

**Master's Programme in Art and Media**

# Designing Assistive Devices for Task Management in Physical Spaces

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### **Abstract**

ADHD in adults has been historically underdiagnosed and even with increasing diagnosis rates there is little support outside of medication, if it is even prescribed. Therapies for symptom management and coping strategies exist but are difficult to access and people living with ADHD symptoms are often left to cope on their own, having an impact on their quality of life. This thesis explores the development of a timer device as an assistive technology for ADHD task management in physical spaces. A combination of literature review and personal experience was examined on ADHD, technology addiction, and coping strategies, as a foundation for the design research. Written as an autoethnography, the author details an autobiographical iterative design process and investigates the effectiveness of the device by conducting a self study. Through diary entries and reflection during the four week self study, it was found that the device improved performance of recurring tasks. This resulted in heightened feelings of achievement and an amplified sense of self-reliance, contributing to a noticeable reduction of anxiety and overwhelm for the user. The findings suggest that incorporating innovative technologies into ADHD symptom management can empower individuals to navigate their daily lives with greater confidence and ease. It lays the groundwork for ADHD assistive devices like these to be further developed and studied, and possibly provide additional support outside of other less accessible means.

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**Keywords** assistive technology, ADHD, prototype development, autobiographical design, habit formation, task management

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# **1. INTRODUCTION**

Task management is a critical aspect of personal and professional productivity, encompassing the organization, prioritization, and completion of various activities. In our modern, digitally driven era, individuals are often confronted with a phenomenon known as 'digital overwhelm.' This arises from the incessant influx of information, tasks, and notifications facilitated by digital tools and platforms. The ubiquity of smartphones, email, project management apps, and other digital interfaces has led to a constant barrage of demands on our attention. As a result, people may find themselves grappling with an overwhelming volume of tasks, struggling to maintain focus, and feeling the pressure to navigate an intricate web of responsibilities. The challenge lies in striking a balance between utilizing digital tools for efficiency and succumbing to the chaos they can introduce, ultimately seeking a harmonious approach to task management in the digital age.

This thesis delves into the creation and implementation of a compact timer device, which I later refer to as 'Forget-me-not', serving as assistive technology to streamline task management in light of digital overwhelm, particularly in tandem with addressing the challenges of managing ADHD symptoms. Employing autobiographical design as a foundational approach, the devices are crafted based on personal experiences and a shared comprehension of attention management. This thesis seeks to examine these influences, present a prototype for a design solution, incorporate user testing data, and derive conclusions regarding the device's efficacy and potential for future development.

## **1.1. Positionality Statement**

Motivation for pursuing this thesis topic has a lot to do with my background and history with technology. I'm a 32 year old white woman who grew up in Canada in the 90's with access to the internet from an early age. I considered myself a hardcore gamer for most of my teens and early 20's and spent a majority of my free time online. I've had a difficult relationship with technology for over 10 years, trying to

manage its increasingly addictive effects with some success as well as many setbacks.

After graduating from my previous degree in 2014, I found myself working in the tech industry of Silicon Valley in California for 5 years, eventually moving there to work as a software engineer. During my time working there I was immersed in an environment where I became very aware of the exploitative business aspects behind addictive practices in technology as well as security risks and data collection practices. This shaped my worldview and was the reasoning behind many of the principles (detailed in chapter 3.3) that guided my design thinking for this thesis.

In 2010 I sought a diagnosis of ADHD for my ongoing and increasing attention issues and performed tedious and expensive testing with medical professionals, only to receive an inconclusive result. I continued to struggle with my attention and decided to try for a diagnosis again 10 years later after a renewed interest, and the doctor confirmed my suspicions with an ADHD diagnosis. As I researched more about the symptoms and noticed their impacts on my life, I became interested in developing personalized solutions after the typical suggestions continued to frustrate and fail me.

It turns out I'm not the only one with this experience of late diagnosis. Many people struggle with ADHD symptoms for much of their life but have not been diagnosed, which can have major impacts on their quality of life. Struggling through academic life and not understanding why you don't function the same way as everyone else can take a major toll on self esteem and contribute to anxiety and depression, a frequent comorbidity diagnosis with ADHD. There is often little to no support outside of medication for adults with ADHD, if they're even able to access that. Most of the focus of behavioural therapy and strategies are for young children in school. This can feel very isolating to someone who has been newly diagnosed in their adult life. There can also be a lot of grief associated with receiving a late diagnosis such as "regrets about lost opportunities, whether it was failing out of school, struggling to

establish a career, or experiencing relationship issues because of their ADHD symptoms going overlooked and untreated.” (Fairbank, 2023).

## **1.2. Project Background and Motivation**

A large number of tools and systems have been developed throughout the years aimed at increasing productivity, such as apps for note taking or making todo lists, project management, and tracking habits, which I go into more detail in section 2.4. In fact a popular first project in a developer’s journey is coding a custom to-do list app, and most of them are applications for a phone. Unfortunately phones are also polluted with many apps designed to addict users, which makes them an inhospitable environment for productivity.

Shifting business interests have tainted technology’s promises of increasing both productivity and human connection, by devolving into bids for our attention and using addiction as the main tool for this purpose. Users' time is the product in this new business marketplace of “The Attention Economy” where application developers are incentivized to retain users’ focus. (Odell, 2019). The longer an app retains users’ attention, the more ads they encounter, resulting in more revenue earned from ad placements. With this type of business investment, it is clear to see why rates of addiction are increasing, and consequently, issues regarding mental health. In one study, 19-32 year olds in the US who visited social media sites more frequently led to significantly increased odds of depression (Lin et al., 2016).

When productivity and addictive apps exist together in the same environment, the lure of addiction means that any productivity gained from using one app can be lost with a simple click. Merely seeing that a message is waiting can be enough to derail a train of thought and oftentimes opening an addictive app can be an unconscious trained reflex. When the addictive app has been opened, it is likely more time will be spent there, more time than the user intended or realized due to the implementation of powerful addictive design (Csikszentmihalyi, 2002).



The environment of mobile phones has been so harmful of an addiction for me that I have now become accustomed to avoiding it and have lost my ability to use it productively whatsoever. The mobile phone has become a swamp of distractions and trying to navigate a tool on it becomes a constant battle of willpower. I want to remember to water my plants, but hours of my day can be lost because the draw of YouTube, an app which cannot be uninstalled on an Android phone, sucked me in after checking the calendar app. I am looking for a way to break this need to be connected at all times to addicting devices while still being able to use a form of digital technology to offload tasks taking up mental energy.

The motivation for this thesis has been borne out of a need to disconnect from the overwhelming experience of technology addiction, whilst trying to recapture some of the benefits that digital technologies had previously provided or promised. As companies introduce more addictive patterns for their apps, many people have realized the negative impact stemming from their use and try to reclaim their own attention and focus by turning to methods such as 'digital detoxes' where they abstain from using digital technologies for a period of time (Newport, 2019). These two experiences of addiction and total abandonment of digital technology have a grey area in between, and the assistive device designed in this thesis fits within that spectrum.

### **1.3. Research Questions**

The aim of this thesis is to explore the development of an assistive device that is simple, intuitive, and embedded within a physical environment to aid with task management. By placing these devices in physical space, it relieves the distractions associated with phone and computer applications and has the potential to bring an intuitive and intentional awareness to the assigned tasks in the contexts of their environments. It also presents the opportunity to build a habit, possibly reaching a point where the habit is engrained and the assistive device is no longer needed.

Through designing this device there are several areas and aspects to observe and analyze. Some questions pertain to the context around this device, different components about the device and its operation, and that of its impact. The topics explored are listed here:

Do other related devices exist and how do they differ?

How simple can a timer like this be and still achieve the effect I'm looking for?

Can an assistive device like this improve response to the associated tasks?

Do they contribute to a positive impact on my wellbeing?

Does having multiple timers within my environment contribute to feelings of stress or overwhelm?

#### **1.4. Research Methods**

The methodology employed for this thesis is Autoethnography, as defined by Poulos (2021), which entails crafting a personal narrative that draws on the researcher's own experiences, memories, and reflections. In adopting this approach, the researcher assumes the dual role of subject and observer, delving into their lived experiences. This narrative method is evident throughout the chapters, particularly in sections such as 1.2 Project Background and Motivation, 2.4 Personal Experience with Task Management, and 4.2 Reflections. Autoethnography emphasizes the use of narrative to present experiences in an engaging manner, conveying nuanced meanings. Rich, detailed descriptions employing emotions and sensory details are crucial to convey the depth of experiences. Acknowledging personal biases and assumptions is important to this methodology, and to this end, a positionality statement in section 1.1 helps to clarify my personal influences and biases on the topic. For ethical considerations, verbal permission was obtained from individuals involved in the

studies, and precautions were taken to exclude personal information and facial images from the thesis.

The research methods utilized include autobiographical design, paper prototyping coupled with user testing, as well as journals and self-reflection. Additionally, a comprehensive literature review will be conducted on topics related to ADHD, technology addiction, and assistive technologies to provide context for the research and position it within existing academic scholarship.

## **2. LITERATURE AND PRACTICE REVIEW**

The following literature and practice review looks into ADHD and its prevalence in the global population and common symptoms. Subsequent chapters explore strategies for task management and physical devices related to them. My personal experience with task management is also explored.

### **2.1. Attention Deficit Hyperactivity Disorder**

ADHD is a common neurodevelopmental condition characterized by persistent patterns of inattention, hyperactivity, and impulsivity. It affects people of all ages, impacting their ability to focus, organize tasks, and control impulsive behaviours. According to one study in 2020, ADHD affected an estimated 366.33 million adults around the world, which is 6.76% of the population (Song *et al.*, 2021).

ADHD can have significant impacts in academic, professional, and social settings. Successful management often requires a personalized strategy, encompassing behavioural tactics, educational assistance, and medication

ADHD is often underdiagnosed in girls and women, and even when diagnosed, “Only 6% of the girls with ADHD are prescribed medication, and 8% received counselling, compared to 47% and 38% in boys. These data indicate that ADHD is under treated in

girls relative to boys, and also, that the majority of both boys and girls with ADHD are not being treated.” (Derks, Hudziak and Boomsma, 2007). This phenomenon could explain my own difficulties seeking a diagnosis for the disorder.

The American DSM-5 (Centers for Disease Control and Prevention, 2023) describes the disorder and lists the diagnostic criteria for ADHD as follows:

People with ADHD show a persistent pattern of inattention and/or hyperactivity–impulsivity that interferes with functioning or development:

**Inattention:** Six or more symptoms of inattention for children up to age 16 years, or five or more for adolescents age 17 years and older and adults; symptoms of inattention have been present for at least 6 months, and they are inappropriate for developmental level:

- ❖ Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or with other activities.
- ❖ Often has trouble holding attention on tasks or play activities.
- ❖ Often does not seem to listen when spoken to directly.
- ❖ Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (e.g., loses focus, side-tracked).
- ❖ Often has trouble organizing tasks and activities.
- ❖ Often avoids, dislikes, or is reluctant to do tasks that require mental effort over a long period of time (such as schoolwork or homework).
- ❖ Often loses things necessary for tasks and activities (e.g. school materials, pencils, books, tools, wallets, keys, paperwork, eyeglasses, mobile telephones).
- ❖ Is often easily distracted
- ❖ Is often forgetful in daily activities.

**Hyperactivity and Impulsivity:** Six or more symptoms of hyperactivity-impulsivity for children up to age 16 years, or five or more for adolescents age 17 years and older and adults; symptoms of hyperactivity-impulsivity have been present for at least 6 months to an extent that is disruptive and inappropriate for the person's developmental level:

- ❖ Often fidgets with or taps hands or feet, or squirms in seat.
- ❖ Often leaves seat in situations when remaining seated is expected.
- ❖ Often runs about or climbs in situations where it is not appropriate (adolescents or adults may be limited to feeling restless).
- ❖ Often unable to play or take part in leisure activities quietly.
- ❖ Is often "on the go" acting as if "driven by a motor".
- ❖ Often talks excessively.
- ❖ Often blurts out an answer before a question has been completed.
- ❖ Often has trouble waiting their turn.
- ❖ Often interrupts or intrudes on others (e.g., butts into conversations or games)

On top of the DSM criteria and stated symptoms, there are secondary behaviours associated with ADHD, such as difficulties with time perception often referred to time blindness. It's a common experience to see a speeding up and slowing down of time in relation to one's pace of life, or certain events, but with ADHD, time is not so linear. Sometimes if a person with ADHD is highly immersed in a state of flow, described as hyperfocus, time flies without them realizing (Csikszentmihalyi, 2002) and all of the sudden what feels like days has been weeks or months and their responsibilities have slipped without them knowing.

There are several symptoms of Attention Deficit and Hyperactivity Disorder that are relevant to the concept of this thesis, I will mainly focus on inattention, impulsivity, and disorganization.

Inattention can look like having difficulty paying attention to details, easily distracted, forgetful, disorganized, and struggling to follow through on tasks. “Out of sight, out of mind” can mean that if they don’t see it in front of them, they can forget that thing or person exists.

Impulsivity can exhibit as acting without thinking, interrupting others, blurting out answers, and having trouble waiting one's turn.

Disorganization can be described as struggling to keep track of personal items, being late, and feeling overwhelmed by daily tasks.

## **2.2. Current Strategies for Task Management**

In this section, I will detail the current strategies that can help with task management, especially methods suggested to me by professionals for coping with ADHD symptoms. I am specifically avoiding talking in depth about software solutions as one of the guiding principles for this thesis is to avoid the addictive environment of a phone.

- ★ Physical calendars (act of writing it out helps remember it)
- ★ Habit trackers - don't lose the streak
- ★ Writing dates on things like leftovers - doesn't work if you forget to look in the fridge
- ★ Post it notes - can become blind to them in your surroundings
- ★ Bullet journals - simple way to keep track of tasks in a journal format
- ★ Todo list by door
- ★ Write task items on colourful paper so easier to find
- ★ Writing instructions for the morning before bed
- ★ Putting items needed for the morning by the door before bed
- ★ Putting out clothes at night for the morning, helps avoid distraction during morning routines

All of these strategies contribute to different facets of successful task management but don't provide a holistic solution, or address recurring tasks specifically.

