted the next three interviews, and Xiaomo did interviews thirteen through fifteen. For the written components, Celine worked on the “Methodology” and “Patterns & Trends” sections, as well as contributing to the “Lo-Fi Redesign” section. Celine led team meetings and guided the group in synthesizing insights into actionable design problems and solutions. Kiana took responsibility for the “Proof of Data”, “Contributions”, “Identify Errors” and “Error Classification” sections. She was also the lead on assisting written analysis with supporting evidence such as charts and graphs. Kiana also contributed to the “Lo-Fi Redesign” section. Xiaomo worked on the “Tradeoffs” section to analyze and identify the design tradeoffs present in light switches that contributed to relevant errors. Yushan was the main contributor to the “Design Space & Redesign” section, making the Lo-fi redesign and the design space & Justification. As a group, we decided to come together and work on the “Lo-Fi Redesign” section by discussing the interview data we collected and pulling further information from the Design Space Charts. We also decided to take our paper to the Writing Hub for additional revisions and to ensure our paper was cohesive.

# Error Analysis

## Identify Errors

Across the thirteen interviews we conducted, users made a range of errors while operating light switches revealing **execution issues** and **design misunderstandings**. The most frequent type of error, reported by participants such as Leah, Jaylynn, and Sabrina, was flipping the wrong switch, especially in setups where multiple switches were positioned together without clear labels or consistent **spatial organization**. In these situations, users often had to try multiple switches before finding the correct one. Users like Arushi and Claudia described resorting to guessing and checking each switch when uncertain, reflecting a lack of distinguishing **signifiers**. This behavior reflected a lack of clear **spatial mapping** or **visual cues** to indicate which switch corresponded to which light.

Several users, including Hannah and Elizabeth, mentioned relying on **habitual patterns**, such as sweeping their hand across the wall or using the leftmost switch first. However, they admitted that this strategy did not work in circumstances where the switches were inconsistent in form. Grace and Yan reported confusion when switches had different input types that disrupted their expectations of how to interact with them. Leah, Claudia, and Elizabeth also mentioned avoiding certain light switches, either because they were confusing, connected to unwanted lighting, or placed awkwardly. These avoidance patterns often stemmed from redundant functionality, poor labeling, or uncomfortable placement.

A few users described accidental activations, such as turning on unrelated appliances or lights due to poor proximity mapping between switches and their corresponding functions. **Feedback** delays also led to minor interaction errors for Claudia and Arushi, as they resorted to flipping switches multiple times because the light response was delayed. Lastly, a few users, such as Elizabeth and Jaylynn, experienced **motor slips**, or minor physical interaction errors, when using flat or dimmer-style switches. Altogether, these observations show that users frequently make errors rooted in interface design and **feedback** limitations, rather than misunderstanding the general purpose of light switches.

## Error classification

The primary error identified across participants is an **action-based slip**, which occurs when a user performs the correct action on the wrong object or a wrong action on a similar object. In this context, users intended to turn on a specific light, but instead flipped the wrong switch because the switches were **physically and visually similar**, making it difficult to distinguish between them. This kind of error results from **description similarity**, where multiple controls share identical appearance, size, or placement, leading users to act upon the wrong one despite having the right goal.

For instance, Leah and Sabrina described flipping the wrong switch first before finding the correct one. Although they understood what they wanted to accomplish, the **uniform appearance** and identical flicking motion of each switch offered no clear indication of which light was being controlled. In several apartments, these errors were further compounded by the presence of switches that controlled unrelated functions such as external lights, power sources, and garbage disposals, located within the same cluster. As Elizabeth mentioned, accidentally activating the disposal instead of a nearby light was both confusing and startling.

These errors highlight how **action-based slips** emerge from ambiguous **affordances**, **poor spatial mapping**, and **lack of differentiation** in interface design. When switches for multiple systems look and behave the same, users are more likely to make **execution errors**, reinforcing the need for clear visual or functional cues.

## Patterns & Trends

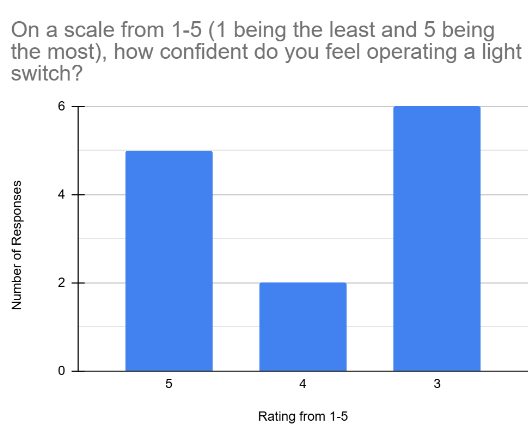



Figure 3: Bar graph displaying ratings from 1-5 on the x-axis and the number of responses at each rating on the y-axis. Ratings correspond to how confident interviewees felt operating a light switch.

