



task management gamified with tetris

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integrative project thesis

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[demo website](#)

## introduction

*Brrring!* The familiar sound punctuates your last few breaths of sleep as you emerge from your covers, fumbling blindly to retrieve your phone. *Ready to build your day?* The notification lingers on your lock screen, waiting with patient persistence for you to play. With a reluctant tap, you open the notification and your screen floods with color as task blocks begin to fall methodically into place at the bottom of your screen.

Blox is a mobile productivity app that aims to relieve some of the anxiety that comes with planning and organization for a University student with a moderate-severe traumatic brain injury (TBI). Though each traumatic brain injury is unique, varying degrees of short-term memory deficits have been reported as a prominent issue for the majority of patients in rehabilitation. Assistive technologies do exist, but there is a need for an affordable and intuitive app system that provides an engaging model for everyday scheduling. This application assures the user that it is OK to do something later and organizes tasks and thoughts into a manageable alignment of colored blocks in a grid, minimizing overwhelming feelings and frustration.

Though I am designing for those with slight memory impairments, the focus on simplicity and the integration of familiar Tetris game elements invites a more universal user base. Recent psychological studies demonstrated a significant increase in task performance when the act of completing a task becomes a game. Gamification, a term coined in the early 2000s, uses “elements of game design in non-game contexts, products, and services to motivate desired behaviors.”<sup>1</sup> In the context of Blox, implementing gamification provides a greater incentive to complete daily tasks, while also improving visual-spatial, organizational, and goal-oriented skills.

Because most traumatic brain injuries occur among younger adults, frequently from sports-related injuries, an assistive application design is the most intuitive solution for an age group that already integrates smartphone usage into daily life. Living on a college campus allows me to reach out to this target audience to conduct interviews and user testing sessions so that the application can most successfully achieve its goal. There are 1.365 million people in the US who sustain such an injury each year, and many of them are college students and athletes whose injuries are mild enough to continue their education but who still experience frustrating challenges with short-term memory and organization skills.<sup>2</sup>

Additionally, a stigma has formed against people who have sustained these injuries due often to misunderstanding and ignorance on the side of those unaffected. I want to help fight against this stigma, generate new conversations about mental impairments, and spread awareness about what everyday life with a brain injury may be like through the creation of this app on a college campus.

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<sup>1</sup> Deterding, Sebastian. "Gamification: Designing for motivation." ResearchGate. July 2012. Accessed December 2016. [researchgate.net](https://www.researchgate.net).

<sup>2</sup> Daneshvar, Daniel H. "The Epidemiology of Sport-Related Concussion." *Clinics in sports medicine* 30, no. 1 (January 2011): 1-17. Accessed November 2016. doi:10.1016/j.csm.2010.08.006.

## contextual background

The drive to do this project stemmed from meeting Rama Mwenesi, who has lived with the repercussions of a traumatic brain injury developed from a series of severe concussions while boxing. My understanding of TBIs through my relationship with him and extensive further research has inspired me to address moderate memory impairment through an integrative phone application.

Though many scheduling applications are readily available, none are specifically tailored to the technological needs of those with more moderate TBIs. This niche group of people can often feel challenged by the complexities of apps designed for the general user but humiliated by exclusively “assistive” designs.<sup>3</sup> As this project has evolved, I have narrowed my target audience specifically to Rama, which has allowed me to create a design that makes a real impact on his needs in his everyday life—something that he is proud to use.

Thus, the most important concept to keep in mind in creating this application has been designing to Rama’s ease of use, instead of prioritizing my own aesthetic and functional decisions. Though existing task management applications such as *Things* and *Any.do* place an emphasis on simplicity as well,

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<sup>3</sup> Ferguson, Scott, Daniel Friedland, and Emma Woodbury. "Smartphone technology: Gentle reminders of everyday tasks for those with prospective memory difficulties post-brain injury." *Brain Injury* 29, no. 5 (January 27, 2015): 583-91. Accessed January 2017. doi:10.3109/02699052.2014.1002109.

there is no driving motivation for someone with a TBI to break from their own routines to use them. Until an app can prove itself to be more beneficial than physically writing a task down on paper, it remains ineffective. Entering a task into a smartphone often feels too risky due to the ease of ignoring or forgetting to check a reminder. This is the primary problem I have been exploring in this past year.

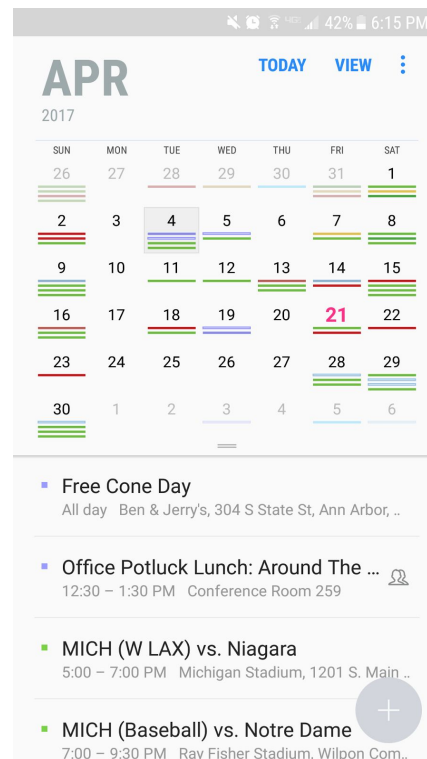
Rama currently writes his daily to-dos and events on individual Post-It notes that he stores in his pocket, and this unique method of coping works for him. He is unwilling to use anything that might be labeled as “assistive” because that would mean admitting to his difficulty with planning. This tends to be a common trend among most people who have endured less severe traumatic brain injuries, who feel they need to make an effort to retain an outside impression of normalcy despite their struggle with prioritizing, organizing and remembering the elements and people of their day-to-day lives.