### **2.3. Related Physical Devices**

I conducted a search for related physical devices that worked in a similar fashion to the timer device designed in this thesis. Several timer based devices exist, such as wrist watches, locks with timers embedded, the Time Timer ([www.timetimer.com](http://www.timetimer.com)) which is a timer with red line to watch as time ticks down, and various egg timers for cooking. None of these devices include an option for recurring alerts over multiple days, only daily alarms or single timers with a timeframe shorter than a day.

I did find some devices that use timers similar to the concept of my device, but were highly specialized and specific. These include:

- ★ Car lights that tell you when you're due for an oil change
- ★ Brita filter has a date setting that lets you put in the date and it notifies you when you need to change it
- ★ Electric toothbrushes that keep track of how long the head has been used and puts a light on when it needs changing
- ★ Smart thermostats that remind users to regularly change air filters for heating and cooling systems
- ★ Coffee machines with periodic deep cleaning alerts

### **2.4. Personal Experience with Task Management**

I've been on a bit of a journey with task management, finding new methods and systems, as well as developing a lot of my own. In elementary school I started out managing my task list in the agenda's we were given at school, but would often forget to even look at it when home. Over the years I've tried various todo list apps, bullet journaling, note taking apps, calendars, and several different systems for

organization and have found that I'm most engaged with systems that are novel and personalized. When I'm inspired by a new idea for organization, whether it's an app or a method, I take the time to completely revamp my organization structure and for the first few weeks I feel on top of things. I struggle to maintain regular routines and systems so eventually the new system becomes unmaintained, and I've fallen back on ad-hoc methods like post-it notes and mental lists. I've had some success with incorporating accountability and external support such as seeing a certified ADHD coach, but have faced challenges when those supports were no longer available. Currently, I'm using a simple text file called TODO to manage my tasks, but am still struggling to maintain a regular routine. I've never found a good way to keep track of recurring tasks and this issue accompanies me to each new iteration of my task management system.

### **3. DESIGN PROCESS**

The design process is explored in the following chapters. Starting with initial concepts and taking inspiration from existing products. Principles for the desired functionality of the device were developed in conjunction with shape and material explorations. Paper prototyping was used to test and develop the initial concept and use cases for the device were also explored. Finally the electronic assembly of the prototype was developed and a case was designed and 3D printed.

#### **3.1. Concepts**

While thinking about the challenges associated with ADHD and the inability of phone applications to provide a sufficient solution, I started dreaming of single use devices that would help manage my attention in physical space rather than digital space. I conceptualized three separate devices to address different challenges. I referred to them as “long-form timer”, “show one thing”, and “keep it lit”. These devices were meant to be part of a suite of tools that would embed task management into the environment, taking the addictive distraction of phones out of



the equation and utilize impulsiveness to act upon the task in the moment. The long-form timer became my focus and was developed during this thesis while the others took a backseat for later development and are included in the chapter Future Work.

Many devices currently exist for tracking short amounts of time from seconds to hours, but the long-form timer is a device used to help with task management in the form of tracking days to weeks. It's meant to specifically target recurring tasks, the kind that need to be done on a regular schedule and are never really done. These are maintenance tasks like house chores, watering plants, or feeding a pet. The device can be placed in the room by an object that is associated with a recurring task, such as by a plant that needs water every 3 days. The user would set the device to the desired amount of days and when that amount of days has passed, the device would gently notify the user by turning on an LED. When the user tends to the task, a button on the timer can be pressed to reset the counter to the set number of days, until it's ready to alert again. The device remembers the time schedule your task is set to so you don't have to, all you have to remember is to tend to it when the light is on and reset it.

The recurring tasks associated with these devices in the environment no longer need to show up on some todo list app somewhere. It's an inappropriate place for a recurring task anyways as the nature of it is that it will never be done, so putting it on a todo list gives the wrong impression of this task, that it can somehow be completed. Once you check it off, it will inevitably come back, and you will have to put it on the list again.

Placing the timer next to the associated task also utilizes impulsivity associated with ADHD as once it's seen, it can be acted upon in that moment. Ideally it would be for a task that takes 2 minutes or less so that it can be addressed as soon as it's noticed. I anticipate that once a task has been repeated enough times, it might become automatic as a learned habit (Clear, 2018).

### 3.2. Inspiration

Inspiration for the long-form timer came from a game called “Stardew Valley” where you can process items in machines to produce something else, such as copper into copper ingots (Figure 1). When the processing has finished, an icon appears above the machine with the item waiting to be collected. The visual reference allows you to see at a glance which machines are ready, and ones that are still processing show a wiggling animation. It captures your attention to tend to the machine. I thought it would be a great idea to try having this in my physical space, so I could see at a glance what is ready to be tended to. I envisioned putting it on plants to be watered, a jar of brewing kombucha to be processed, or a guitar to encourage practicing.



**Figure 1. A screenshot of the game Stardew Valley showing rows of kegs, some displaying icons overhead, indicating they are done processing. (Anonymous, n.d., ‘cask-stardew-valley-kegs’, accessed 8th December 2023, <https://static0.gamerantimages.com/wordpress/wp-content/uploads/2021/03/cask-stardew-valley-kegs.jpg>)**

### **3.3. Principles**

In the early stages of this thesis I decided upon some principles to guide my design decisions. It gave me a structure to refer back to when choices or problems arose during the design process.

This is a list of principles I decided on going into the first stages of design for the timer device.

- ★ Encourage intentional interaction and slow use
- ★ Each device is single function with simple interaction
- ★ Long-term timer (multiple days)
- ★ Minimize battery use
- ★ No internet or phone connection
- ★ Subtle and gentle mechanisms (such as alerts)
- ★ Explore unusual/satisfying interactions and materials
- ★ Avoid creating more overwhelm

Some of these principles did not make it into the first prototype.

### **3.4. Shape and Material Exploration**

I explored different possibilities for materials to encase the electronics. My first instinct was a hard plastic in the shape of a gem stone as shown in Figure 2 but as I thought about the interaction of pressing a reset button, I wanted to imagine more unusual materials and modes of interaction. Silicone was one option, allowing the LED to give off a diffused glow through the translucent material and the reset button could be accessed by giving the device a satisfying squish. This was inspired by a friend's project of a squishable LED cat light shown in Figure 3.

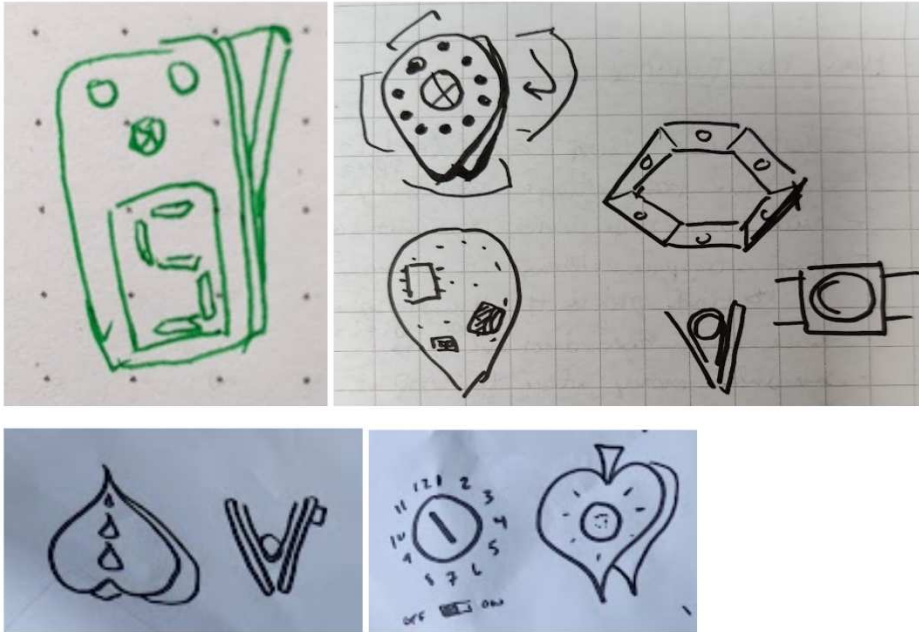


**Figure 2. Plastic faceted gemstones in various colours. (BeadTin LLC, n.d., ‘Neon Multi 18mm Round Plastic Faceted Stones (4oz)’, accessed 8th December, 2023, <https://www.beadtin.com/products/neon-multi-18mm-round-plastic-faceted-stones-4oz>)**



**Figure 3. Silicone cat with LEDs that responds to being pet or squished. (Jasmine Xie, n.d., ‘Squish That Cat!’, accessed 10th December 2023, <https://www.jasminexie.art/squish-that-cat>)**

I made several concept sketches to help explore other options for shapes ways of interacting with the device seen in Figure 4. below. Many of the designs include a clip-based design similar to that of a clothespin.



**Figures 4. Preliminary drawings of the long-form timer device**

Another material investigated was a thin wood veneer that would look like a solid wooden block but would allow LEDs to shine through as seen in Figure 5. I imagined this would grab attention when the LED is on, but fit into the surroundings without looking like a digital device all the time. It would provide a more sophisticated look for the device.



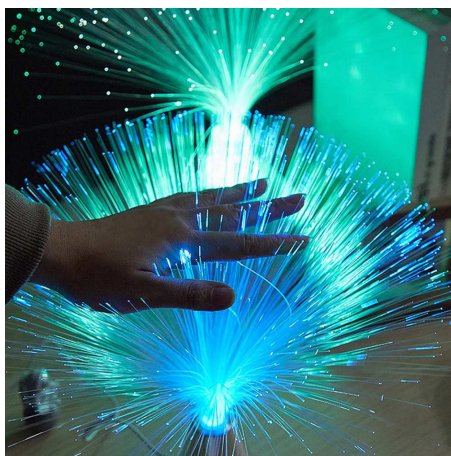
**Figure 5. Wooden veneer smart clock with LED display. (Aliexpress, n.d., 'Fashion Alarm Clock LED Wooden Watch Table Voice Control Digital Wood**

**Despertador USB/AAA Powered Electronic Desktop Clocks', accessed 10th December 2023, <https://www.aliexpress.com/item/1005005959377834.html>)**

The last two materials I contemplated using, shown in Figures 6 and 7, were a faux fur or fibre optic to diffuse the light through, giving it more personality, almost a creature-like appearance.



**Figure 6. Faux fur headband with rgb LEDs. (AliExpress, n.d., 'Cute LED Glowing Light Up Japanese Hair Bands Luminous Cat Fox Ears Headbands Animal Hairband Costume Cosplay Props Accessories', accessed 10th December 2023, <https://www.aliexpress.com/item/1005003678002838.html>)**

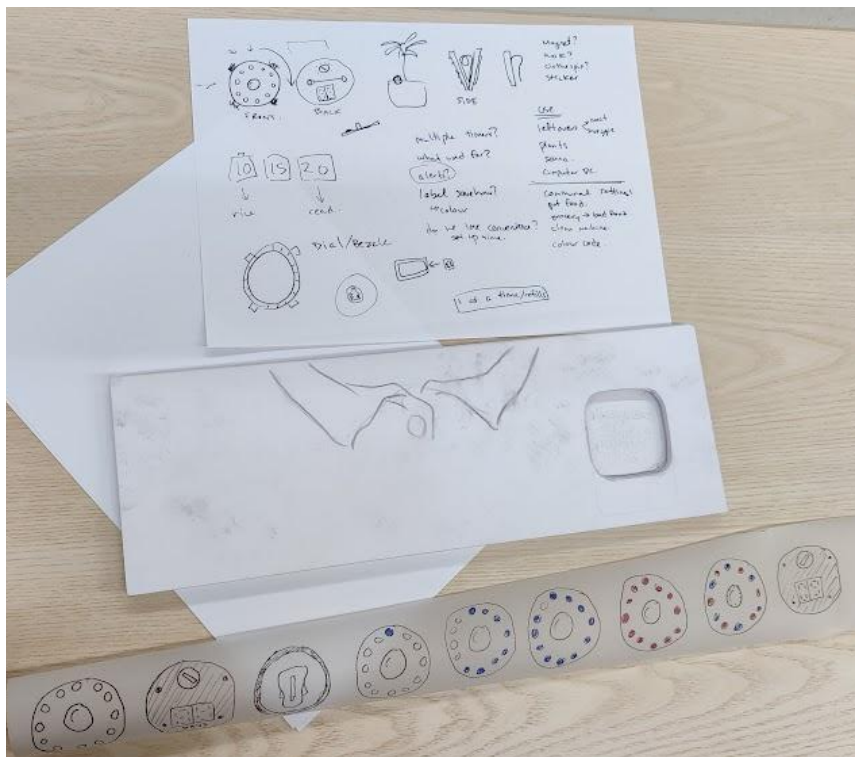


**Figure 7. Fiber optic lamp. (AliExpress, n.d., 'Multicolor LED Fiber Optic Lamp Interior Decoration Centerpiece Holiday Wedding Lamp LED Night Light Lamp**

for Holiday Atmosphere', accessed 10th December 2023, <https://www.aliexpress.com/i/1005004278231737.html>)

### 3.5. Paper Prototyping

I made a paper prototype of the long form timer design and performed three user testing sessions with 9 people. The study was conducted in 15 minutes, with one interviewer, one participant, and one observer per session. I was the interviewer in one, the observer in another, and not present for the last. Sketches were made on tracing paper and slid through a case with a window to slide drawings through when showing phases of the device, see Figure 8. The shirt collar drawing was unrelated.



**Figure 8. Paper prototype drawings**

The design included a view of the device with the back case on, the back with the case off and different phases of setting the timer, and the front with phases of the

timer counting down and notifying other functionality such as what did the buttons do and how the timer can be set and reset. Figure 9 shows a participant interactive with the paper prototype.



**Figure 9. Participant interacting with the paper prototype during the study.**

The interviewer would familiarize the participant with the device's purpose and various functions, and then ask the participant to set the device, encouraging them to speak their thought process as they acted. I taught two interviewers about the device and its functions and walked them through the testing structure and questions. I conducted one study where I was the interviewer. I wanted to test intuitive design so I described all the features of the device and asked the user to set the alarm without telling them how. It didn't seem like they could figure it out without more guidance, so the next interviewer gave them more direct instructions and explained how to do each function.