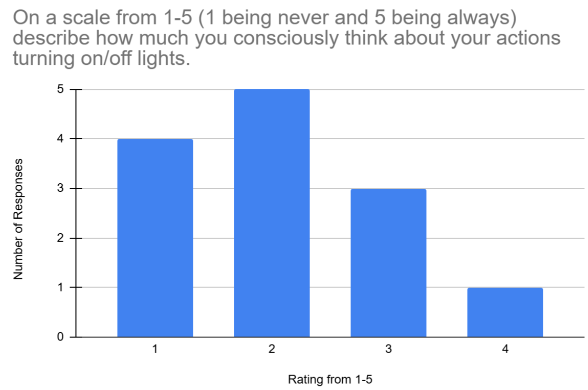



Figure 4: Bar graph displaying ratings from 1-5 on the x-axis and the number of responses at each rating on the y-axis. Ratings correspond to how much cognitive processing interviewees experience while operating a light switch.

From our interview, 7 out of 13 participants reported that they do not memorize light switch correspondences and they would rely on trial-and-error until they find the right light. 3 additional participants would resort to turning on or off the lights all at once to avoid having to process that. This trend aligns with the idea that users rely on **knowledge in the world** rather than **knowledge in the head**. Users prefer to rely on recognition and receive **feedback** instead of trying to memorize the order each switch functions, even for tasks they perform everyday. This means that when there is not enough knowledge in the world, users can only rely on visual feedback to complete their task, which can lead up to errors.

8 out of 13 participants also reported their light switch design including other functionalities, whether that is turning on or off the power outlet in the room, adjusting brightness, or having a switch that does not seem to control anything. For 5 of these participants, the different functionality was offered through the same design–the design of a light switch, which broadens the **gulf of execution** for users as they try to decide which switch to use. Using the same toggle as an **affordance** for distinct functions reduces differentiation, turning the switch into an ambiguous **signifier** that invites slips.

With that in mind, all 13 participants rated 3, 4, or 5 (five being most confident and one being least) when being asked for their confidence in operating a light switch (See Figure 3). This is because light switch designs are universal, utilize **knowledge in the world**, learned from a young age, and used daily. This confidence reflects strong **mental models** that minimize reliance on memory.

In fact, it has become so integrated into users' lives that 9 out of 13 students rated 1or 2 (one being never and five being always) on how much they consciously think about their actions turning on/off the lights (See Figure 4). Recognizing a flip or flat design as typical light switches become **knowledge in the head** and the limited **affordances** (being clicked or flicked) **constrains** users to limited actions. Although errors exist, but as Participant #5 said, "I'm not sure if I'll turn on the right light if you asked me to but it's not hard to figure out."

# Trade offs

1. **Simplicity vs Functionality**

   In light switch design, simplicity means allowing a person to perform the task without unnecessary mental effort or physical strain. The everyday toggle switch is a clear example of that. Its **conceptual model** is straightforward: up means on, down means off. The motion follows a direct **mapping** to the result, so the action and the outcome feel naturally connected. With an interface this transparent, the **gulf of execution** becomes very small because the user knows what to do and what will happen. Still, that simplicity begins to break down when entering a room with several lights. Several participants in the interviews said they had to test each switch individually before identifying the correct light. 9 out of 13 interviewees noted this trial and error routine, turning what should be a quick flick into a guessing process that requires more attention. What was intended to reduce effort ends up increasing it, especially when identical switches control multiple lights in the same space. The physical motion remains simple, but the overall task becomes complex because the system no longer provides a clear connection between action and outcome.

   Adding **functionality** creates additional challenges. In many student apartments, switches do more than turn lights on or off; they can dim illumination, power outlets, or include motion sensors. 5 out of 13 interviewees mentioned these added functions. While they appreciated the extra control, the mixture of functions widened the **gulf of execution**. Users often paused to determine which switch or slider produced which result before acting. When **signifiers** such as small labels or subtle sliders were present, they were often too weak to guide quick and confident decisions. Even though most participants continued to favor the flip design for its immediate feedback and familiarity, their experiences showed that simplicity alone cannot handle the functional complexity of shared living environments. As a system expands to support more tasks, it also needs clearer **signifiers** and stronger **mappings** so that each interaction feels deliberate rather than uncertain.