*rama writing down his day on a post-it note.*

According to a report by Lars Evald, a neuropsychologist at Aarhus University in Denmark, there are advantages and disadvantages to TBI patients adopting personal digital assistants, which range from programs in smartphones to need-specific devices and pagers. After several weeks of training sessions with a smartphone calendar, users reported reasons for discontent relating to the cost of the device (cell service, etc.), difficulty remembering how to use the device or manipulating the screen, battery life, and misplacement.<sup>4</sup> There is currently no mode of technology available that solves all or even some of these problems, leaving those with moderate memory impairments to find their own solutions, like Rama has done.

In Evald's study, 10 of the 13 participants were already using some form of a calendar to organize their day, though only four were using the calendars on their smartphone devices. After the study, which involved six-week training sessions in typing out calendar assignments and navigating the calendar application, 10 of the participants continued to use their Android smartphones as their primary daily organizers. Nearly half of users reported to feeling an improvement in memory after the six weeks, and three reported to feeling less stress. Above all, the visual and auditory pop-up reminders on their screens were reported to be the most helpful, and the all-inclusiveness of a smartphone device allowed them to keep everything (email, messaging, calendar, browser) together with ease.



*Android calendar design*

<sup>4</sup> Evald, Lars. " Prospective memory rehabilitation using smartphones in patients with TBI: What do participants report?" *Neuropsychological Rehabilitation* 25, no. 2 (October 21, 2014): 283-97. Accessed December 2016. doi:10.1080/09602011.2014.970557.

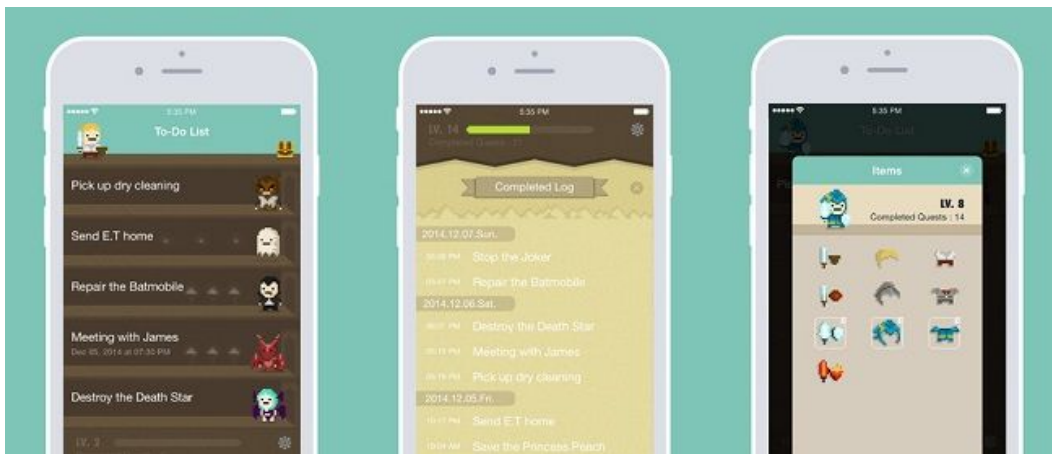
Despite the success of the calendar training sessions, the Android calendar system is a complex, multifaceted tool designed for users who are capable of and willing to enter a significant amount of information for each task and manage multiple calendars. For those who already struggle with organization, this is overwhelming and unhelpful without a significant amount of training and upkeep. Often, the lack of an effective technological aid for reminders is what leads those with more moderate TBIs to become more dependent on family and friends, resulting in waves of depression as they feel inescapably burdensome to their loved ones. A prominent goal in creating Blox is to help these users become more independent with an aid that emphasizes simplicity, accessibility, and most likely is already in their pocket. Additionally, Blox functions without cell service, preventing expensive data charges or lack of function in low service areas.

Maia Volk, another University student who sustained a severe concussion last year and spent three months in recovery, recounted an experience she had during that time where she was given the responsibility of planning a party at her co-op. "I struggled with splitting big tasks like planning that party into smaller more manageable ones. I was immediately overwhelmed when I started thinking about sending invitations, buying food, setting up, and everything else—I couldn't do it," Maia said. In her frustration, she sent a detailed email to her co-op listing all of the things she had difficulty doing so that they could better understand what she was mentally capable of.