While observing the other interviewers, I noted they also seemed to be confused about some of the functions and needed help describing them to the participant. This was valuable information that the device was not intuitive and the process of setting it was not clear, even with instruction. I also received feedback during the sessions that the users expected different behaviour from the device, such as some



form of feedback after they had set the device or that the LEDs would count up rather than down. Notes from the study are included in Appendix 2.

### **Paper Prototype for alarm setting logic**

During prototyping, I made the decision to change to a single push-button and slide-switch for setting the alarm, rather than a rotary switch due to constraints of the amount of pins on the board. The logic was that there would be a program mode and a run mode, accessible by moving the slide switch. While in program mode, pressing the button would add a day to the counter and the led would blink as confirmation each time the button is pressed. When the slider is moved to run mode, it would first flash the number of days entered in programming mode and then run the timer until the alarm time was reached and the light would go on. When the button is pressed during run mode, it would reset the timer and it would count up to the day count again.

I made a simple paper prototype, pictured in Figure 10, to work through the actions. I asked two people to each go through the logic with me and test its clarity. We discussed what feedback would be useful for the user to understand the different modes and settings. How they would know the alarm has been set, how long it's been set for, and understand the short and long pressing capabilities. We came to the conclusion that the feedback would be shown when the user flicks the slider to the run position and it would flash back how many days they set. They also asked how they can see how many days are left once it's running and I brainstormed logic for incorporating a long and short press. When the slider is in run mode, a short press would blink the number of days left to the user, and two short presses would blink the total number of days the alarm was set to. A long press would activate the reset function and the timer would reset. The logic is depicted in Figure 11.

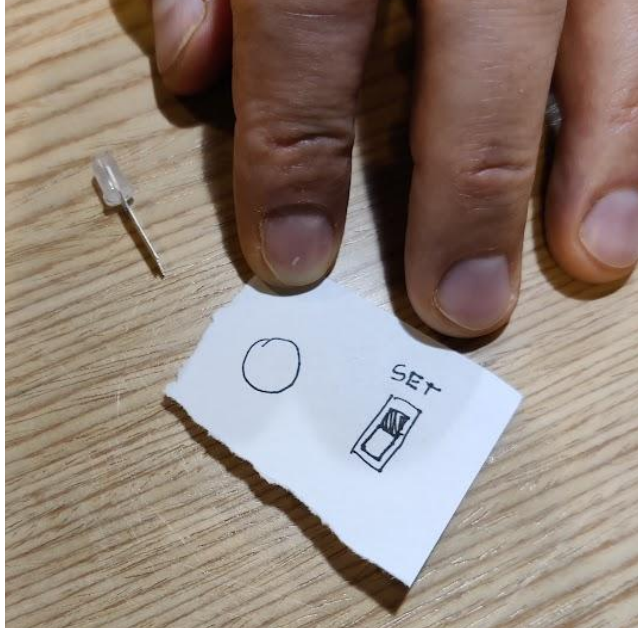


Figure 10. A paper prototype representing one round button and a rectangular slider with the word set on one side of the slider.

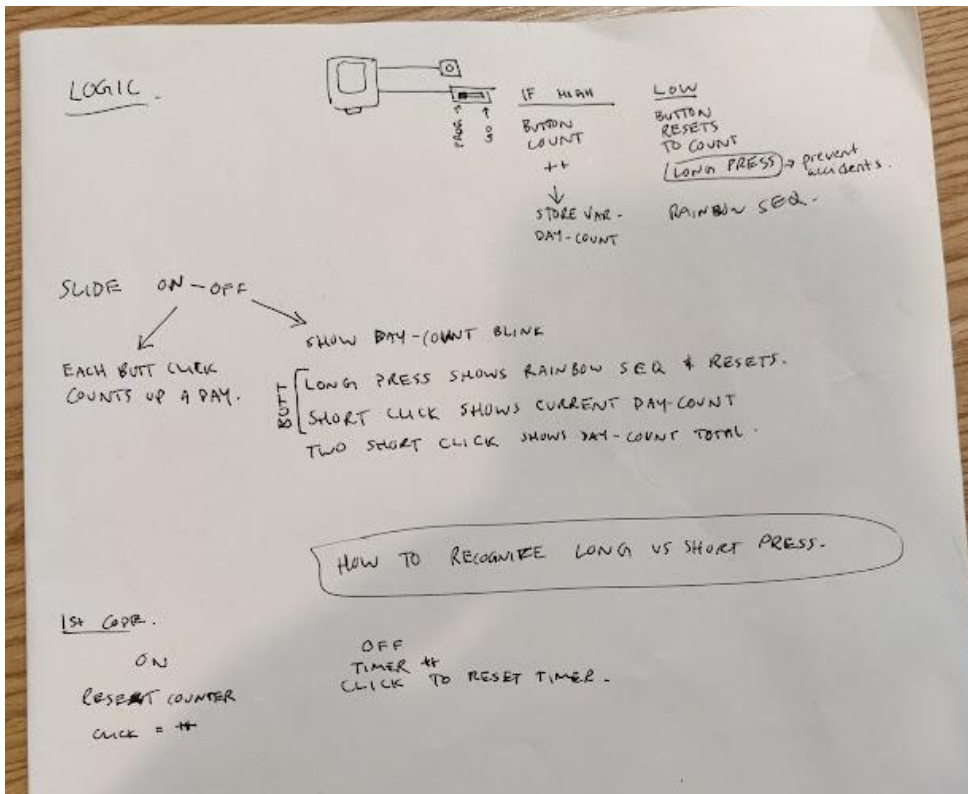


Figure 11. Notes about logic for the second paper prototype.

### 3.6. Use Case Exploration

Throughout the design process and various testing phases, I asked people about what potential uses they foresaw for a device like this while I also brainstormed some of my own. The initial use case I saw for this device was for maintaining house chores, like tidying on a regular schedule, doing the dishes, vacuuming, or cleaning the bathroom. These tasks would appear in my todo list every so often or be done when it became obvious, but wouldn't happen as regularly as I would like. Often when life becomes busy and I'm not at home very much, these tasks pile up. It contributes to an uncomfortable feeling of chaos when I'm at home, and if I have visitors it brings up feelings of shame about the cleanliness of my space. Another personal use case for this device would be to handle watering schedules for my plants. Sometimes I don't realize how many days have passed since I last watered a plant and there's no obvious signs of drooping so it gets ignored for too long and starts to suffer. My plants all have different watering times, some can be every 3-5 days, and some are once every 1-2 months.

Other use cases include:

- ★ Leftovers in the fridge
- ★ Kombucha culture
- ★ Exercise routines
- ★ Sauna schedule
- ★ Practicing a skill, such as guitar
- ★ Medication reminders
- ★ Feeding a pet (especially with cohabitation)
- ★ Bill payments
- ★ Computer backups

Many of these use cases could be used for one person living alone, or in a collaborative living or work setting with many people tending to the tasks.

### **3.7. Prototype**

In this section, the process for developing the prototype is detailed. Hardware components are included in Appendix 1. The subsequent chapters deal with technology considerations, button logic and breadboard assembly.

#### **Technology Considerations**

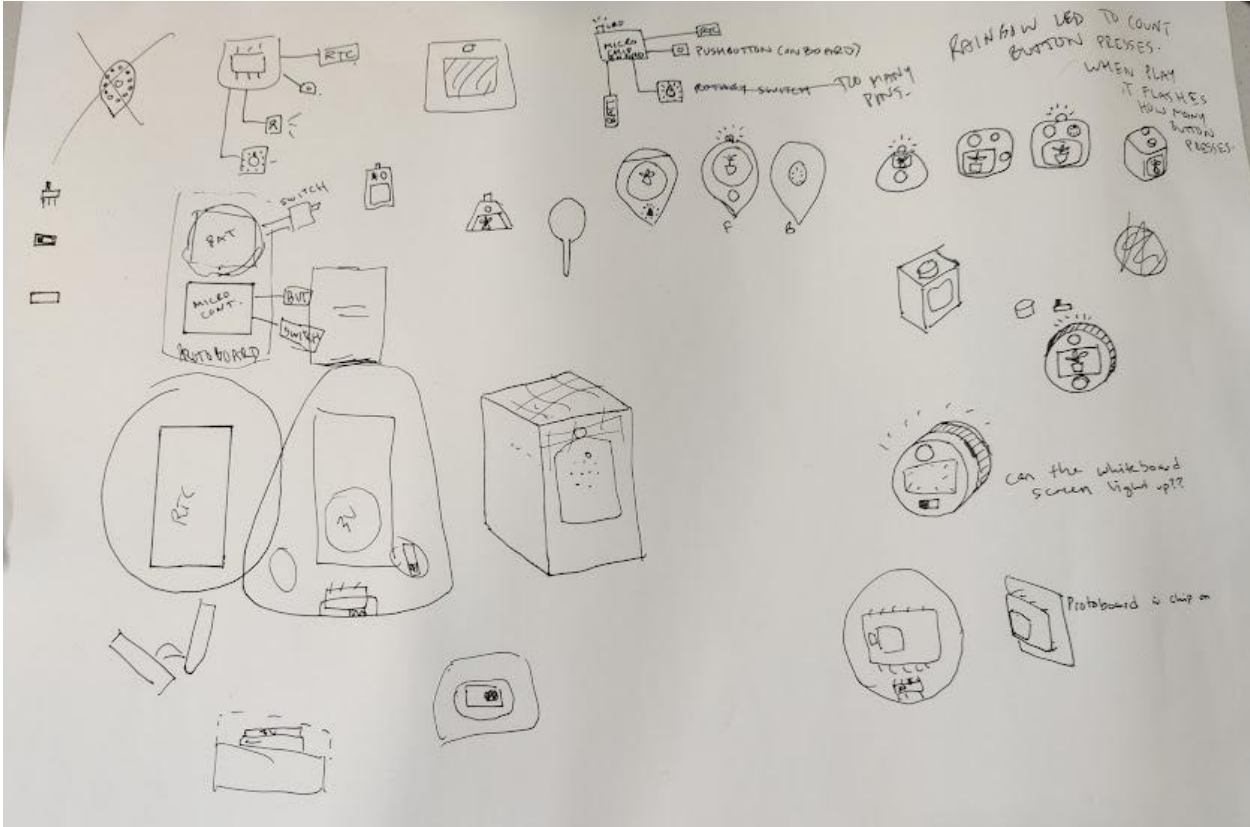
I consulted with a few people about the best way to go about getting a quick basic functioning prototype. Things we considered for the functionality was that it was preferably small, battery powered, and had an LED and reset button included on the board so there would be less soldering to do and less points of failure introduced. First we considered the Adafruit Feather Board (Appendix 1.1) and Adafruit RTC board (Appendix 1.2) with a JST connector wire (Appendix 1.3) for less soldering, but they were out of stock on the cables and I'm pretty confident with my soldering ability. Next we looked at the XIAO-RP2040 board (Appendix 1.3) because it has a smaller form factor, an onboard neopixel RGB LED, as well as a reset button. I had been working with the XIAO-ESP32C3 board (Appendix 1.4) previously so I was familiar with it, but I didn't require the wifi and bluetooth connectivity so we switched to the other XIAO board.

I was looking at adding a rotary switch (Appendix 1.7) for selecting up to 10-12 days for the count, but we determined that wouldn't be possible with the limited pins available on the XIAO board without creating a complicated pin breakout board. Another reason against using this component is the need for increased complexity and additional components such as a way to display the data associated with the switch in the form of an LED ring or digit display. This would increase the costs and time for assembly, and setting the day count is too infrequent of an interaction to justify the costs. With this limitation I came up with the logic of using only one button and one switch to program the device. I wanted to keep it simple.

I also considered making a programmer for the device to externalize the day count input hardware on a separate board, but that brings in its own issues. Having the

separation provides opportunity for one or the other to get lost or not be available when needed, making it more difficult to set the alarm, even if it is rarely. It adds unnecessary complexity to the device.

The components that were decided upon were the XIAO-RP2040 board, a DS1302 RTC Module, a basic momentary switch, and a small slider switch. With that decided, an order was placed for the parts and I began sketching out the shape and size for a possible case as shown in Figure 12.



**Figure 12. Various drawings for possible case enclosures after components had been decided upon and ordered.**

**Button Logic**

For the logic to program the alarm into the timer, I envisioned having one momentary switch, and one slider switch to change modes. One mode would be for

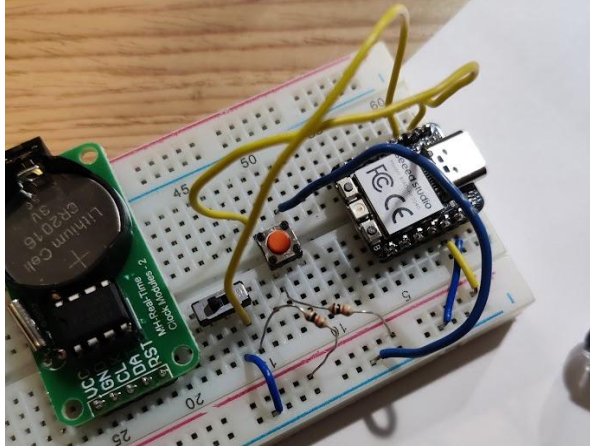
programming the day count into the device and the other mode would run the alarm with the programmed day count. I then drew a simple paper prototype, as mentioned in the previous section 3.5 Paper Prototyping, and tested the envisioned two button logic.

I wanted to make it more difficult to reset the timer in case of accidental presses, or if someone unfamiliar with the device is curious and touches the button. The way I thought of doing this was that you have to press and hold the button while in run mode to reset the timer. It would give you feedback that it's reset, such as glowing rainbow for a few seconds, and displaying the day count back to you using blinks on the LED afterwards.

I was inspired by a remote for wall sockets that functions with a single click to turn on and two clicks to turn off. Multiple clicking on simple devices hadn't really occurred to me yet, so I found inspiration in this design and wanted to use different types of presses in my design, short, long, and multiple presses. I also used inspiration for the simple button programming interface from my basic digital wristwatch. With just four buttons it enables a lot of functionality.