2. **Consistency vs Differentiation**

   **Consistency** serves as a key principle in light switch design, ensuring that a uniform appearance, size, and motion help users operate within a familiar **conceptual model** across their environment.This uniformity helps lower the learning curve and allows users to act without hesitation. As established in our error analysis, most failures were **action-based slips** caused by **description similarity**, which weakened the **mapping** and widened the **gulf of execution**. When every switch looks and moves the same way, users begin to lose a clear understanding of what each one controls. In our interviews, 4 out of 13 interviewees reported confusion between light and power controls (See Figure 2) because the controls shared identical designs. 9 out of 13 interviewees mentioned having to test several switches before finding the right one, showing that consistent design can blur functional boundaries and force users to rely on feedback rather than recognition.

**Differentiation** introduces variation to make each control easier to identify. Visual and tactile **signifiers** such as color, material, or small icons help users establish a stronger connection between action and outcome. Several interviewees commented that small distinctions in color or texture made it easier to remember which switch controlled which light, yet others found those same variations visually inconsistent and less aesthetically pleasing. This tension reflects the balance between usability and visual harmony. Too much differentiation can disrupt the perceived order of the environment, but too much consistency can obscure function. Effective design requires a balance where the interface remains visually coherent while still providing enough clear **signifiers** to guide accurate and confident interaction.

3. **Spatial Mapping vs Centralized Control**

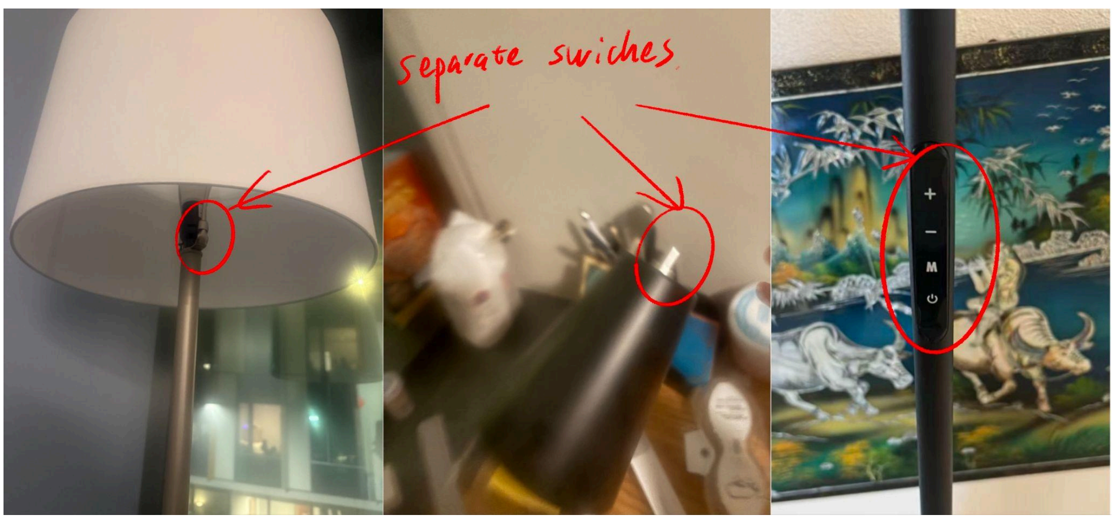



Figure 5. Distributed lighting setup with separate switches for two floor lamps and a desk lamp. The arrangement improves spatial mapping and intuitiveness but requires more physical movement to operate all lights.

The way switches are arranged in a room directly shapes the **system image** that users form about how the lighting works. When switches follow **spatial mapping**, their positions correspond naturally to the lights they control, creating a strong alignment between **knowledge in the world** and user intention. A switch located close to the light, or aligned with the illuminated area, makes the action feel physically meaningful (See Figure 5). The environment itself becomes an **affordance**, guiding the user toward the correct operation without conscious thought. This design strengthens the **conceptual model** and minimizes reliance on memory. Yet a layout that favors accurate mapping often requires users to move across different areas, increasing physical effort. The action feels intuitive, but the added distance introduces a mild **physical constraint**, especially when several lights need to be operated quickly.