To cope with this daily frustration and help her to focus on what she needed to do, Maia did puzzles and went through many coloring books—fun activities that allowed her to set small, achievable goals and complete them, restoring a sense of control over what she was doing. Rama plays puzzle games like Tetris and PacMan everyday to help him stay focused and calm so that he can successfully go about his day and complete the things he needs to do. The natural parallels between these goal-oriented puzzle games and task completion has driven me to combine the two in an effort to ease some of the stress associated with getting things done in a fun, simple way. "The achievement served as a catalyst,

but it was the activity itself, not the achievement, that was the real reward," writes Elizabeth Lawley, professor of interactive games and media at the Rochester Institute of Technology, of a gamified system developed to increase student retention rates at the Institute.<sup>5</sup> Blox motivates users with the activity of playing Tetris; the reward—the knowledge that you as a user are improving your task completion efficiency—comes second.

Currently, there are a few notable task management applications that apply the concept of gamification to their model. All are based on creating a character within the app that conquers and overcomes battles as the user complete your tasks, simulating a mission or journey the user partakes in everyday. One of these is called Quest, which rewards the user with coins to purchase new clothing and weapons every time a task is completed. Each completed task corresponds to a victorious battle or heroic feat. Though this application is simple enough, the character creation has a limit and the battles fought become repetitive, decreasing the motivational aspect of the app.

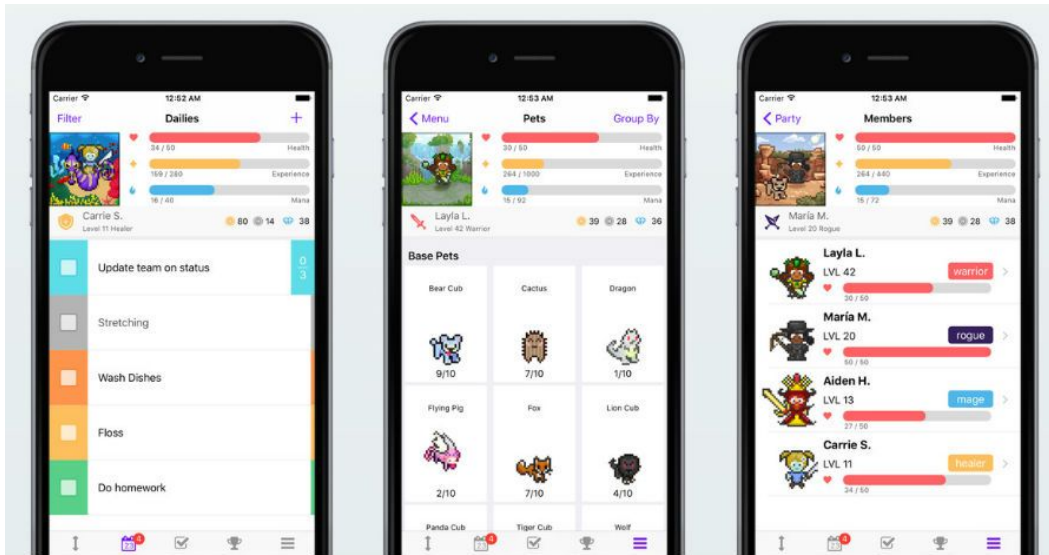


*quest app interface design*

<sup>5</sup> Deterding, Sebastian. "Gamification: Designing for motivation." ResearchGate. July 2012. Accessed December 2016. researchgate.net.



Habitica, another application that turns completing tasks into fighting virtual battles, allows the user to share their lists with friends so that getting things done becomes a collaborative effort.



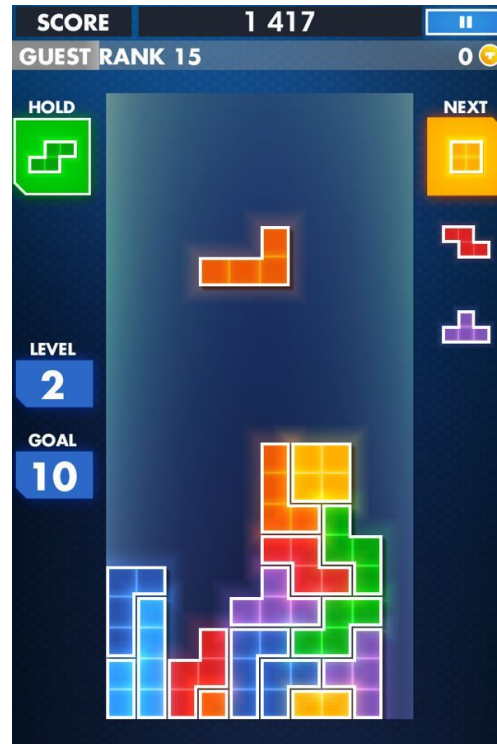
*habitica app interface design*

Though this is an effective way to bring a human connection into a to-do list application, the interface design is cluttered and there are an overwhelming amount of options, adjustments, and features that are more excessive than useful for merely getting your laundry done on time. Additionally, Rama and Maia have both stated how much they despised depending so heavily on their friends to remember when and where they needed to be all the time. Though the constant assurance and support was helpful, they felt guilty about using their friends in this way. So despite the fact that applications like Quest and Habitica have proved successful for the general smartphone user, they remain too complex and ultimately unengaging for a user with a traumatic brain injury.

