

# 2021 MIMS Capstone Project Report

## Collab.io

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## Section I. Introduction

### 1a. Motivations and Goals

From March of 2020 when COVID-19 has been declared a global pandemic, many social containment and distancing measures have been in place in the U.S.. One of them is the closure of education institutions. As a result, students have adopted online, remote learning as part of a “new normal” of their everyday life. There are many aspects of how higher education systems will adapt and evolve to face the unpredicted future, we would like to focus on the student experience side of this multifaceted space because we've all experienced first hand the benefits and challenges that came with remote learning.

As a team, we would like to conduct research on how students keep themselves motivated, how they find and get support from their communities, and how they meet their goals for getting education during this big transition to remote learning. This project aims to build a product that not only compensates for the shortcomings of remote learning, but also leverages the benefits of it. We are re-imagining a world where education institutions will adopt remote learning as part of their curriculum in the future and our goal is to propose a solution that **increases students' satisfaction level of their overall learning experience.**

### 1b. Group expertise

Our team is composed of 4 members equipped with different expertise:

- Yinan Chen: UX Designer & Front-end Developer
- Victor Hsin: Front-end & Back-end Developer
- Yuexi Wang: Product/Project Manager and UX Designer
- Tracy Wei: UX Researcher & Designer

## Section II. User & Market Research Methods

Our user research was conducted in 3 phases:

1. We sent out a survey on Qualtrics with 13 questions distributed among various undergraduate and graduate students social media groups.
2. We conducted 5 in-depth user interviews over zoom.
3. With both qualitative and quantitative data gathered above, we defined two user personas and several user stories.

### 2a. Survey

We conducted an exploratory survey to understand our target users' current learning experience and habits. It is distributed to a wide range of learners from undergrad to early professionals who engage in remote learning regularly. The survey questions touched on topics such as basic demographics, general learning habits, major struggles in remote learning as well as habit-forming tools used. We have received 60 valid responses out of total 78 responses. The survey results as displayed below helped us scope the project and let us better explore users' pain points.

Benefits of remote learning



Based on the word cloud, top words related to benefits of remote learning are time, flexible/flexibility, commute, and class. Our respondents indicated that with remote learning taking place, they have more **flexibility to manage their schedule** (e.g. saving more time from not commuting.) Moreover, lecture recordings makes it easier to review course content at any time and the respondents enjoy the flexibility.

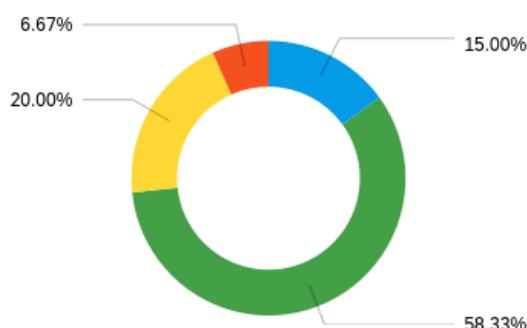
## Struggles of remote learning



Words such as communication, classmate, focus and interaction came up when respondents are asked to describe their struggles of remote learning. They felt **less motivated** to work and they **found it harder to focus in class**. They miss the **community feeling** with friends and feel more difficult to build rapport with classmates. Some of them also find it harder to discuss course content and ask questions.

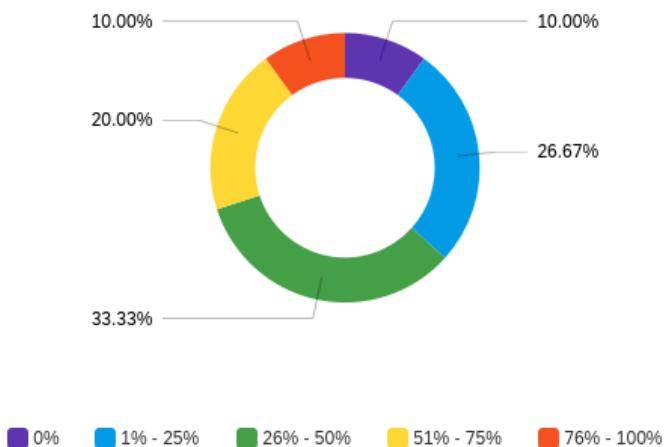
## Interactions with classmates

How often do you discuss course material with your classmates outside of class?



More than 70% of participants indicated that they never or only meet with classmates a few times outside of class. Due to remote learning, there are less opportunities for spontaneous conversations that are once prevalent offline.