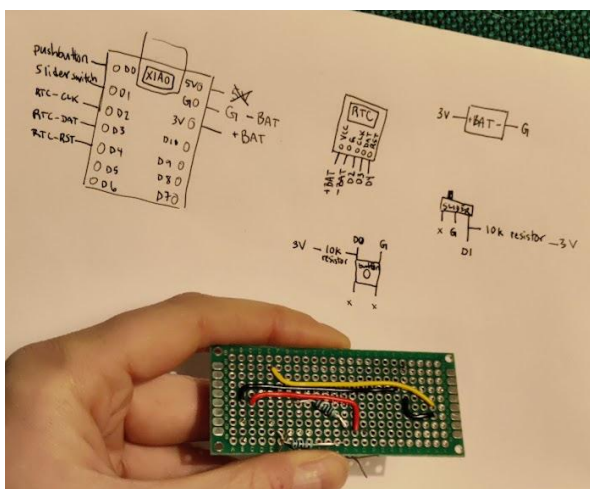
### **Breadboard Assembly**

After consulting about the hardware components and deciding on a basic design, the parts were ordered for 5 prototypes. I received the order and plugged in all the components to a breadboard to test the circuit's functionality, shown in Figure 13.

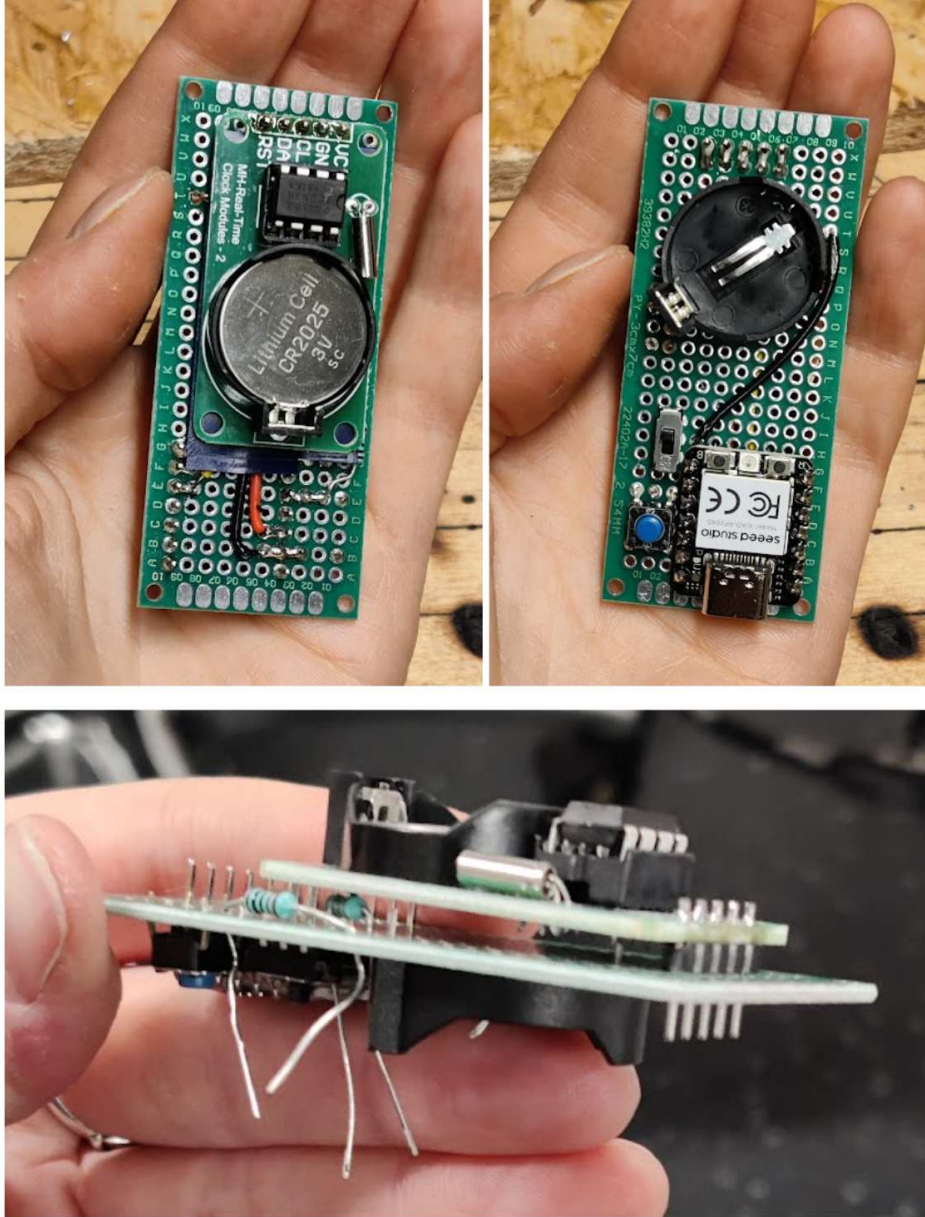


**Figure 13. Breadboard with XIAO-RP2040 board, RTC module, push button, slide button, pull-up resistors for the buttons, and connecting wires. The RTC had not yet been wired.**

Everything was wired up correctly and properly communicating with the Arduino program, so I proceeded to lay out the components for soldering to a protoboard. I started by drawing connection diagrams for each component, shown in Figure 14, so I could keep track of which pins plugged into which components. I placed the components evenly on the protoboard and proceeded to make the connector wires. I tried to keep the wiring as tidy as possible for consideration of making a 3D printed case afterwards, see Figure 15.



**Figure 14. Drawings of circuit components and connections as well as the protoboard with some wires placed on it, ready for soldering.**

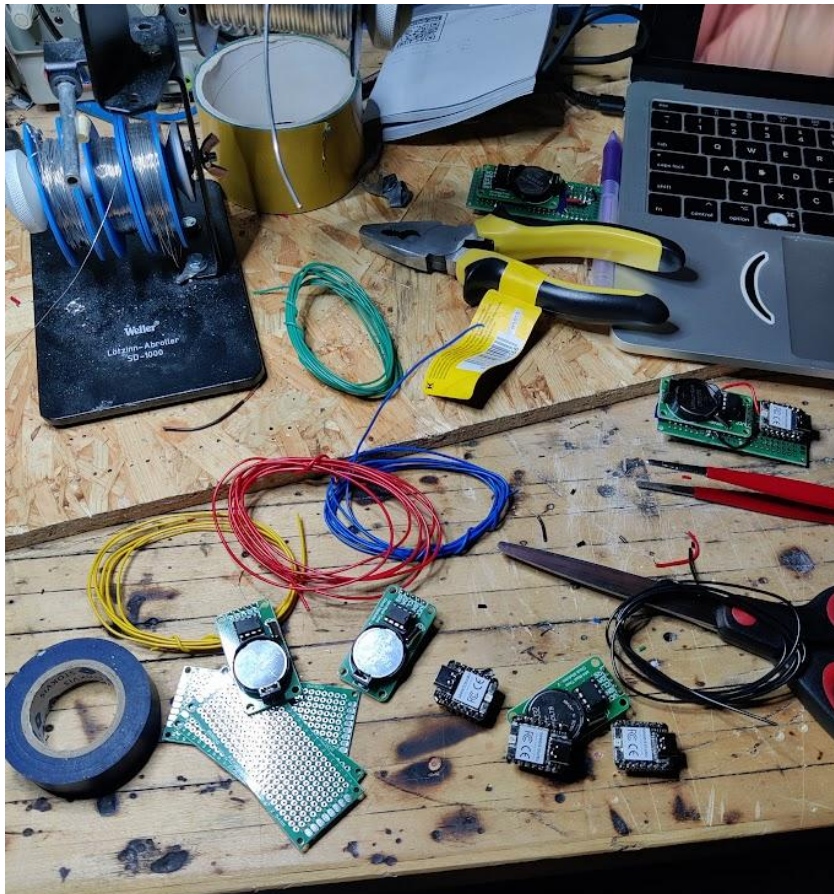


**Figure 15. Front, back, and side view of the first soldered prototype.**

After the first prototype was soldered, I connected it to the computer to test the logic and function of each component. Everything was working as expected. The next thing I did was place a battery on the board to power the device, and unfortunately I ran into some issues with the connection points to the XIAO-RP2040. I had connected the power to the wrong pin and the board would only output voltage but not accept it through that pin. I located the voltage in pins on the back of the board and resoldered the battery to those connectors. I connected the battery and the LED



was the wrong colour when the timer went off and subsequently changed colour every time it activated. I discovered that the battery's 3V was insufficient to power the board. I decided to proceed using the power from the XIAO board's USB plug, which meant that instead of having the freedom to place the device anywhere, they would have to be tethered to a wall socket. Additionally, I decided for the first prototype that the day count could be uploaded in the program and I could side-step adding the button and slider by using the reset button on the XIAO board. I decided to solder the other 4 prototypes leaving out the battery pack (aside from the dedicated RTC battery), button, and slider to simplify it. Figure 16 shows my workstation while soldering the other prototypes and the finished boards are shown in Figure 17. I decided to wrap the exposed electronics in electric tape, shown in Figure 18, so I would be able to start using them for the study right away while a proper case was designed for them later.



**Figure 16. Workstation showing mid-process of soldering the components onto the protoboard with various tools, wires, and tape.**

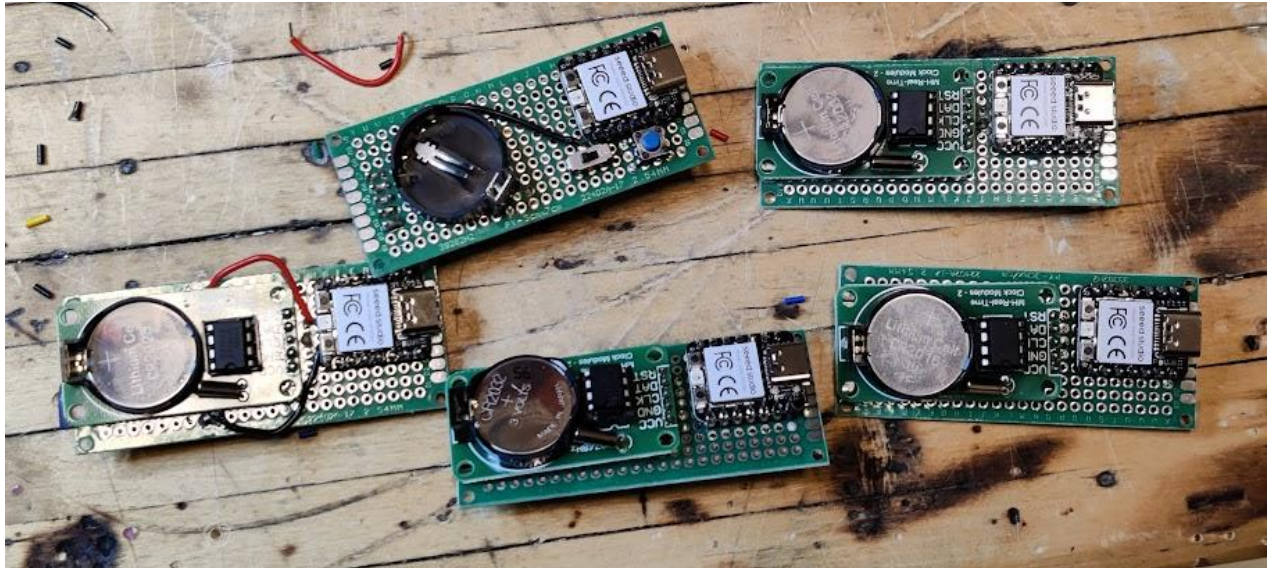


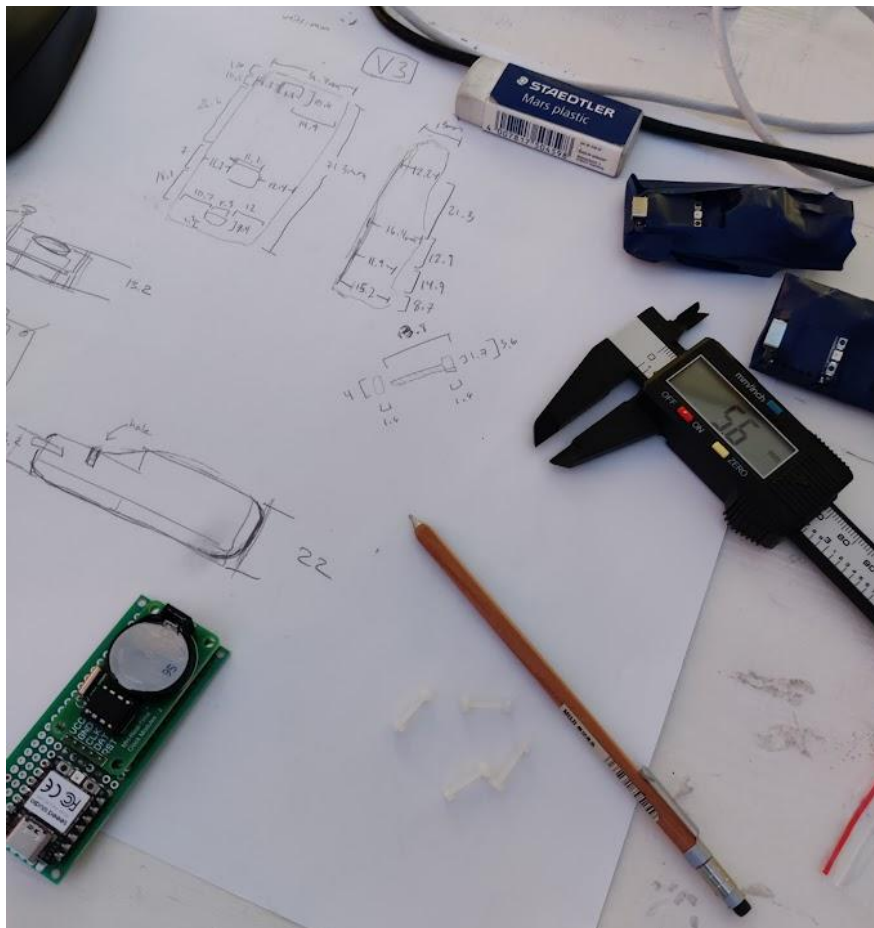
Figure 17. Finished prototype boards.