Tetris, an addictive puzzle game characterized by the repetition of falling colored blocks, causes the user to think with the game instead of about it, setting it apart from character creation games and omitting any kind of limit of play. According to BrainCraft, an educational mini series by PBS, playing Tetris for 1.5 hours per week improves your brain plasticity, making parts of your brain

more efficient and allowing you to use less brain power to complete certain tasks. Tetris taps into the natural human desire to organize and achieve goals by keeping the user's brain engaged with a series of incomplete tasks.

Other studies have shown that the brightly colored, recognizable block shapes begin to appear in players' dreams as they play more frequently, a phenomenon that has come to be known as the Tetris effect. This effect demonstrates the significant memorability of these shapes and the application of visuospatial skills developed in the game to real life experiences. In a 2000 study by Robert Stickgold, subjects with anterograde amnesia—the inability to form new memories—were observed playing Tetris and reported dreaming about falling blocks despite not being able to remember playing the next day.<sup>6</sup> With this research in mind, I made the decision to create an application that enhances user experience with task management app through the game of Tetris, where each task you create simultaneously creates a falling block that you direct to the bottom of your screen. Once a task is completed, the block disappears.



*original tetris app interface design*

<sup>6</sup> Stickgold, Robert. "Replaying the Game: Hypnagogic Images in Normals and Amnesics." *Science* 290, no. 5490 (2000): 350-53. doi:10.1126/science.290.5490.350.

The design aesthetic of the application draws inspiration from above mentioned *Any.do*, which provides an intuitive and efficient way to add task reminder details through day- and time-picker tabs that scroll up from the bottom of the Add Task interface. These tabs make it easier to add general reminder information, instead of having to key in specific values for each task added. In my own application design, the Tetris blocks, which retain the same color and shape relationships as the original game, have been simplified to flat, two-dimensional blocks of color. This omits three-dimensionality in the application to create a more straightforward, high contrast look against a white background that increases overall ease of read. All icons and colors used are inspired by or are directly pulled from the Android material design guide to retain consistency and authenticity.



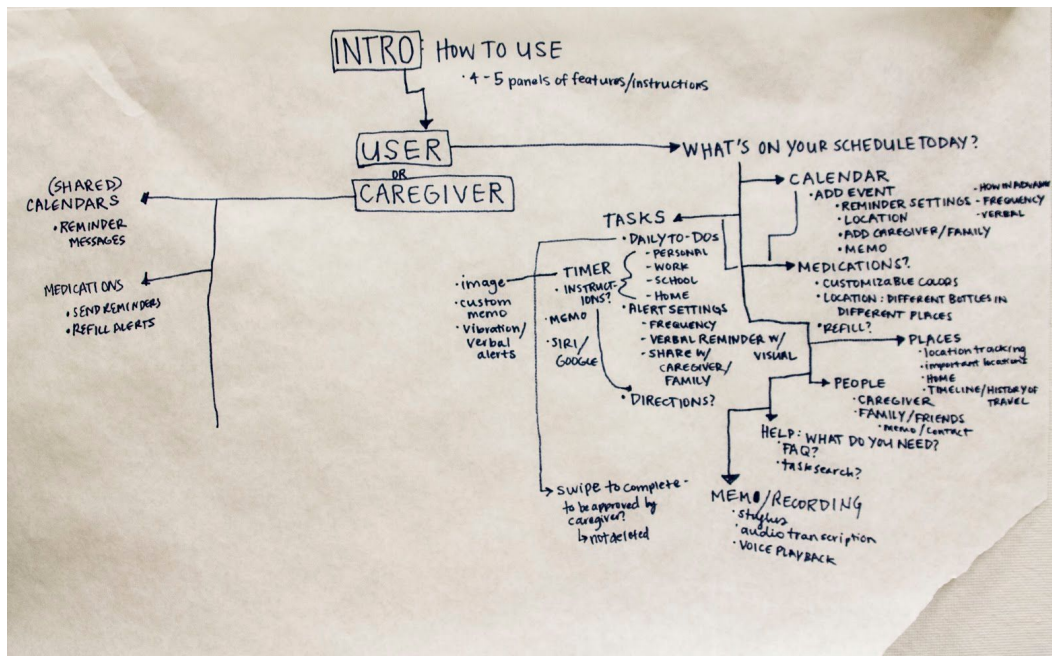
*blox block redesign*

## methodology

In the summer before the fall semester began, I was set on creating an application for those with TBIs that organized notes and pictures and journal entries into an easily searchable, comprehensive order. I wanted this app to provide a sense of security to the users and help loved ones and doctors to understand the user's phases of recovery through their records. My initial wireframes included location recognition, face recognition, symptoms reports, diary entries, and task management—an app with so many elements that it would further complicate life rather than simplify it. This idea changed drastically once I began the aforementioned research and conducted interviews, trying to understand as much as I could about traumatic brain injuries: how they affected cognition, attention, memory, and adaptability to new technology, how colors and words are perceived, methods for coping and recovery, and all of the challenges, frustrations and small victories in daily life.