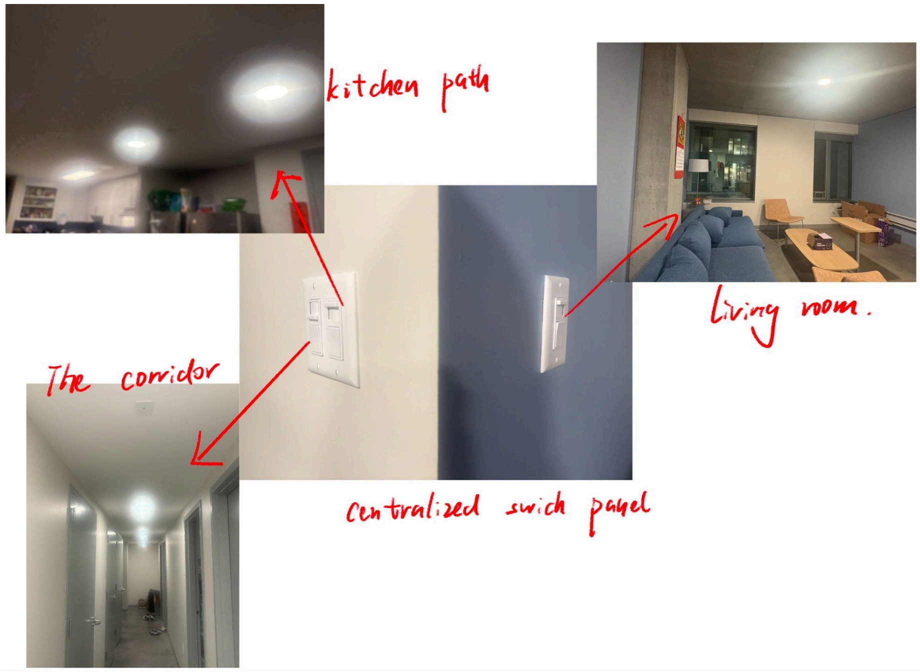



Figure 6. A centralized switch panel with three identical toggles controlling the corridor, kitchen path, and living room lights. This layout offers convenience but makes it hard to predict which switch controls which light, often leading to trial-and-error use.

**Centralized control** integrates all switches in a single panel, typically near the entrance. This arrangement simplifies access and lowers the **gulf of execution** by allowing users to control multiple lights without walking around. It also supports fast **feedback**, since users can immediately see which lights respond to each toggle. However, the convenience of a single control point weakens spatial logic and increases cognitive demand (See Figure 6). Our interviews showed that 9 out of 13 interviewees had to test several switches before identifying the right one, a behavior that reflects a gap between their **conceptual model** and the actual system design. While centralized layouts enhance efficiency, they depend more on **knowledge in the head**, requiring users to remember or learn each switch's function. These findings suggest that effective lighting systems should calibrate this trade-off based on spatial context and user routine, designing for both intuitive mapping and convenient access.

# Design Space & Redesign

## Design space chart

### Functionality vs. Simplicity:

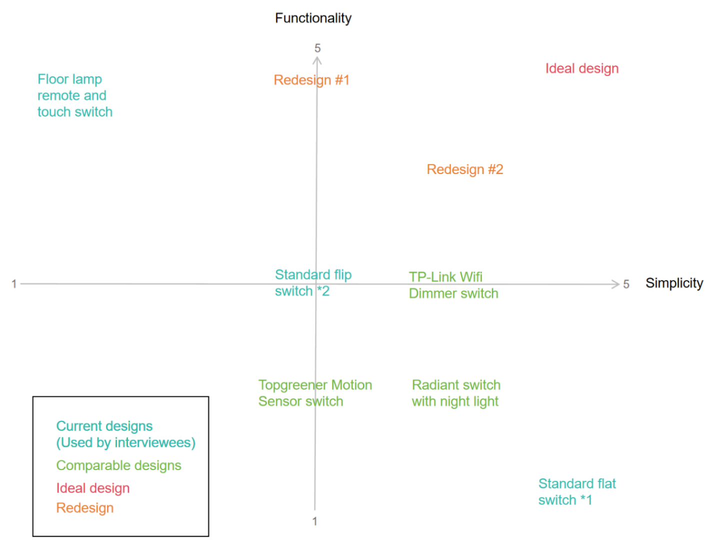



Figure 7: Design space chart with comparing functionality and simplicity

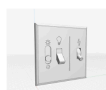
| | | Model | Functionality | Simplicity |
|---|---|---|---|---|
| Current Design |  | Standard flip switch *2 | 3 | 3 |
| |  | Standard flat switch *1 | 1 | 5 |
| |  | Floor lamp remote and touch switch | 5 | 1 |
| Comparable Design |  | RADIANT® SINGLE POLE/3-WAY SWITCH WITH NIGHT LIGHT | 2 | 4 |
| |  | TOPGREENER In-Wall PIR Motion Sensor Light Switch | 2 | 3 |
| |  | TP-Link - Tapo Smart Wi-Fi Light Dimmer Switch | 3 | 4 |
| Redesign #1 |  | 1 Power outlet switch<br>1 Light switch<br>1 brightness switch | 5 | 3 |
| Redesign #2 |  | 1 Power outlet switch<br>1 Light switch with integrated brightness control | 4 | 4 |
| Ideal Design | | | 5 | 5 |