Figure 18. Soldered protoboards covered in electrical tape

### 3.8. Case Design

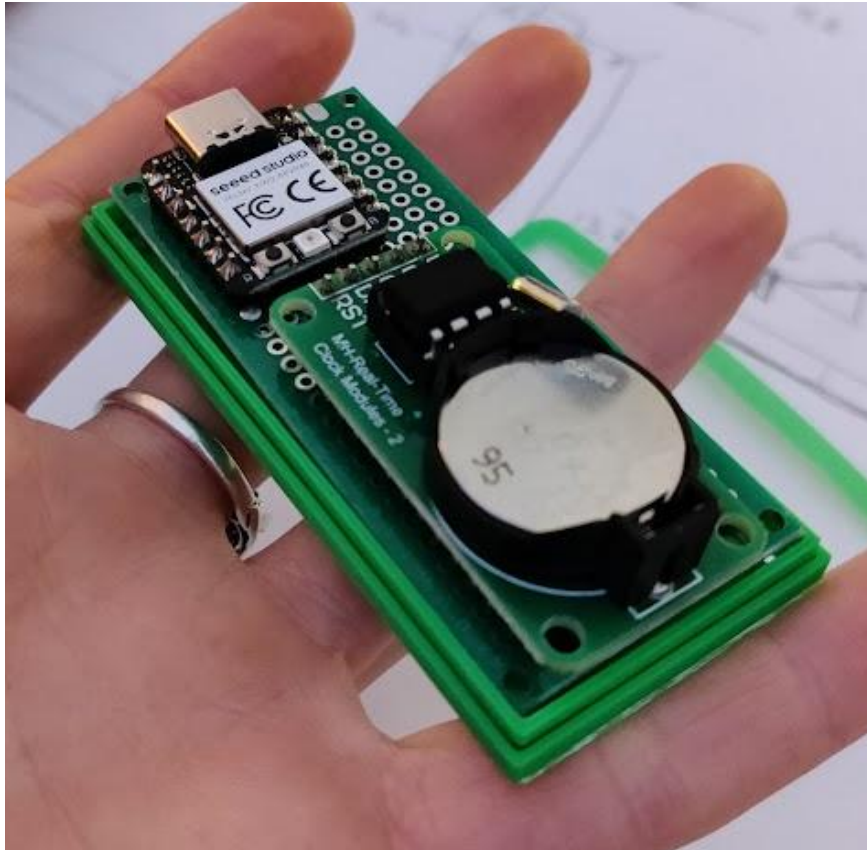
Once the protoboards were finished I started to design a 3D printed case to protect the components for long-term use. Sketches were made with the dimensions of the main components of the device, see Figure 19. Key considerations were that the case should be accessible for replacing the battery, access to the USB-C connection, access to the button on the microcontroller and having visibility of the LED indicator. The case was designed in Autodesk Fusion 360, a parametric CAD modelling tool.



**Figure 19. Sketch of component dimensions**

The first 3D print focused just on the base of the case as a way to check the tolerance of the 3D printer and my own measurements. The case was printed in PLA with a Bambu Lab P1P 3D printer. The protoboard fit very well, but some dimensions were off, as can be seen in Figure 20. The depth of the base was also a bit too tight fitting.

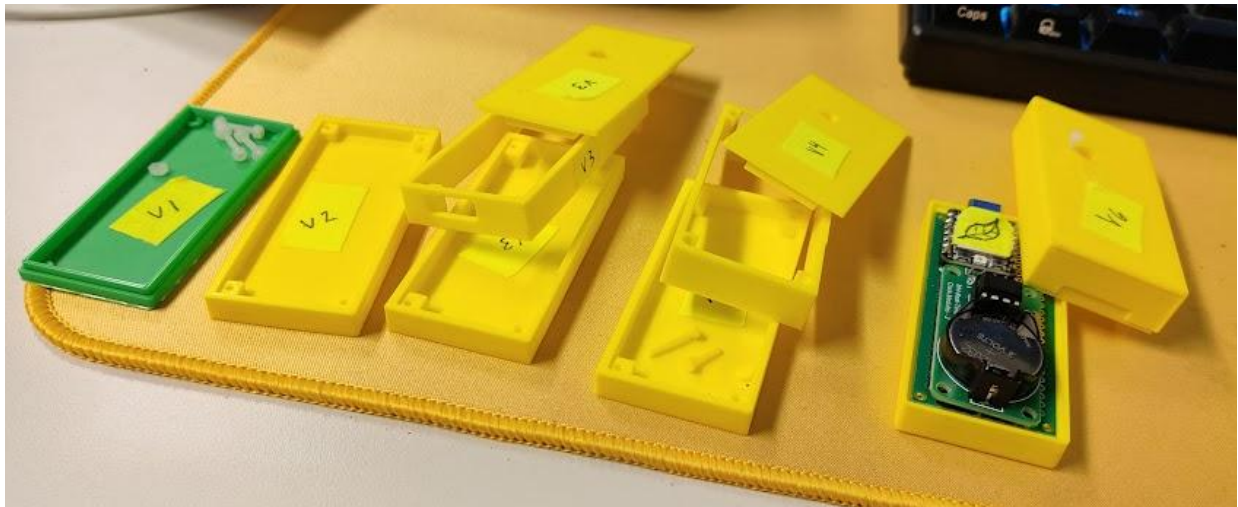
Version 2 of the base was also a little bit more off, so the dimensions were double checked and adjusted.



**Figure 20. Version 1 of the bottom part of the case**

The case design kept the same rectangular shape throughout the design process. Versions 1 - 4 incorporated minor changes to the dimensions with each iteration. Initially the idea was to fasten the base layer and the protoboard to the top layer with the nuts and bolts but the required bolt sizes weren't immediately available. To overcome this a middle layer was incorporated in versions 3 and 4 whereby the base layer and the protoboard could be fastened to the middle layer and then a snap fit lid would be used to cover the bolts. Versions 1-4 also had an indent which allowed a nut to be press-fitted into the body of the backside of the case. The design became quite complicated simply to fit the too-small bolt. Fortunately with each version the tolerance became tighter each time and it was discovered that with the right dimensions the protoboard snap fitted into the lower case tightly enough, that there

was no longer a need to use the bolts, thus simplifying the case design and printing process by reducing the need for overhang printing. Versions 3 and 4 also fine tuned the snap fit aspect and allowed the case to be reduced to just two parts. Version 5 was designed, but not printed, because a measurement flaw was noticed in the CAD model just before printing. Each iteration general focused on the major flaw of the previous model, but also allowed for fine tuning the dimensions of other parts, such as the total internal volume of the case, top and bottom layer thicknesses (which was kept at 2mm), an internal ridge for holding down the protoboard and the size and placement of the USB-C port and button, see Figure 21. Version 6 also incorporated a groove in the seem to make it easier to open the case and while not visible in the photograph all the external edges and some internal components were filleted for a smoother finish.



**Figure 21. Versions 1 to 6 of the case**

Version six of the case can be seen in Figure 22. The case is fully snap fit and everything can come apart quite easily. A nylon bolt is being used to reactivate the timer and the material is quite nice as it also glows when the LED goes off. For the time being the prototype case is sufficient for testing the functionality of the concept.



**Figure 21. Versions 6 of the case being programmed**

## **4. USER TESTING**

It would be useful for this design to do these different kinds of studies: self study, surveys, usability testing, and home user testing with diary entries and a concluding interview. For the scope of this thesis, I focused on self study to start with and detail the plans for the other kinds of studies in the section Future Work.

### **4.1. Self Study Structure**

The basis of this study is to understand how the timer devices impact the tasks they have been assigned to help with. I want to track if they are being actively used and my general feelings towards them. I will log diary entries daily or every other day and refer to this list of questions to prompt thoughts about the overall concept, design, and placement. The entries will be in audio recording and/or jot form notes, where I write if I've tended to the timers, any feelings towards it, and any ideas or

surrounding thoughts I have about it. Every 5-7 days I will write a reflective paragraph summarising the thoughts and behaviours at that time. Over the course of the study I will see how my thinking and interactions change through these reflections.

### **Questions:**

- ★ Did I interact with the timers today? Why, or why not?
- ★ How do I feel these devices help me manage tasks day to day?
- ★ Do I address them? Ignore them? Want to snooze them?
- ★ Is it apparent when they need attention? Are they too hidden/visible?
- ★ When I notice it, do I do it right away?
- ★ What kinds of tasks do I assign them to and where do I put them?
- ★ How many is too many?
- ★ Do I feel overwhelmed by them?
- ★ Do I wish there was a central location for them?

### **Speculations:**

I believe that these timers will ultimately contribute to a sense of well-being about recurring maintenance tasks within my environments, if I didn't I wouldn't be investigating this topic at all. I anticipate that I will have some negative feelings towards them, possibly a sense of overwhelm or shame about not tending to them. I wonder if the negative feelings will contribute to me not tending to the tasks I've assigned on a regular basis and that I may begin to ignore them within my environment, the same way putting a sticky note somewhere begins to be a blind spot my mind avoids looking at. Considering the amount of times I've switched task management methods throughout my life, as detailed in chapter XX, novelty seems to play a key role in my systems and I have concerns that this system might break down over time as the novelty wears off. Perhaps I may find a way to keep the system novel by changing the timers to different tasks, different day counts, different logic, or continuing to update the devices for a refreshing and more engaging look.

I also see the possibility of these devices helping me to develop consistent habits and allowing me to build more habits on top of them, a concept known as habit stacking (Clear, 2018).

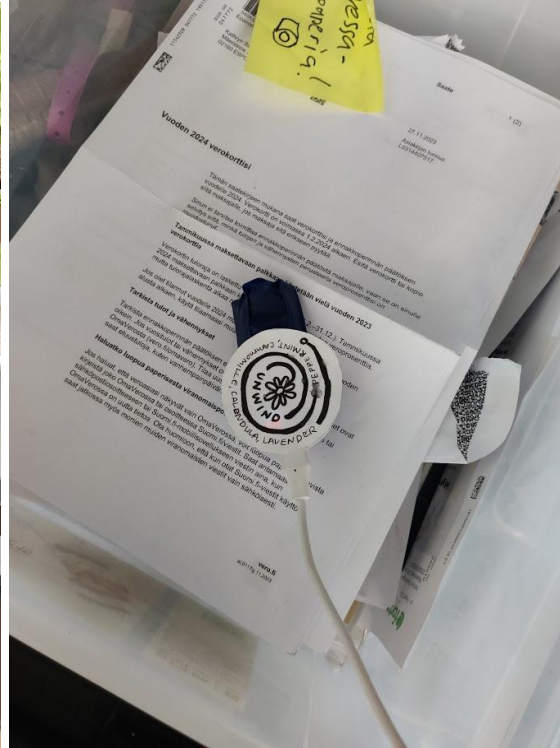
## **4.2. Reflections**

This section includes reflections from the self study in increments of every 5 days, including the first day when setting up the devices for study. Daily entries from the self study can be found in Appendix 3.

### **Day 0**

The first task I've put a device by, as shown in Figure 22, is a plant that is barely alive and needs to be misted every day if it has any chance of living. The threshold for completing the task every day is to just mist that one plant, but by misting that plant I also remember to check the other plants if they need water as well. I don't always check all the plants, but as long as that one plant gets misted, the task is complete and I can reset the timer. Another task I've assigned is putting away items from my 'chaos bin,' as seen in Figure 23, a place I've dedicated to putting out of place items around my apartment. The requirement for completing the task is low, simply putting away at least one item from the bin. Sometimes when putting things away I might feel inspired to put more than one away, and other times I struggle to handle just one. The bin contained a small piece of paper with a spiral on it which I decided to use as a diffuser for the LED on the timer to give it a different look.





**Figures 22 (left) and 23. One timer device placed by a plant that needs watering and one device placed inside a box of things needing sorting.**

### **After 5 days of use**

After arriving home one day, the timers were glowing blue in my dark apartment as seen in Figure 24. Things seem to be fine using the timers, I'm managing to tend to them but I am worried that the novelty of them will run out and I won't tend to them any more. I'm wondering if it will become a struggle, or if the ease of doing them will come and go. I'm already having feelings of wanting to skip tending to them. I don't want to put too many daily timers to prevent me from getting overwhelmed and putting them off, so I just have the two right now. I'm often in a rush when I'm getting ready to go in the morning and I don't look forward to doing the tasks associated with the devices. It feels forced, but that's ok, as long as it gets done. It feels like I never really have time to do them, but that's the point, it doesn't take long. Small steps towards keeping my home and life tidy.



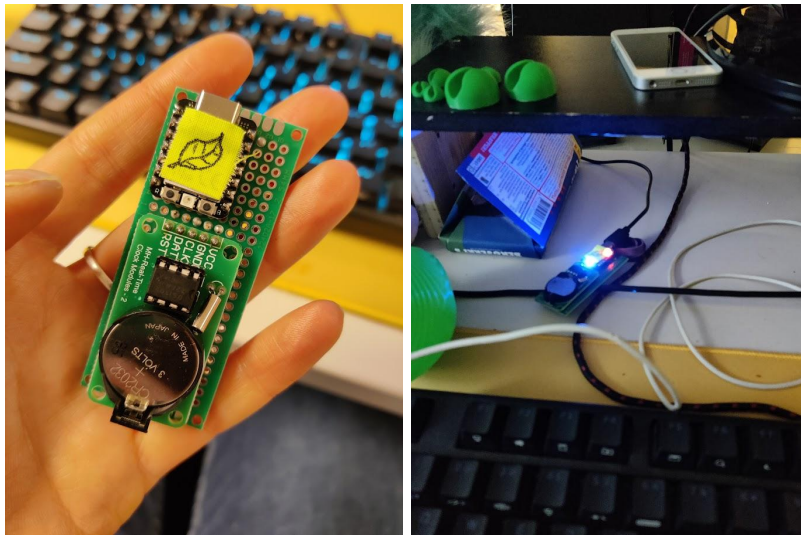
**Figure 24. The two timers in my home with their notification light on after arriving home and the apartment was dark.**

I've been mulling over what I want to assign them to. I've started by simply plugging them in so the timer starts running and then assigning them after. Before the prototype was finished I felt like I had way more applications for them. The limitation of having to plug them into the wall has changed where I can physically put them and has restricted how many I can use because of wall space and the number of adaptors and cords I have available. I found more USB plugs and cords after 5 days so I can plug the other ones in. I want to assign the newer ones to multi-day tasks so I don't have too many daily timers everyday. I'm considering making the current daily one of putting one thing away every few days so each day seems less repetitive. The idea of building a daily habit is of interest to me though, so I'll stick with those two as daily for now.