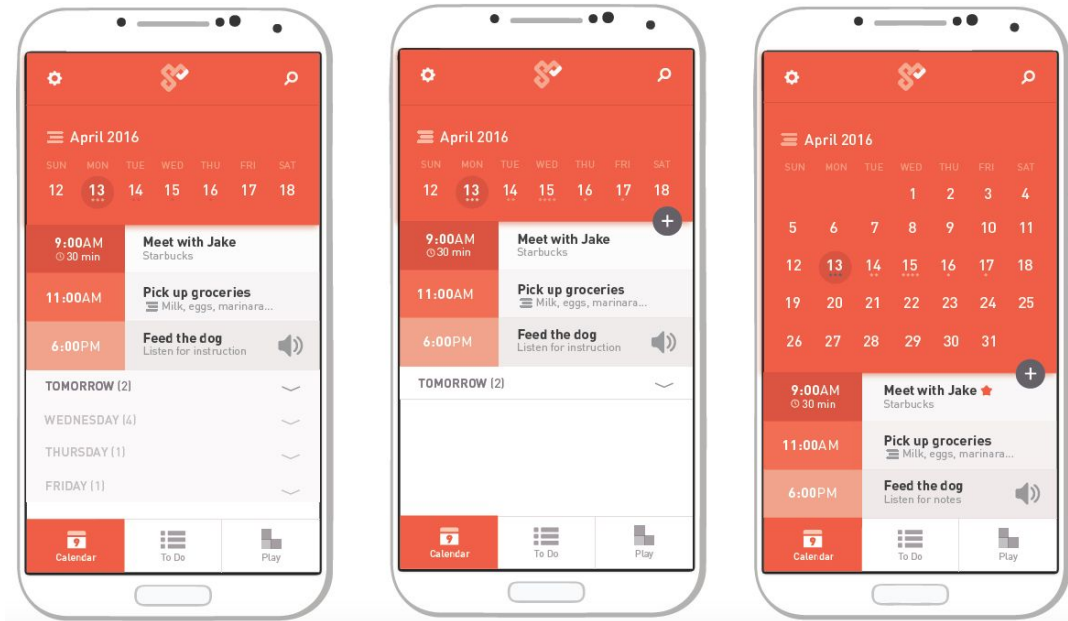
Once I felt confident enough in my basic understanding of the neurological and psychological symptoms of a brain injury, I began making extensive thought

maps to explore key words to keep in mind as I was designing. *Empowerment, simplicity, fun, engaging, intuitive, functional.* This application should not scream "assistive," it should be a useful and enticing tool for anyone who needs some additional motivation to get things done, while still serving the specific needs of someone with a brain injury. After establishing these keywords, I began researching existing applications that already integrate gamification into task management, and observed that each one implemented a reward system for completing a task.



an initial wireframe

This analysis, and the knowledge that a reward aided in remembrance of a task, led me to create my first sketch of an interface design. In this initial design, you could view your tasks in a calendar format or a list format, and once you completed a task, you would be rewarded with gameplay of a simple puzzle game. Thus, you could not play the game until you completed your task. This was the primary issue with the other applications, an issue that I incidentally emulated in my own design. The game aspect was not integral enough to the task completion to be considered a direct motivation.



### *initial interface design drafts*

This first design also emulated the complexity and general aesthetic of pre-existing applications, despite my efforts to simplify and create something new. The primary red color that characterized this design, meant to increase memorability, was overwhelming and dizzying if looked at for too long. I conducted several user testing sessions with Rama with this design, going through each screen tap by tap to determine what worked and what did not.

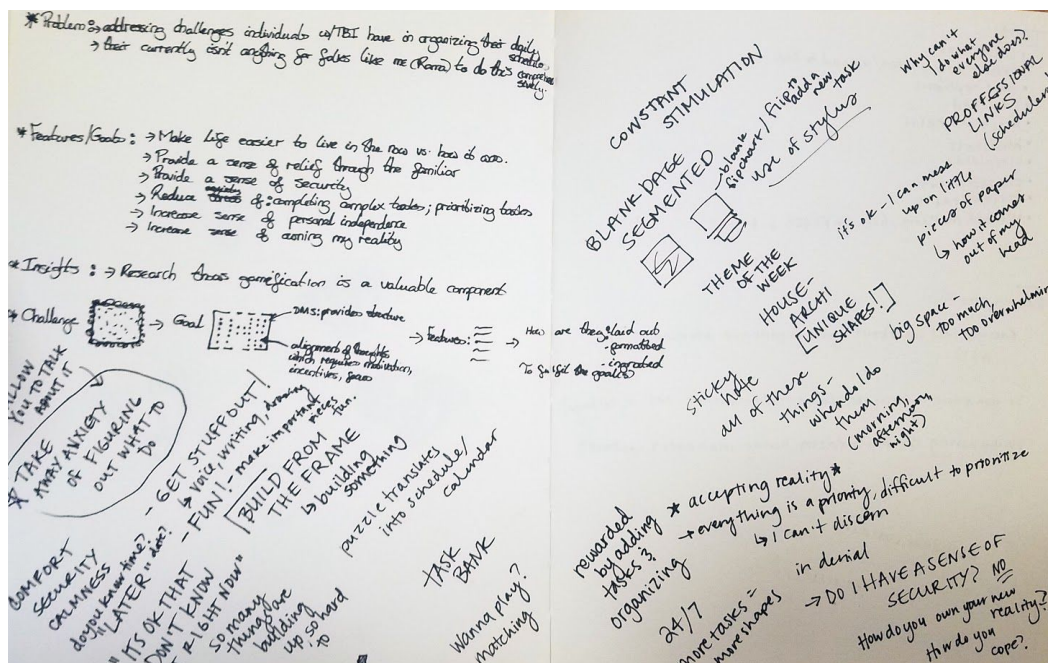
I believe the misdirection and ambiguity of this first iteration prevented me from establishing a strong identity for it, which became a point of contention as I struggled to come up with an appropriate name. Despite this unsuccessful design, this iteration was crucial in my creative process.