Figure 8: Design table comparing functionality and simplicity

**Scale explanation:** A 5 in the functionality axes means the switch panel packs the most functions (number of on/off switches, dimming control, color temperature control, remote control, WiFi and compatibility with smart home, human detection auto on/off). And a 5 in the simplicity means that the switch is intuitive and requires little knowledge and memory to operate.

**Current design:** The standard flat switch *1 has the simplest design while offering little functionality; it can only turn on or off a single light. The standard flip switch *2 adds functionality by a lot since it **affords** controlling two different lights, while it has few **signifiers** which function corresponds to which switch, so its simplicity decreases significantly. Another current design, the Floor lamp remote and touch switch, offers a lot of functionality, you can change the brightness and CCT (color temperature), and you can control the light by using the remote or touch panel, but it is the most complex design and significantly increases the **gulf of execution.**

**Comparable design:** The radiant switch with Night light adds the night light function to a standard switch, but in the **user's mental model**, they might think that night light is another switch because it looks similar to the switch, and there won't be any feedback when you push on the night light, which can give a large **gulf of evaluation.** The motion sensing switch adds another functionality, but the simplicity further decreases because it has a very complex interface, and the switch is quite small, the user might make **mistakes** and think the more obvious PIR part is a push button. TP-link smart dimmer switch adds the wifi wireless control and brightness control. It uses two small buttons for the brightness control with brightness symbols on it, **signifying** that it is not the on/off control, so there won't be a large **gulf of execution**.

**Redesign**: Our redesigns were made with a balance of functionality and simplicity; they packed the most demanded functions while trying to reduce the chance of user errors. The first redesign packs the function of two switches (one for light and one for power outlet), it also has a delicate slider to adjust the brightness. It is not the simplest design, but we use different symbols and shapes to signify the function of each switch (brightness, light on/off, outlet on/off). The second redesign integrates the light on/off switch with the brightness control, three different symbols signify the off, mid brightness, and full brightness, it is a simpler and more intuitive design while loss the function of delicate brightness control (Which the user can set the brightness to a fix level, and don't need to conscious think about which brightness level they need everytime).