### **After 10 days of use**

I started to introduce more than daily timers so I have some timers that go off very few days now to see how the interaction flow changes. I put tape on some of the

timers and drew a little picture so I can identify them easier and it makes them a little more colourful to look at which is shown in Figure 25 and 26. I'm noticing that I don't tend to them right away all the time anymore but I'm still cognisant of their presence and do them eventually that day. The days have started to blur together and I really don't remember if I did them or not, I've also had a hard time remembering to make a diary entry every day or whether I have made a diary entry. I think I will make one of the timers a reminder to record a diary entry and put it inside my bedroom so the bright light will prevent me from sleeping until it is done. I'm starting to notice that I ruminate a lot on the limitations of the device and am brainstorming often about how to better implement it in the future.



**Figures 25 and 26. A timer I placed in my studio to remind me to water plants every 3 days.**

### **After 20 days of use**

Sometimes when I see the timer I really want to leave it and tend to it later and I have to push myself to do it. I think every time I do that it somehow makes it easier because my brain can't convince me it's a time consuming task anymore. I am finding it difficult to tend to them right now because it's a stressful time and I'm often out of the house, but I'm tending to them at least every 1.5 days or so with the drifting of the timers. I really like the timer I have in the kitchen of my studio, it's a bit poorly taped to the wall, as seen in Figure XX, but when I see the light on there I'm excited I get to tend to the plants. It's more fun when there are people around and

they chat with me about my plants and the timers. So far I don't think anyone has touched it, or damaged any of the plants on the windowsill. They are placed there a bit precariously, as shown in Figures 27 and 28.



**Figures 27 and 28. One device taped to the wall beneath a row of avocado seeds in cups of water.**

The drift of the timers is starting to bother me a bit because now they're becoming an extra thing I have to worry about. I didn't anticipate that my partner would be disturbed by the lights going off in the middle of the night in the other room and now I've started worrying about when I did them last and if I need to reset them in the morning so as not to have them go off again in the night. I'm thinking a possible solution for the drift is to deduct a couple hours from the timer when it's set. So if I tend to them at 1am, it resets to 11pm the next day.

There are two buttons on the current prototype, boot and reset. I thought boot would upset the program on the board so I carefully checked each time to make sure I was pressing reset. After a couple times of accidentally pressing the boot button, I found that it didn't matter and the timers continued to run as normal. This allowed me to be more nonchalant about resetting the devices and just click buttons until the LED goes off.

I'm finding that the days are passing really fast right now and I didn't notice it until I put my 3 day timer to run.

### **After 25 days of use**

I realized that the focus of these devices was not just about task management in general but on recurring tasks. Intuitively I made them for this purpose, as this was a missing feature in any task management system I would use. It acts more like a habit tracker, but instead of a tracker, it's a reminder to do the task. It's a bit of an in between the two ideas. I've been doing the tasks every day or two pretty consistently. Sometimes I leave them on for a while and tend to them later in the day or the next day. I've been having less feelings of procrastination towards them because I've done the task many times now. I know it's a short task so I have less thoughts about excuses for putting it off.

One of the issues I have encountered is that both the running LEDs and the timer LED give off quite a bit of light and if they're on in the night it can disturb my partner's sleep. I have to be mindful of when I'm tending to them and sometimes I hide the light under a book or by flipping the device over, which I then have to remember to flip back to see the timer LED light. This is both a limitation in the current prototype, having the small device lights constantly on, and that of a drift issue where the LED goes on later and later until it's activating in the middle of the night. I think I would consider having a consistent set time for the devices.

### **After 30 days of use**

These devices are accomplishing the goal I set for them, which is encouraging me to consistently manage recurring tasks. I have started to trust myself that I will tend to the tasks everyday or every other day. The feelings of wanting to ignore it are subsiding and it has become incorporated into my daily routine. I'm also not feeling guilt or shame about missing a day because I know from ongoing experiences that I will get to it the next day and that's ok. The multi day timers have also been incorporated into my routine and are helping me maintain my ongoing projects and tasks associated with them.

When my tasks get displaced because of company visiting or my partner staying over, I am mindful about them and place them back or still tend to them even when the task has moved away from the associated task. It's less of a disruption than I anticipated and proves to myself that they have been incorporated into my routines.

## **5. CONCLUSIONS**

Overall the study went well. I was able to test out different locations, task assignments, and different day counts. My emotions towards the device shifted back and forth but ultimately I'm still continuing to tend to them and foresee that I will continue to keep them around.

### **5.1. Results and Discussion of Self Study**

For the first prototype, the device was reduced down to its simplest function, an LED that turned on after the set amount of days uploaded from the program. This allowed for testing to start on the basic concept and feedback could be incorporated earlier in the iterative design loop. Having myself as the test user gave me the ability to evaluate logic and design decisions before creating a more polished prototype.

This practice of iterating in autobiographical design is to test early and often to prevent overthinking the design and investing a lot of effort into the first prototype. It allows for the design to shift more according to the needs I discover through the self study.

With that said, several limitations became apparent during the self study. As detailed in chapter 3.7 Prototype, I encountered some issues that limited the functionality of the device immediately. As stated, I had to use a plug to connect the device to power, limiting where I could place the devices as well as how many due to limited plugs. For simplicity of the device I also removed the programming logic for the day count

and provided the day count in the program uploaded to the board. This means there is no way to set the day count through the device itself. This didn't hinder its operation for my self study as I am knowledgeable about how to set the day count, and after it was set once I didn't change it. The tape used to wrap the board offers little to no protection for the components as well as it looking a bit unattractive and bare. I believe one of the boards became damaged because of this unprotected factor. When I first plugged in the board to start the study, I immediately noticed there were two smaller LEDs that were continuously lit on the board which caused a bit of distraction for when the notification light was on. It also caused problems for sleeping at night as the small LEDs actually gave off quite a bit of light. As I began to use the timers, I also encountered a limitation of the time slowly drifting as the timer was reset later and later, eventually causing it to flip from morning to evening, and eventually late into the night, again causing more issues for sleeping. There is no way to snooze the device if you want it to activate again later, which can add to blindness for the notification light. The LED light is also steady when on, a bouncing glow animation could be added to for better attention grabbing. I also found that when starting out the first few days, I wasn't sure if the timers were activating on the right time scale as there was no way to check how much time was left on the device or what day count the device was set to.

## **5.2. Summary**

Due to limitations in the prototype I was unable to adhere to all of the principles I set out in chapter 3.3. The exclusion of a battery meant that the device was tethered and minimizing battery use was irrelevant. The alerting mechanism was still fairly subtle as the LED would come on and stay on, not causing much distraction in the space, but there was no feedback for the resetting of the timer, negating any satisfying interaction. The prototype adhered to the principles of being a single function with a simple interaction and having no internet or phone connection. By only having a few devices active at a time I was able to avoid creating more overwhelm, and one of the devices used in the self study was set to multiple days.

In response to the research questions detailed in chapter 1.3, I was able to gather some research of other devices that exist similar to this but nothing quite like it was found. I discovered that the timer could be quite simple with the day count uploaded through the program, turning the LED on when the alarm was reached, and using the onboard reset button to reset the timer. It was still able to achieve results with this limited functionality which was a positive surprise, and it was able to increase response quite effectively to the associated tasks. I found that amongst the several negative and positive feelings experienced during the self study that it did contribute a positive impact on my wellbeing, resulting in decreased feelings of anxiety as well as gained a sense of achievement and trust in myself. Having multiple timers within my space on occasion caused some feelings of stress, but not overwhelm.

This project in a way gave me a sense of control over my phone addiction and task management system. It let me decide with intention what to pay attention to with my limited time and energy resources. It gave me a way to outsource the small repetitive tasks in my brain and let go of the worry that I would forget they exist. I gained a sense of trust in my ability to manage ongoing tasks. I think over time a balance and flow will emerge of how many devices are active and where they're placed so that I don't get overwhelmed or bored of the timers and continue to tend to the associated tasks. I have a hope that after time I will be able to regularly perform the tasks without the timer's notification and I can place the timer on another task that needs attention.

## **6. FUTURE WORK**

Additional Research Questions

Does the use of physical timer devices assist neurodivergent people with task management?

Continuation of Self Study



I find the devices useful and will continue using them. I want to iterate on their circuitry, logic, and different case designs. I'm hoping that over time I'll learn to naturally tend to the tasks and won't need to rely on the timers as much. If I notice I'm slipping on things, I can always put them back. It's like a little emergency attention given to a task I see building up so I can gradually get it done. Maybe the project changes every week, one week it's clean up this bin, the next week it's clean one thing in the bathroom, the next week it's work on taxes every day for 20 mins.. Who knows.

## **6.1. User Studies and Further Research**

I aim to broaden the scope of my studies beyond personal experiences. I plan to gather data through surveys, exploring individuals' encounters with attention issues and time blindness. Additionally, I aspire to conduct usability testing on the prototype to ensure a design that is intuitive and user-friendly for a wider audience. Some further research questions I would like to explore is if it is possible to learn a habit by using the timer that can be performed reliably without the device, and at what point does the number of active devices become overwhelming. I would also like to investigate the effect of temperature on the function of the device. Could it safely be placed in a fridge or freezer or left outside in the hot summer sun?

Methods for conducting further research would involve the use of surveys to get a better understanding of individuals experience of ADHD specifically relating to task management systems, usability testing to observe interaction with the device to better understand ease of use, user errors, and overall satisfaction, and user studies with interviews about others experience of using the timer devices.

For user testing I would seek out participants who have expressed interest in using these devices, self-identify as having ADHD, or experience ADHD symptoms. Throughout my design process I have received different responses to my project when speaking about it with others. Many expressed excitement towards the possibility of these devices and interest in having them, and from others, confusion

about why anyone would need something like this. The people who expressed interest likely also have issues with time blindness and organization, whereas the ones who express confusion I would imagine do not experience issues with time perception. It could provide interesting data to also have a user study with the later group, but as I'm designing an assistive device for people who are neurodivergent, I would target those users first.

These studies would involve giving participants some timers to use in their own home and documenting their experiences with it. They could receive anywhere from 2-5 devices, depending on production scale, and they would be asked to make diary entries, including answering a few questions about their interactions with the device. The study would ideally be over the course of 1-3 months so the devices have time to complete many cycles. The study would conclude with a freeform interview with the participant where we would discuss their total experience using the device and about capturing the diary entries.

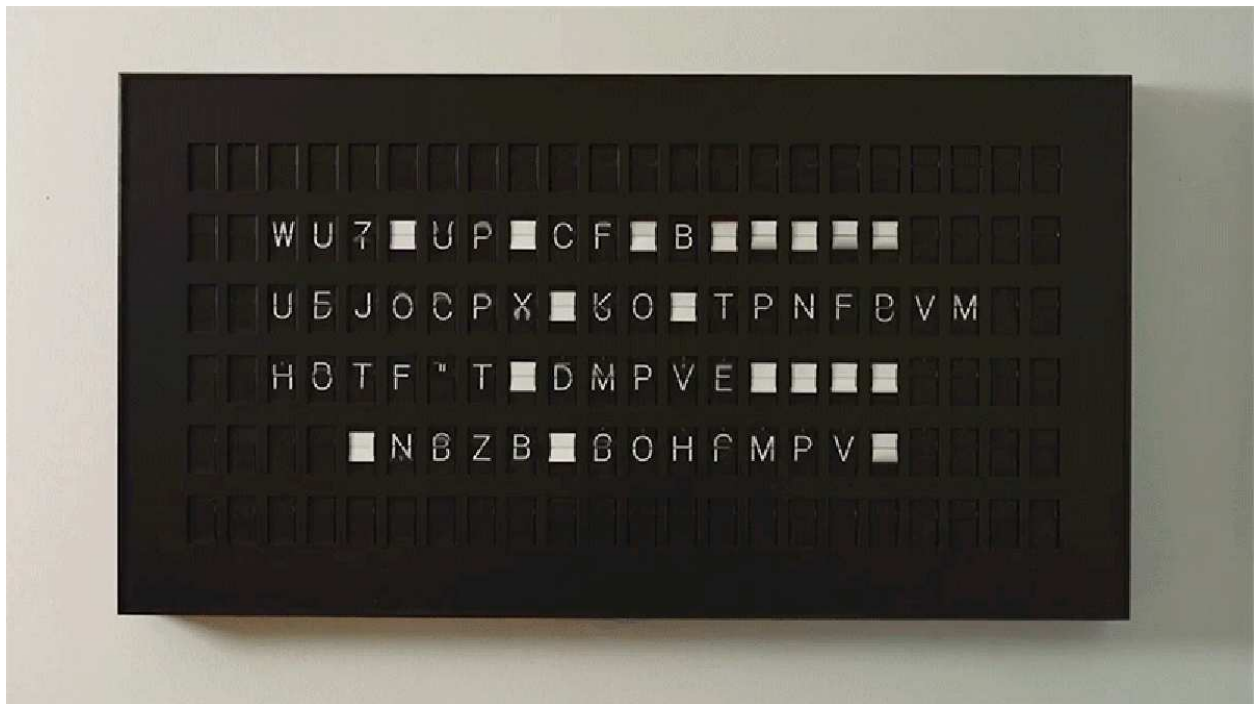
I would be interested to know if they consistently tend to the tasks, if the timing was consistent or varied, and whether they ignore it at all. As people's responsibilities and interests vary, I would like to know what kinds of tasks they assign them to, if they changed the pace of timer associated with it, and if the devices remained assigned to the same task throughout the study. Feelings experienced towards the devices is also valuable information as emotional regulation is a common issue with ADHD as well. I'd like to know how it felt to have the devices in their space, if they felt pressured or overwhelmed, and if there was any guilt or shame that came up related to the device use.

Consent forms and practices for handling of data would be central to conducting these studies, as well as approaching an ethics board about my testing proposal. I would have to find a way to generalize the data as not to single out any participant.