During this time of user testing, I began working on development with my friend, a senior in Computer Science. Though I wish I had the time to learn how to develop the entire application myself, this was too big of a task for this relatively small window of time. Our collaboration has proved to be an invaluable learning experience for us both, a result of spending the past year exploring the complex relationship between design and code.



Mid-way through the year, I presented to a panel of professors this initial rough design and the research I had been conducting on puzzle games as a method of rehabilitation for TBIs. My reviewers suggested that I needed to narrow my audience and create an application that was unique and combined Tetris with task management in a different way. Rama needed the puzzle game to complete tasks; there was significantly less of a motivation from being rewarded after he had completed them.

I took winter break to mull over all of this feedback and all of the problems I needed to solve with this new iteration, sketching on Post-It notes and napkins and whatever I could get my hands on as potential design concepts came to me. This was by far the most challenging time period of my process because I was convinced that I would not find a logical solution. When I returned to campus, I immediately met again with Rama, hopeful that we could brainstorm together. This meeting, a three hour discussion with scrawled notes and sketches played out over a wobbly Starbucks table, was a major turning point.



meeting notes

Rama, who is actually in the process of developing another application himself, is adept at identifying specific problems in interaction designs. Together, we sketched and re-sketched until we developed the beginnings of a wireframe that worked. This process and result was nothing short of a miracle, and once the basic structure for the new design was complete, the subsequent interaction decisions flowed naturally.

I then moved to digital sketching, transferring our sketches into the Adobe Suite. Once here, I went through the same process with Rama again, conducting several user testing sessions with various iterations where I guided him through the navigation and observed his reactions. As I further developed this version, I found the establishment of an identity and a name a much smoother, intuitive process.



## creative work



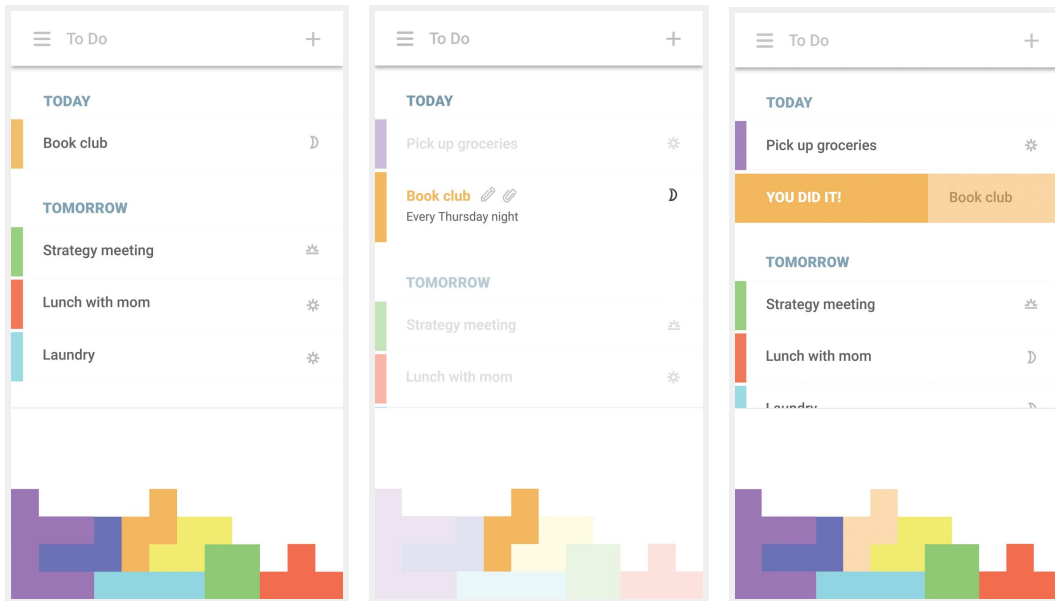
*final wordmark*

I decided to create a more rounded typeface to balance the geometric, angular shape of the blocks. The name Blox refers to the parallel between the seven colored block shapes and schedule blocks, which promotes a focus on one task or activity at a time. The “x” also functions as a check mark, emulating the concept that as each task completed, the corresponding colored shape disappears, clearing up space in your schedule and at the bottom of your screen. The wordmark should always remain white with a 50% transparency on the checkmark so that it can relate to all seven block color backgrounds.

After building a pattern of blocks, I rotated them 45° so that the L-shaped purple block appeared as a check mark. The check mark in the Blox logo is an extended version of this L-shaped block, which appears on the user’s home screen to open the application.