## Consistency vs. Differentiation:

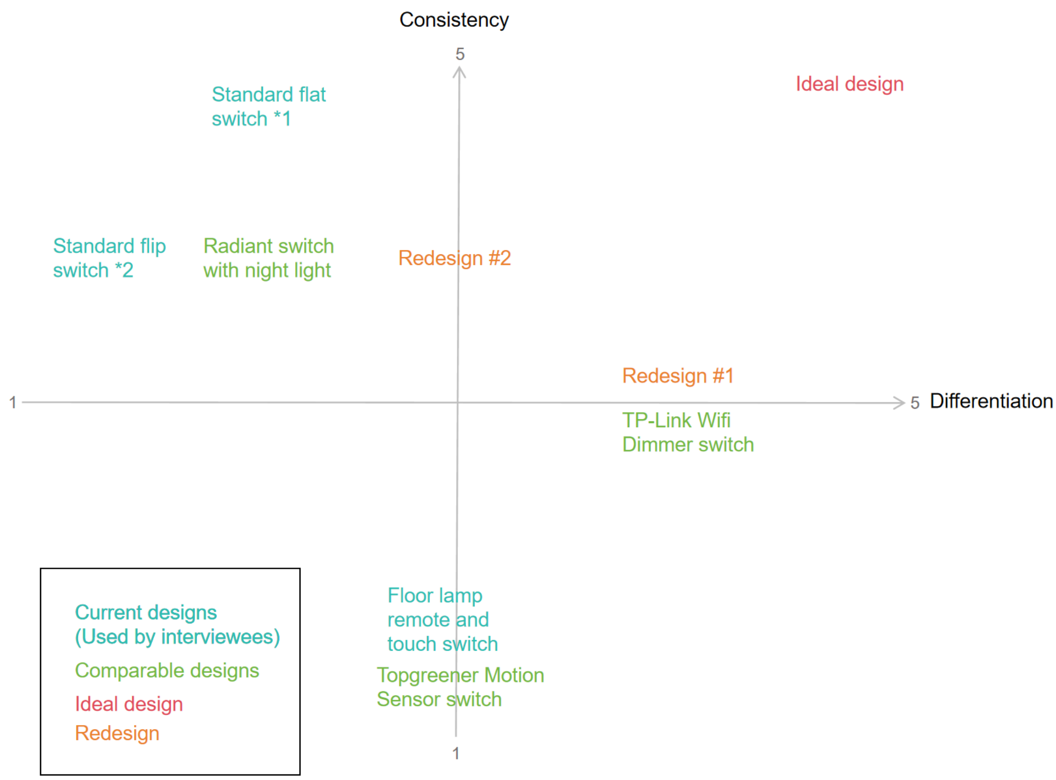



Figure 9: Design table comparing consistency and differentiation

| | | Model | Consistency | Differentiation |
|---|---|---|---|---|
| Current Design |  | Standard flip switch *2 | 4 | 1 |
| |  | Standard flat switch *1 | 4 | 2 |
| |  | Floor lamp remote and touch switch | 1 | 3 |
| Comparable Design |  | RADIANT® SINGLE POLE/3-WAY SWITCH WITH NIGHT LIGHT | 4 | 2 |
| |  | TOPGREENER In-Wall PIR Motion Sensor Light Switch | 1 | 3 |
| |  | TP-Link - Tapo Smart Wi-Fi Light Dimmer Switch | 3 | 4 |
| Redesign #1 |  | 1 Power outlet switch<br>1 Light switch<br>1 brightness switch | 3 | 4 |
| Redesign #2 |  | 1 Power outlet switch<br>1 Light switch with integrated brightness control | 4 | 3 |
| Ideal Design | | | 5 | 5 |

Figure 10: Design chart comparing consistency and differentiation

**Scale explanation:** A 5 in the consistency means the single switch panel (we are not talking about the consistency of multiple panels in a place) has a consistent design element where the same shape and dimension mean the same functionality. A 5 in the differentiation means different functions use different design **elements.**

**Current design:** Both standard switches have a **consistent** design, but the flip model might or might not have the four white screws near the switches, making them less consistent and may increase the user's **gulf of execution** as they might serve some **functionality** in the **user's mental model**. They don't have good **differentiation** because they do not have any **signifiers** that tell the functionality (light or power) and how they differ from other switches that look the same. The floor lamp has the worst consistency because the remote and touch panel interface looks completely different, it has medium differentiation by using symbols that provide **knowledge in the world**, and it reduces the **gulf of execution**.

**Comparable Design:** The motion-detect switch also has poor consistency for the complex interface as different shapes and dimensions do not align well. It has differentiation by labelling (on, auto, off), but **labelling** should be the last resort, and it can not be easily understood by people who don't speak English. The switch with night light is consistent by having two squares with the same dimensions, but it doesn't have a clear **signifier** besides a little color difference, making it not a very differentiable design. The TP-Link Wifi dimmer switch has medium consistency, it has three rectangles with different dimensions but align very well, it also uses switch shape and symbol as **signifiers** that are in the **knowledge in the world**.

**Redesign:** The first redesign has medium consistency by having three different shape switches, but these also help differentiate the functionality, and it uses symbols that provide **knowledge in the world** to signify and further differentiate the functionality. The second redesign has higher consistency by integrating the dimming control; this integration also reduces the differentiation between on/off and dimmer.

# Lo-Fi Redesign & Justification

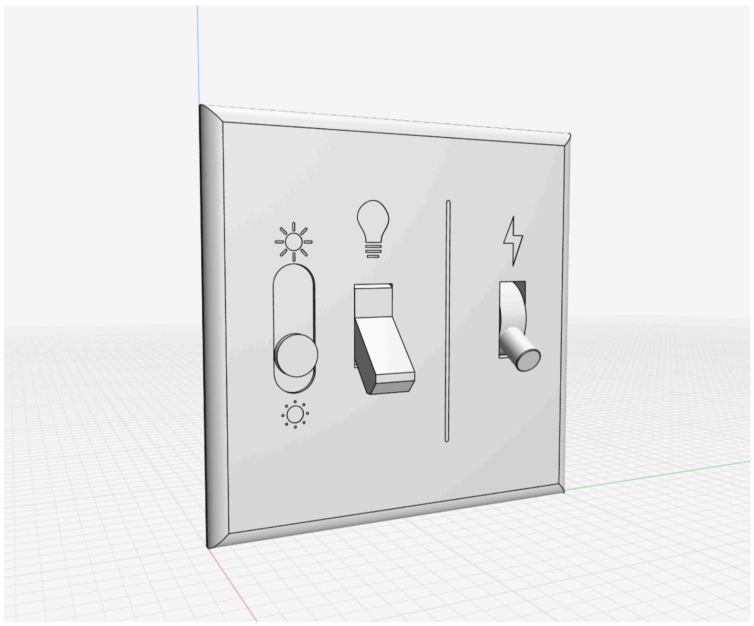


Figure 11: Lo-fi redesign #1 with a regular light switch, brightness level, and power knob