## 6.2. Additional Device Concepts

### Show one thing

The concept of the Smart Flipboard in Figure 29 is to take a large list of things and display them one at a time, changing the displayed item daily or weekly. This may circumvent the overwhelm of looking at a large task list or list of options. It addresses the inability to prioritize, executive dysfunction, and decision paralysis. It also plays to the need for novelty that people with ADHD experience. This would allow people to set longer term goals, regular task lists, or other lists to allow for them to be whittled down, or regularly practiced.



**Figure 29. Smart messaging flipboard display containing six rows of individual flip letters.**

[https://i.kinja-img.com/gawker-media/image/upload/c\\_fill,f\\_auto,fl\\_progressive,g\\_center,h\\_675,pg\\_1,q\\_80,w\\_1200/q9aasknaplymnb1w50ch.gif](https://i.kinja-img.com/gawker-media/image/upload/c_fill,f_auto,fl_progressive,g_center,h_675,pg_1,q_80,w_1200/q9aasknaplymnb1w50ch.gif)

Some potential use cases I envision for this device:

- ★ Tasks that have ambiguous deadlines
- ★ Regular tasks such as house chores

- ★ Word of the day for learning a new language
- ★ For people with many hobbies, one hobby to focus on
- ★ List of friends to keep in touch with
- ★ Quote of the day

### Keep it lit



**Figure 30. Silicone cat lamp with RGB light that activates when squished.**

**[https://i5.walmartimages.com/asr/4149ed74-3d66-4556-b7e6-0194073c981e\\_1.37042a245a86669692a33d6ff61e97c9.jpeg](https://i5.walmartimages.com/asr/4149ed74-3d66-4556-b7e6-0194073c981e_1.37042a245a86669692a33d6ff61e97c9.jpeg)**

Habit tracking comes in many forms and is often associated with some sort of streak that you want to keep up by doing the habit daily. I have found that while the streak

can be motivating for a time when you are sticking with it, as soon as it's broken, it becomes easy to let it slide and stop doing it. I wanted to design a habit tracker device that is more forgiving, easier to get back into when re-inspired, and similarly rewarding as the streak. I envisioned having some sort of fun shape made of silicon that you would squish after performing the associated action. The light would get brighter every time you squish it, until it is fully bright and glows rainbow. The rainbow would indicate you are at the max for that habit, and any additional squishes would perhaps give a different animation before returning to the rainbow. As time passes the light slowly diminishes, requiring you to continue performing the habit and squishing the light. Perhaps I could implement a spaced repetition algorithm with the habit, so as it's performed more regularly, the light decays slower.

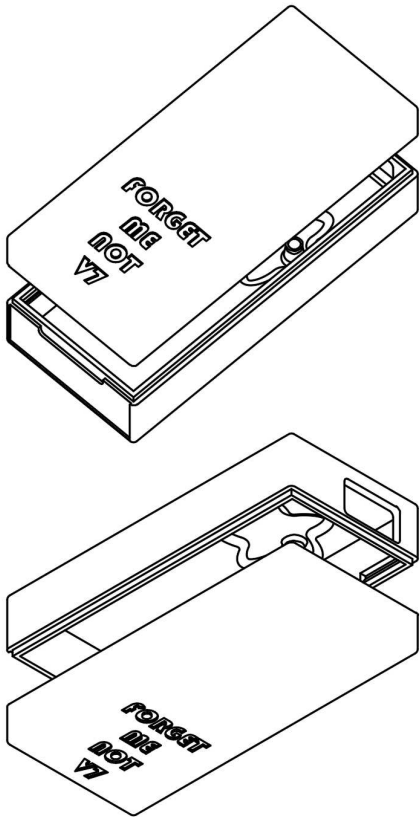
This device addresses issues with memory, keeping motivation for long term goals and habit formation.

Some potential use cases I envision for this device:

- ★ Track daily habits such as doing yoga, journaling, meditation, etc.
- ★ Learning a new skill such as playing guitar
- ★ Spend time tidying a space
- ★ Contacting a friend to keep in touch

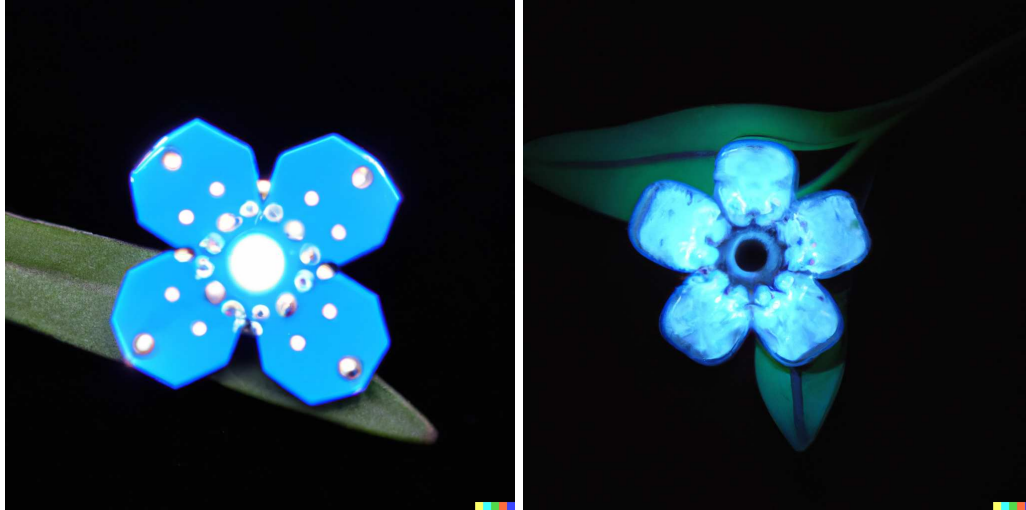
### **6.3. Redesign**

I've come to call the timer device Forget-me-not and have considered designing them in the shape of the flower by the same name. A version 7 of the device was drafted and depicted below in Figure 31 which incorporates the product name and indents the shape of a forget me not into the case. This way when the indicator light is lit, the hidden shape is revealed.



**Figure 31. Isometric view of version 7 of the Forget Me Not case prototype**

I used DALL-E 2 to generate some images for a possible shape and feel as depicted in Figures 32 and 33. It would give it a playful name association that directly correlates to the concept of remembering tasks as well as a unique and pleasing look for embedding into physical spaces. The petals also might help serve as a method to display a countdown of sorts so the amount of days left could be accurately conveyed. This could aid in better time perception overall for the user.



**Figures 32 and 33. Circuit board with glowing LEDs in the shape of a forget-me-not flower, generated using DALL-E 2. (Katie Ballinger, DALL-E 2. 11th December 2023. [www.labs.openai.com](http://www.labs.openai.com))**

In the redesign, I would incorporate batteries for more flexibility and freedom by making it run on standard AA or AAA batteries. This would accommodate a user who is disciplined enough to use and maintain rechargeable batteries, but does not punish a user who may forget to charge a device and could lead to an interruption in their routine further than just changing a battery. A rotary encoder with LEDs would be added for easy day count setting and reset. For practicality, a clip on the back allows securing it to different objects. To enhance user engagement, a soft bouncing glow during notifications would save battery while capturing attention. Simplifying day count adjustments, LEDs around petals would light up in various colours, making it a breeze to set larger increments. Checking the day count would be a visual treat as the petals indicate the remaining days.

#### **6.4. Production Plan**

The production plan is a systematic approach to refine and improve the envisioned device. Starting with a redesign based on self-study conclusions, the prototype undergoes usability testing to identify areas for improvement. Adjustments are

made based on test results, leading to a decision on the technology for the next prototype.

The design process includes creating a printed circuit board (PCB) for testing. A small number of PCB boards and components are ordered, and after assembly, functional testing ensures proper operation. Logical programming is then implemented to match the prototype's new design.

Iterative testing and refinement continue, with additional rounds of usability testing incorporating user feedback. At this stage, material exploration for a casing structure is done and decided upon. A limited run of prototypes is manufactured for a more extensive 1-3 month user study, informing final redesigns to create an optimized device.

The last phase would involve producing a limited run of the final prototype for personal use and sharing the PCB design and component kit online. The open-source approach encourages others to replicate and contribute to the device's evolution without commercial interests in mind.



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# APPENDICES

## 1. Hardware Components

The components listed here are referenced by chapter 3.7 Prototype. The name is as it's referenced in text, manufacturer, model, and URL.

### 1.1. Adafruit Feather Board

Adafruit Industries LLC - ADAFRUIT FEATHER RP2040

<https://www.digikey.fi/products/detail/adafruit-industries-llc/4884/14000603?s=N4lgTgTCBcDaIIYBM4DMBOBXAlgFwAQBYAOQ-EAXQF8g>

### 1.2. Adafruit RTC Board

Adafruit Industries LLC - STEMMA QT PCF8523 RTC

<https://www.digikey.fi/products/detail/adafruit-industries-llc/5189/15189154?s=N4lgTCBcDaIIIBMCGAzATgVwJYBcAEArAlwAcAnCALoC%2BQA>

### 1.3. JST Connector Wire

Adafruit Industries LLC - STEMMA QWIIC JST SH CABLE 50MM

<https://www.digikey.fi/products/detail/adafruit-industries-llc/4399/10824268?s=N4lgTCBcDaIIYBM4DMBOBXAlgFwAQBYBmATmJAF0BfIA>

### 1.3. XIAO-RP2040 Board

Seeed Technology Co., Ltd - SEEED STUDIO XIAO RP2040 ARDUINO

<https://www.digikey.fi/en/products/detail/seeed-technology-co-ltd/102010428/14672129>

### 1.4. XIAO-ESP32C3 Board

Seeed Technology Co., Ltd - SEEED STUDIO XIAO ESP32C3 WIFI+B

<https://www.digikey.fi/en/products/detail/seeed-technology-co-ltd/113991054/16652880>

### **1.5. DS1302 RTC Module**

Okystar Technology Co., Ltd - OKY3391 DS1302 Real Time Clock Module

<https://www.okystar.com/product-item/ds1302-time-clock-module-for-arduino-oky3391/#tab-id-3>

### **1.7. Rotary Switch**

Grayhill Inc. - SWITCH ROTARY 2-10POS 150MA 115V

<https://www.digikey.fi/fi/products/detail/grayhill-inc/50DP36-01-1-AJN/764218>

### **1.8. RGB Rotary Encoder**

Sparkfun - Rotary Encoder - Illuminated (RGB)

<https://www.sparkfun.com/products/15141>

## 2. Paper Prototyping Study Notes

### SETUP.

- explain basic concept.  
long term timer over multiple days. (count down)
- explain what back and front displays are  
(leds, button, dial) (backside)

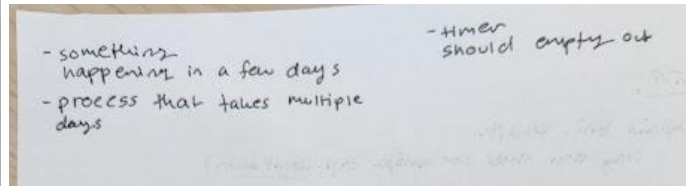
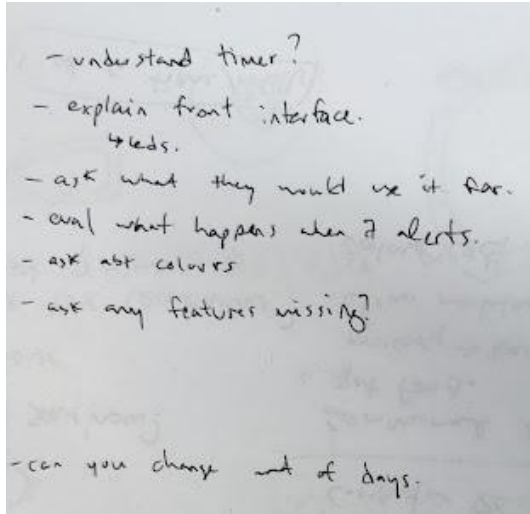
### EVAL.

- please set the timer.  
<sup>one day,</sup>  
(move to back clip, explain picture of clip)  
(move to first LED screen)
- how do you understand this <sup>display?</sup> phase?  
(move along LEDs slowly until red, explain days pass)
- how would you use this? why?

### Notes.

- press button to confirm
- would try something on the front first
- need confirmation
- dots signify days / one round = one day.
- pills. (want exact time)
- expecting full led ring.
- would expect beeping or vibrating.
- didn't know abt button.
- context of use?
- needed instructions
- red display wasn't clear
- button as dial  
↳ put controls on front





### 3. Self Study Diary Entries

#### Day 0

- Finished prototype, setup
- Put one on my box of chaos to sort (a box where things that don't have a place or need to be put away end up. Intention is to put away at least one thing each day.
- Put one by my almost dead plant to mist, plan to water the other plants as well when I check if that one needs mist.
- Thought about putting one by the sink so I wash one per day. I don't have another plug right now so will pause on that, plus I do my dishes pretty consistently anyways.
- Would reset them in the morning to start them off.
- Noticed that there's two small LEDs that's always on when it's plugged in, which distracts from the notification LED. That's a bummer. Will try to cover it with a case, or some tape. Not sure how to turn it off in code right now, but I think it still functions with it anyways.

#### Day 1

- I did the thing, I pressed the reset button, and that started the timer properly. I put one thing away from the box, and then I watered a bunch of plants.

- I want a timer for mending clothes every 3 days or something. Need to start tackling my clothing backlog.

## Day 2

- I was waiting for my timers to go off, I was really excited, and then they weren't going off, so I waited. I was itching to do the thing even though the timer isn't done. I guess I could have just pressed the reset button even if it wasn't time yet and done it early.
- I put the thing away from the box and then forgot to reset the timer for a while, but I noticed it and reset it.
- So if I press the timers later and later every day, there's a time drift that happens. If I press it at 2pm and then the next day I press it at 2:10pm, and the day after that it's 2:20pm, and eventually it's like 5pm when it goes off again.
- If I click the timer early, how do I know how close I am to the alarm time? Maybe I need a different colour to show so I know it's getting close enough for me to be able to do it early. If it's a multiday thing, then I should be able to see how many days are left. I could make a short press on the reset button that shows me how many days are left, and maybe two short presses to show how many days the alarm is set to, then a long press would actually reset it. So if I am wondering "how long did I set this thing to again? Ah, tap-tap, right it was 8 days."
- It's not possible right now with this logic to add hours, only days. So if I just wanted to nudge it an hour forward that's not possible.
- What if I want it to be over 90 days? That's a lot of clicking to get to 90 days (when I eventually get the button programming mode working) What if there was a day, week, month mode? I feel like that would really benefit from a display.
- What if I wanted the timer to be the last day of the month? That's currently not possible with the way the alarm is programmed. I think I could do it easily in the code, but I'm not sure how I would achieve that through programming it on the board.