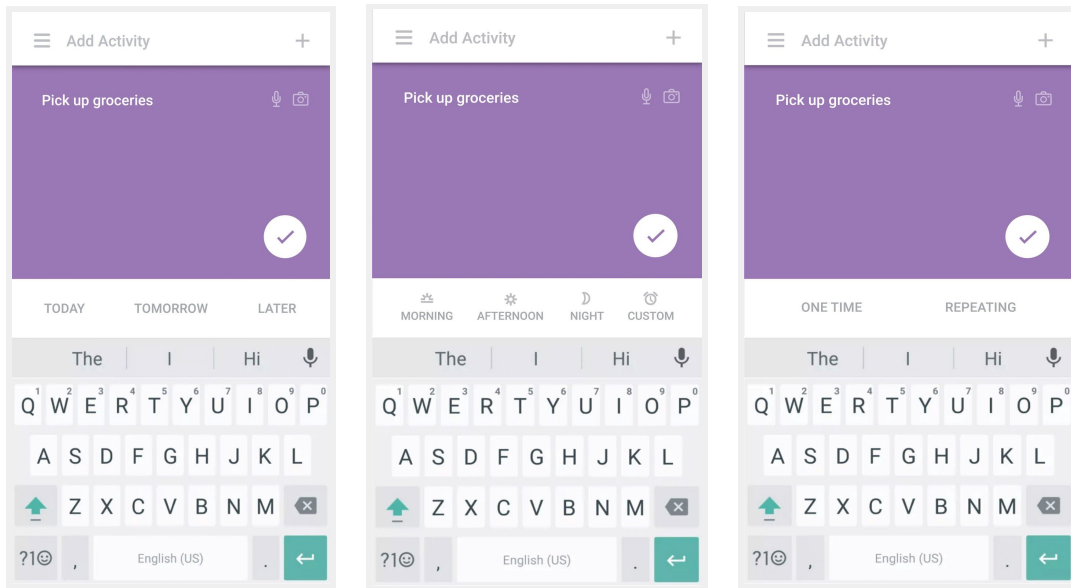


*push logo*



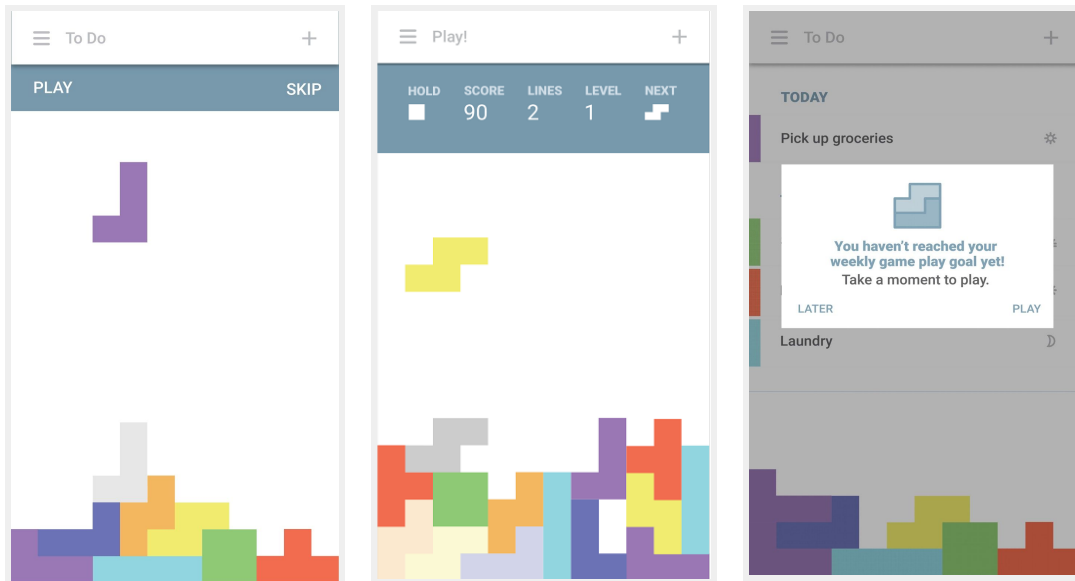
*task list interface*

The final design for the task list retains as much simplicity as possible while still providing necessary information for each item. The user can choose how many tasks are viewed at a time, which then highlights the corresponding blocks. The color stripe prefacing each task indicates the color block represented below and the icon column to the right indicates general time of day (morning, afternoon, night, or a custom time). Finally, the tasks are categorized by day (today, tomorrow, specific day of the week, unsorted). By breaking down reminders into these straightforward sections with minimal view options, the goal is to allow users to feel less overwhelmed. The menu, accessed through the “hamburger” button in the top left corner, allows you change your task view, track your progress, change your reminder settings and play Tetris. Tapping the plus sign button in the top right brings you to the Add Task screen.



### *add task interfaces*

Within the Add Task interface, the background color of the add task screen represents the randomized task block the user will create with their task. The initial Add Task screen prompts the user with the language “I will...” which they then replace with their own task. This language is meant to empower and engage the user more than the words “Add task...” might. Once the task is typed, spoken or uploaded as an image, it can be saved by tapping on the checkmark button. Once this button is tapped, the user is given the option to be reminded today, tomorrow, or later. If the user taps “today” or “tomorrow,” they are brought to the next screen. If the user taps “later,” a calendar pops up with the option to choose a specific day or merely choose the option “Ask me later.” Either choice brings the user to the following screen, which asks, with corresponding icons, what time of day the user wants to be reminded in the morning, afternoon, or evening with an option to enter a custom time as well). The final screen asks about the frequency of this activity—whether this is something the user is doing once or doing regularly. At any time, the user can tap the checkmark button again to save a task without the additional reminder information and it will be sent to the unsorted section at the bottom of the user’s task list.