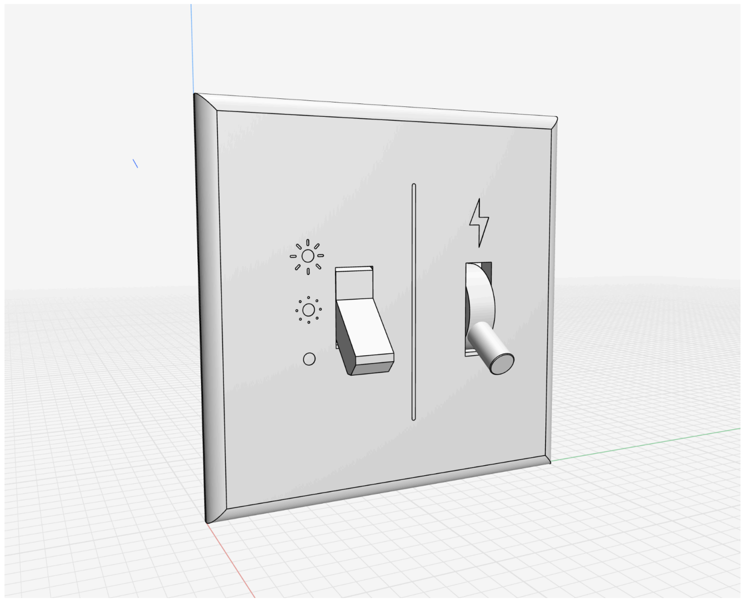


Figure 12: Lo-fi redesign #2 with integrated light switch and brightness level, and power knob

For our redesign, we identified user's main challenge as how existing light switches cause users to rely on trial and **error** to use the right light switch or blindly turn on and off all switches to avoid the hassle of thinking about it. This means that we have to consider how our design can sufficiently provide **knowledge in the world** to narrow the **gulf of execution** for users. Through our interviews, we learned that these errors primarily stem from **description similarity**, when all switches look and function the same, since users have no external cues to guide their actions. To address this, our redesign focuses on improving **visual differentiation** and **functional clarity** so that each switch more clearly communicates its role and location.

From our interviews, 5 out of 13 participants expressed confusions with their light switches when in reality they only had two switches and only one of them controlling light. Intuitively, this should not cause confusion since there is only a single light controller. However, due to the identical look of both switches following traditional light switch design, the design still causes confusion every time the users interact with them. This is a problem since the user's knowledge in the head is contradicting the design's actual functionality.

Our redesign interface features a standard flick light switch with a lightbulb symbol above it to clearly indicate its function as the primary light control (See Figure 9). Next to it, we added a brightness slider labeled with a small sun and large sun icon to represent low and high brightness levels (See Figure 9). This pairing maintains the user's familiar **conceptual model** of flipping on and off lights while integrating brightness control in a way that feels natural and intuitive. The use of icons provides **knowledge in the world**, allowing users to quickly understand what each element does without relying on memory or experimentation.

On the same panel, we shifted the power switch to create a cleared separation from the light controls. While it still uses an up-and-down knob motion, the knob's shape differs from the light switch, and a lightning bolt symbol above it signals that it controls power rather than lighting (See Figure 9). This subtle, but important, differentiation addresses the confusion several participants reported when switches for lights and outlets looked identical.

In design, it is also important to group similar elements together for faster scanability and understanding. With that idea, we intentionally **grouped** the light switch and brightness slider together while separating the power control knob. This visual grouping helps users immediately distinguish between lighting and power functions, minimizing the likelihood of **action-based slips**.

Our second redesign (See Figure 10) explores an alternative approach to reducing confusion while maintaining simplicity. In this version, we introduced a three-position light switch with three distinct levels: off at the bottom, medium brightness at the middle, and full brightness at the top. A sun diagram with three levels is placed beside the switch to visually communicate brightness progression. This design combines the on and off control and brightness adjustment into a single, familiar motion, reducing interface complexity while still providing clear **visual feedback**. Like the first version, the power knob remains separate with a lightning bolt symbol (See Figure 10) and a slightly different shape to maintain consistency in differentiation.