- What if I had different kinds of timers? Like different kinds of modes. Could set it to hours, days, weeks, months.
- What if I mimicked the way google calendar sets up repeating events?

**Does not repeat**

Daily

Weekly on Tuesday

Monthly on the first Tuesday

Annually on December 5

Every weekday (Monday to Friday)

Custom...

**Custom recurrence**

Repeat every 1 week

Repeat on

M T W T F S S

Ends

Never

On Mar 5, 2024

After 13 occurrences

Cancel Done

- I mean that kind of defeats the purpose of its simplicity. Also if you want to set the timer to something like 90 days, you can do it, but it's more difficult, so it kind of discourages that kind of longer term use. I could put a fancy display on it, I could put bells and whistles on it, but then I'm just getting closer to what a phone does.

### Day 3

- This morning I tended to the timers. I saw them go off and thought I don't have time to tend to them, but I did anyway.
- I put one very small thing away from the box, I spritzed my plant, and I reset them both.
- I was thinking of leaving them until the evening when I come home, but I just wanted to get them done. So that's good, I'm getting the stuff done, they're working.



- My plants didn't look like they needed water, so I misted the one and left the others alone

#### **Day 4**

- They didn't go off before I left the house around 12. Not sure when I reset it yesterday, is it on time? I'm not sure. I might have pressed the bootloader button by accident, I'll check tonight if they go off.
- There's no way to "snooze" the timer for a day. What if the thing isn't ready, but I want the light to go away and notify me the next day? There's no functionality for that currently. Do I even want that kind of functionality? I kind of like the simplicity of it not being able to snooze. But right now I'm dealing only with daily timers, so that may be relevant for multi day timers.
- I'm thinking about adding some timers at my studio for things, like I have a pile of clothes I want to mend, or water my plants in the kitchen, or clean up my space every few days as it becomes unruly. I don't really want to put them in the collective space where anyone can press them if they don't know what they are, because it might disturb the timer setting and I wouldn't be able to tell. So maybe I would have like a "command station" of timers at my desk and I could label them so I know at a glance what needs tending to, and it's in a spot I look at all the time so I would notice them. My friend in the same room would also be able to see that they're ready and he knows what my project is so maybe he could also help me out by letting me know they're ready, or by just doing the task and resetting it himself.
- I want to put a timer on my kombucha. I have it sitting in the fridge waiting to start it, but I'm a bit worried about starting a new project while I finish my thesis, so I'll maybe start that in the new year. I think you're supposed to feed them every week or so.
- When there are many timers on, is that something that makes me want to avoid them more, or engage with them more? I don't spend a lot of time at my home, they're kind of annoying because usually I get up and I'm rushing around trying to leave, so to tend to them, it has to be a quick thing. The timer I want to set for mending clothes, it's not a 2 minute thing to do, so maybe it's

not a good candidate for this timer, or I have a different kind of timer. So I have these little maintenance tasks, like doing dishes or cleaning up something from the box, or putting some clothes away. The box is a place I put things when I come home or when I'm tidying up and it's just a box of things that needs to be put away. Everything that comes into my house that needs to find a place, I just throw it in this box and I deal with it later, but I never deal with it. It just goes in my closet and I never see it or put it away. It helps to keep my house from becoming a disaster, but I also don't feel organized. So I put a timer there to make me put one thing away per day, doesn't matter how small, just as long as one thing goes away. If I have time, sometimes the act of just putting that one thing away sometimes spurs me to put another thing away and I see another thing that can go away, so sometimes more things go away, but bare minimum one thing goes away. Like yesterday I was in a rush, needed to go, but I needed to put one thing away, so I picked up a USB stick and put it in a drawer. That was enough to satisfy that task for the day. The first day I had more time and actually took an entire bag of clothes out, sorted them and put them all away, so I actually got quite a few things put away that day. Steady progress away from chaos is going to help me maintain my household.

- There's my one plant that's really dying and it just needs a mist everyday if I'm going to keep it alive, but while I'm doing that everyday, I also see the other plants on my shelf and check if they need water too and tend to them if they need it. But there's my other plants across the room that need a good drink like once a week, and I think I want to put a different timer for those. I need to drag some of them into the shower and rain on them for a bit and that's a bit more involved than just misting or pouring water from a jug.
- I'm having the same kind of clutter issue at my studio and maybe I'd like a timer for every few days to help me combat the crazy mess in here.
- I think I'd like to put a piece of tape on each timer with a picture or word for what they belong to. I'll do that tonight.

## Day 6

- Thought about the timer for turning my light on and off, constant rotating, can see where it's at, simple, intuitive, and visual. But it makes a noise
- They have drifted to be at night now and I want to reset them for the morning, so maybe tonight I'll skip it, or I'll do the task and reset them in the morning.

## **Day 7**

- I left the timers alone last night and tended to them in the morning. I was in a rush, but I managed to water a few plants, then I had to refill the jug so I didn't water the others (the jug needs to evaporate chemicals for 24 hours). I did put something away from the bin but I can't remember what. I think it was small.
- I came to the studio and my plant timer was on. I want to change the day count on it to be every few days instead. I also want to make a little sign and put it in the kitchen next to the plants. I put a piece of tape on it and drew a little leaf. I want to cover the LEDs on it so the other LED is more pronounced when it turns on.
- I'm thinking a soft glowing on/off would be more attention grabbing than a stationary light. Sometimes I don't realize it's on right away because there's so many other random LEDs everywhere else in the room, like from small electronics and such. Could think about adding a sound component as well, so if you don't see it you hear it and vice versa.

## **Day 8**

- I'm feeling frustrated with this project, like it's putting structure on myself and my brain tries to resist the structure and rebel against doing the thing my past self told it to do. The whole effort of trying to regulate and put structure to my life feels futile, like it will always go towards chaos and no device or app will ever help me. I'm staring at the LED that's on and thinking about what makes this device different from any other thing I've tried. Will my mind just eventually start to ignore the light, it's just a part of my background now? Is it ok though if I just need a break that day and I don't do it, should I be forgiving to myself, or should I be forcing myself to do it every day? My attitude towards it seems to change day to day.

- I think my brain is just procrastinating by having this thought train.
- I left the timers all day and tended to them at midnight, put away a couple things and watered most of my plants including the one outside. Felt fine doing the task.

### **Day 9**

- Timers went off at midnight or 1am, I'm not sure but I don't really want to tend to them tonight, I'm going to do it tomorrow and reset them for the morning.
- Was looking at the rotary encoder and thinking about how I could have incorporated that into my design. I was thinking there was no way to do it besides showing a digit display, but if I still had the ring of LEDs with the rotary encoder in the middle, I could use it to count days on the LEDs. one turn completes a red ring, then it turns them to green, then blue, then purple and so on to show weeks or something. Then count down can just be those colours counting down until it's red again, last day blinks one red LED, then the day of it does something special. Maybe a rainbow glowing on and off?
- Came to the office and the timer is on for watering the plants. I want to change it to every 3 days because they don't need so much attention. I'll program that now.

### **Day 10**

- Was busy this morning and was going to skip my timers. I did notice them and then I realized it's really just something so small that I can do it in a brief moment. So I spritzed my plant and threw a post it note in the garbage, that is considered done.

### **Day 12**

- Yesterday I did the watering task at 11:30 or midnight but I forgot to click it. I did the putting away one at like 1am and I remembered to click it, and then I remembered to click the other one. But now they're set for like 1am..
- I'll just reset it right now in the morning so it'll go off at a better time. Ok both reset.

- Noticed the boot button doesn't make the light go off
- I put a new timer on my mirror so that when I'm going to bed I can remember to do my diary entry, I've been forgetting already. Meta task level.
- I feel fine about them. I'm still getting stuff done, even if it's not at the interval I'd like, it's not consistent because I keep forgetting and it pushes back each day, so it's like every 1.5 days, but that's still better than when I didn't have the timers and I wouldn't do it for weeks and my plants would all die.

### **Day 13**

- Did the timers at 1 or 2am. Felt fine.
- In the morning, I wanted to do them, but I knew they weren't going to go off. I think I put something away anyway, so that was nice. Wanting to do the thing without needing the timer, because that's always an option.
- Discovered the timer I set to remind me to record these daily journal entries wasn't working. It's plugged into the wall, it was on before, so I don't know what's up with it. Maybe the charger isn't powered enough, or the cable is too long.
- I figured out that the boot button doesn't do anything, so if the LED is on and I accidentally press the boot button instead of the reset button, the LED doesn't go off. So it's not the end of the world, I just hit the other button. So now I can nonchalantly feel around for a button rather than looking at the tiny letter first before pushing it. Then I just push whichever button until the LED goes off. Nicer than panicking about pushing the wrong button.
- The avocado light went off at space 21 today. I did not realize 3 days had already passed. Damn that went fast. I thought I set it yesterday. I guess I'll look back at my pictures and see what date I took the picture. Time is passing very fast right now.
- I watered all the avocados, had Jason take a pic of me as proof I did it, and also topped up all the water in the plant jars. So I did the entire task, not just the bare minimum.

- There's tape over the button on that timer, so I just poked around until the LED went off, cause now I don't have to worry about the boot button and reset button.
- The diffusion of the LED on the tape was quite nice.

#### **Day 14**

- I don't remember if my timers went off this morning. They're not on now and it's 11 at night.. I think I tended to them at like 1am or something yesterday, or maybe I reset them in the morning. I can't remember.
- They might go on in the night and wake my light-sensitive partner (even though they're in the other room!)

#### **Day 15**

- Was in a rush this morning so didn't do the things.
- It's now 12:08am, did the things.

#### **Day 16**

- Didn't do my timers this morning, don't remember if they were on or not.
- I tended to them at like 12 or 1 in the morning. Unfortunately for my partner that means they'll go off in the middle of the night and wake them up the next night. I'll try to reset it in the morning
- One of the devices isn't working, the one to do the journal entries for thesis. I brought home a cable to replace it, will hook it up tomorrow to get the timing right.
- Just felt a pang of trust for the devices, like I may not be doing it on time every day and may let it drift until morning, even skipping it once or twice, but it's still mostly getting done and my plants are staying alive and my bin is slowly getting emptied (very slowly, because I keep putting new things in there..) but i know that i'm in a special stressed time and that emptying that bin is not my priority right now, so i'm ok letting it pile up because i trust that it's being maintained and will have energy to do more than the bare minimum soon.

- I'm going to keep using these devices, they're useful. I want to iterate on their design and play with different cases. I'm hoping that over time I'll learn to naturally tend to the tasks and won't need to rely on the timers as much. If I notice I'm slipping on things, I can always put them back. It's like a little emergency attention given to a task I see building up so I can gradually get it done. Maybe the project changes every week, one week it's clean up this bin, the next week it's clean one thing in the bathroom, the next week it's work on taxes every day for 20 mins.. Who knows.

### **Day 17**

- Tried plugging in the new cable but it didn't work. Tested the plug and cables and it wasn't that. Took the board into the studio to debug and it still wasn't working so something might have shorted as the board wasn't being recognized by the computer at all. Will leave it for now and debug it later.

### **Day 19**

- When I walked past one of my timers, the plant one, it was on. I didn't even think about it, I just did it. I spritz 2 plants and reset it
- I noticed the plant I'm trying to save for the first time has grown a new shoot! I'm really trying to revive it, so new little leaf, that's great.
- I was away for a day and the timers went off. I didn't tend to them when I got back, I just crashed. Things are really stressful right now but these tasks are not totally necessary tasks so it's ok that I miss a couple, that's fine.

### **Day 21**

- 2:45pm, noticed my timers were on so I tended to them
- Plant light was on at the studio so I watered all the plants and reset the timer

### **Day 22**

- Saw the light on and tended to it, i've been at home during the day the last couple days so it's been going off in the afternoon and I've been tending to it

- Noticed the feelings of not wanting to do it are decreasing, like I'm running out of excuses to not do them and so I just do it, which is great and what I was hoping for.

## **Day 24**

- Had company today
- Yesterday I hid the plant watering timer because the light comes into the bedroom from the device just running and disturbs my partner, but now I can't see the light come on from it and I have to remember to turn it around again. It's kind of an extra thing to remember and something I didn't anticipate.
- I turned it back over this morning and it was on, so I did the thing and reset the timer.
- The box of chaos that I was putting things away from got put in a different spot away from the timer and now it's just on the shelf. I don't know if it went off today or not. It might have gotten unplugged accidentally resetting the timer.
- Having company over kind of disrupted where everything goes
- I wonder if I could have a snooze mode where the timer is only active during certain hours so it wouldn't go off in the middle of the night if the drift occurs. Maybe you could set the snooze hours somehow, but that just introduces more complications.
- I'm thinking about how to figure out the timelines for when a task needs to be done, like I'm not sure when my peace lily plant needs water, I just water it when it droops and I wish that I could catch it a day or two before it droops. I thought about maybe putting a post it note with a date when I water it and then next time I water it I can calculate the time needed based on that. There's other ways to check if it needs water, like sticking my finger in the soil to check the moisture level, or picking up the pot to see if it's light. I do wish I had another timer to put out for that but one device stopped working and I haven't been able to debug it and another has been set aside for doing the 3D



printed case design. So I currently just have the two at home for daily tasks and the one at the studio for every 3 days.

### **Day 26**

- Tended to the home tasks earlier today
- Light was on for watering plants at the studio, so I topped everything up. Watered them alongside the professional who comes to water the other plants. Was a nice serendipity and we chatted about plants for a while.
- Looked at them at night and was really satisfied that I'd done them earlier. Feels like I'm on top of things.

### **Day 27**

- Tended to the devices this morning without hesitation and went above the basic version of each task.
- Feel like the devices have become incorporated into my routine and they're getting easier and more automatic to tend to.
- I also feel less stressed about the maintenance of my home because I know it's slowly getting tended to and it will eventually get to a cleaner state even though it's a bit chaotic right now while I'm very busy and out of the house a lot.