### *play interfaces*

Finally, once the user saves the task, they are brought to the Tetris-inspired interface where the task block begins to fall from the top of the screen and the user is able to manipulate where it lands in relation to their other task blocks. From this screen, the user can skip this interaction or choose to play a game of Tetris. If the play option is chosen, the game is played with the task blocks they have already built frozen at the bottom of their screen. This motivates the user to complete more tasks before they play so that they are not at a disadvantage. Gameplay does not affect the pre-existing task blocks, which reappear in the same organization after the game has finished.

For the final installation, I built two Tetris block shelves to display the application and the website, and to hold branding stickers and my postcards. I created a poster representing a third Tetris block to explain the inspiration for and premise of Blox. The final element is an etched acrylic sign with the Blox logo that is illuminated by color-changing LED strip lights, which parallels the color-changing introductory screen. I left a small yellow book for comments and feedback on top of the red shelf, the pages and notes viewers had left small enough for Rama to read through and respond without becoming overwhelmed. Because my project was physically so small, I wanted to create a vibrant

environment in the gallery that drew people in and humanized app design. I created this app for one person, a design that has been invaluablely shaped by my relationship with Rama and his story. This is so often not the case in app design, which usually heavily emphasizes universality and ease of use for any smartphone user as key marketing points. This universality came second in my design, and I wanted this concept of personal technology to be clear in my presentation. Blox was not created to generate a profit or establish an enterprise, Blox was created to help one person's day to day life become a little easier.



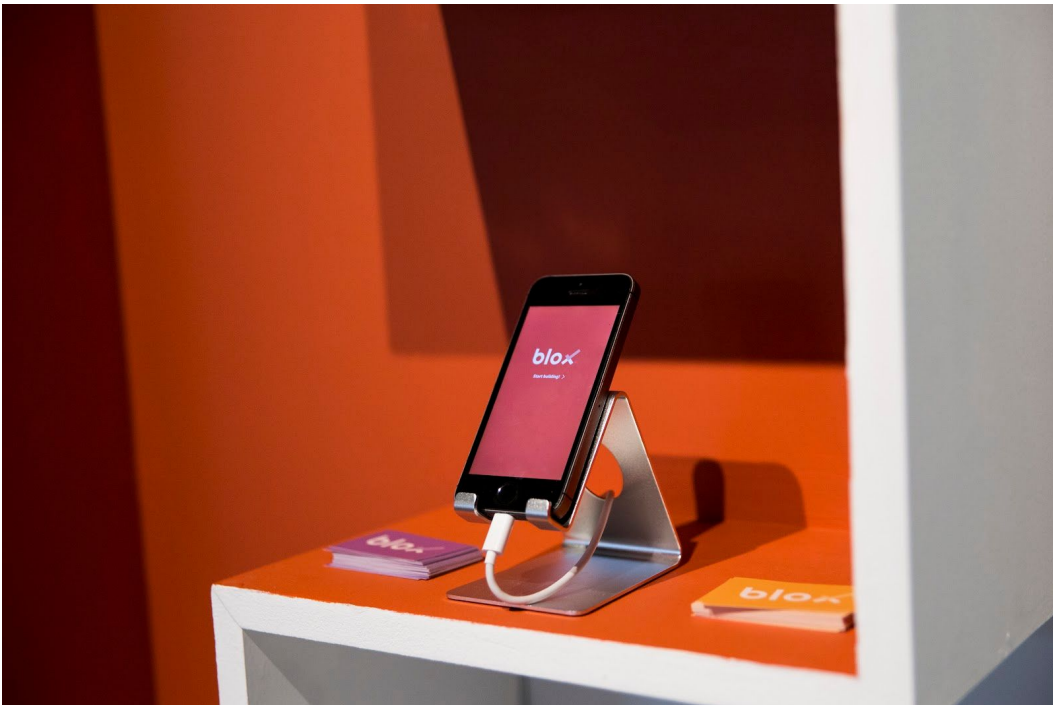
*final installation*



*rama at the gallery opening*







## conclusion

The version of Blox that I presented in the gallery is a guided interactive demo, bringing the user through the app step-by-step with explanations and tips. Development of the fully operating application is about halfway complete, so I aim to finalize this version for Android devices and submit Blox to the Google Play Store within the next year. I also plan on beginning development for iOS in this time frame and creating a more immersive website that includes a demo video and development updates that potential users can subscribe to. Blox has truly sparked my interest in the evolving field of user experience design for the purpose of social improvement, and I hope to continue working in this field in my future endeavors.

Though Blox is certainly not perfect nor completely resolved in its design, I have learned and grown considerably with this project in the past year. Blox is straightforward, intuitive and unique in its form—three design elements that were crucial to accomplish in my creative process from the beginning. The shift of audience focus narrowed to just Rama was a pivotal point in development, and allowed me to create something that made a real difference for one person. Blox is about simple, fun productivity for Rama, but also for you. Build your day with Blox, because getting things done should always be this fun—no exceptions.



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