This second version serves users who prefer a streamlined interaction without multiple controls while still addressing the core problem of **description similarity.** By embedding brightness control within the switch itself, the design limits the number of interactive elements while maintaining clear **affordances** and **feedback** through position and labeling.

Both designs are meant to effectively prevent **action-based slips** by externalizing information and visually distinguishing function. Version one (See Figure 9) prioritizes flexibility and clarity through multiple dedicated controls, while version two (See Figure 10) simplifies the interaction into one **intuitive** mechanism. Together, these solutions demonstrate how thoughtful differentiation, **clear mapping**, and meaningful cues can transform a common source of confusion into a more intuitive user experience.

## Redesign Tradeoffs

### Control Range vs Cognitive Load

In light switch design, control range describes how many lighting functions a user can manage from one interface, while cognitive load refers to the mental effort required to understand and operate those controls. The redesign creates a new balance between control range and cognitive load. It brings brightness, light, and power control onto one panel so users can manage everything in the same place. Each control has clear **affordances** and **signifiers** that strengthen the **system image** and make the panel easier to understand. With more options available, users have greater control and receive more **feedback**, but they also need to process more information and learn how new symbols relate to each action. This increases the **cognitive load** at first, though over time it helps users build a stronger **conceptual model** of how the system works. The redesign uses **knowledge in the world** to make these added features easy to read and operate without extra effort.

**Functionality vs. Cost**

While our two redesigns add the function of dimming control, and **signifiers** that help the user to reduce the **gulf of execution**, they also slightly increase the cost of production. We lean on **knowledge in the world**—commonly used symbols—so users don't have to memorize anything, and adding these symbols costs very little in comparison to other types of **signifiers**.

Despite the added function, cost stays low. We reuse standard components and arrange three off-the-shelf switches in a new configuration, achieving higher functionality with minimal custom parts. This keeps the bill of materials only slightly above a basic switch while avoiding the complexity of motion sensors, Wi-Fi, or remote control. The result balances functionality and cost: **strong signifiers, clear affordances, smaller gulfs of execution/evaluation**, and a price far below fully "smart" systems.

**Functionality vs. Simplicity**

Our redesign balances **functionality** and **simplicity** using clear **signifiers**. The first version offers a flip for light, a slider or dimming, and a separate outlet control (See Figure 9). Icons and distinct shapes place **knowledge in the world**, so users can see what to do right away. It slightly increases the **gulf of execution and complexity** on the first use, but reduces **action slips** from look-alike switches, outlet vs light **description similarity slips**, and trial-and-error searching.

The second further simplifies the panel with a single three-position switch so the control matches the mental model of "position equals brightness" (See Figure 10). Clear symbols and immediate feedback narrow the **gulf of execution and evaluation**. The **tradeoff** is less granular dimming, and the user will need to be conscious of the brightness they need each time they turn on the light. This version improves **simplicity** while reducing some **functionality**.

**Consistency vs Differentiation**

Both redesigns aim to solve the confusion caused by identical switches. The first version strengthens **differentiation** by giving each control a distinct form, motion, and placement (See Figure 9). The brightness slider, light switch, and power knob have clear **affordances**, while icons and labels serve as **signifiers** that provide **knowledge in the world**. These cues help prevent **action-based slips** and make the system image easier to read.

The second version moves toward **consistency** by combining brightness control and light activation into one three-position flip switch (See Figure 10). It keeps a familiar **conceptual model** and uses position and feedback to show brightness levels. The layout looks simpler while still communicating function. Both versions reduce the **gulf of execution** and make interaction more intuitive by helping users understand the system without trial and error.

# Writing Hub Studio Summary

**The Writing Hub Appointment Report**

**Client:** Kiana Duggal

**Staff or Resource:** Anneli HA.

**Date:** November 10, 2025, 4:30 pm - 5:00 pm

**Course name and #, or "Non-Course Writing Project":** DSGN 1

**Was the prompt or assignment sheet accessible during the session?:** Yes;

**Session Summary and Suggestions:**

Hi Kiana, thank you for joining the Writing Hub today!

In our session, we went over your project for DSGN 1. Here's what we discussed for next steps:

- The project looked great! It was very straightforward and you and your group did a great job of being detailed and thorough in the explanations of the questions and the participants' actions.
- Moving forward, the project could benefit from providing a more in-depth explanation for a couple of the question sections, which we went over during the session.

Feel free to visit the Writing Hub again!