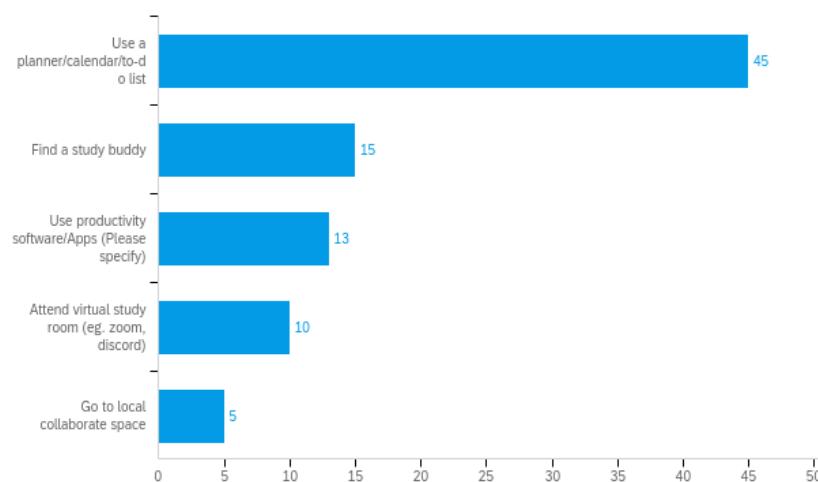
Around what percentage of your assignments require working with other students in your class?



Even though we are under remote learning, 90% of participants indicated that their assignments still require working with other students. However, remote learning limits interactions with classmates, thus making it more difficult to collaborate.

## Time management and tool usage

How do you stay productive while doing coursework? (Please select all that applies)



Using a **planner or to-do list** is participants' first choice to stay productive. Some participants also look for companions for working together, like finding a **study buddy** or **attending a virtual study room**.

## 2b. User interview

The interviews were conducted with 5 participants who indicated their interest in a follow-up conversation. We have two main goals going into the user interviews:

1. **Study goals:** One of our interview objectives is to find out how confident are people in meeting their goals for getting education.
2. **Productivity level:** We also want to find out how satisfied people are with their current productivity level.

### Insights and findings

1. People are generally more confident to meet their academic goals and career goals
  - a. Participants indicated that by establishing a study routine, they are confident to meet their academic goals
  - b. Participants think that remote setting has give them equal or more opportunities to make career connections
2. People felt that the remote setting has made them less confident to meet their social goals
  - a. Participants felt that reaching out to new people takes more effort and conversations over zoom seems unnatural/forced
3. People who indicated a high satisfaction with productivity level generally leverage tools or people to keep them disciplined and productive
  - a. Using a todo list, blocking out big chunks of time for concentrated work, using a study buddy, re-creating a study hall environment when studying
4. People who have a low satisfaction with their productivity level struggles with keeping themself focused in a home environment, and a blurry work-life boundary

## User Personas

With the above insights, we were able to identify two types of personas from the students we've surveyed and interviewed. These insights guided the features design or our product.

“



**Anna James**

Sometimes has trouble focusing on their studies in a remote setting. Needs more motivation and help in class from either professor or peers.

*“I got distracted easily by Youtube or even snacks at home. I miss co-lab very much.”*

“



**Jenna Doe**

Able to manage their school work and stay productive, but has unmet social needs and hope to build relationships with their peers.



*“I have not made any new connections in school since the pandemic starts.”*

## 2c. Market Research

In addition to user research, we also conducted analysis to understand the current landscape of remote learning and collaboration. Although plenty of solutions exist in the market ranging from video meeting to online collaboration board, they are not necessarily meeting the needs of learners. Opportunities might lie beyond a general virtual study space.

	<b>Main Features</b>	<b>Benefits</b>	<b>Drawbacks</b>
<b>Gather.town</b>	Facilitate video calls, file sharing activated by avatar distance, focus on hosting online career fairs and other interaction heavy events.	<ul style="list-style-type: none"> <li>- Gamified and fun experience</li> <li>- Support public and private sessions in a single space</li> </ul>	<ul style="list-style-type: none"> <li>- Better for networking and bigger event scenarios</li> <li>- No control over who joined video chat in public</li> </ul>

<b>Zoom/Discord virtual study room</b>	Organized by individuals, facilitate online custody space using existing video and audio based tools	- Light-weight product - low onboarding cost	- Users cannot customize or choose participants - No interaction supported between users
<b>Library (In-person)</b>	Support quiet, focus space and atmosphere for study and learning	- Support face-to-face interaction - Stand-alone study space improve focus level and productivity	- Require physically travel, more commute cost - Quiet focus space can't coexist with group discussion space
<b>Opportunities</b>	Remote co-study space that support students with shared learning goals or similar focus	- Combine the benefits of having study buddies and interaction with cohorts - Overcome the restrictions of physical distances	- Hard to overcome the control external influences in remote-setting

## Section III. Product Design

### 3a. Ideation

With the above research insights gathered, we decided to design a product that tracks and visualizes students' focus time to increase their motivations; improve their productivity level by using the power of study buddy and mutual support; and finally compensate for the missing social interactions to cultivate more meaningful relationships with their peers.

We've conducted a group brainstorm session on "how might we..." statements, and after clustering, we converged into 3 main areas of problem space we want to improve: **motivation, productivity** and **interactions within programs/courses**. Below is a summary of features we have come up with to solve these problems.

1. Provide a place for students to create study hall sessions with study buddies from their program or class; use behavioral economics rules of transparency and shame to keep students motivated and productive and form study

habits

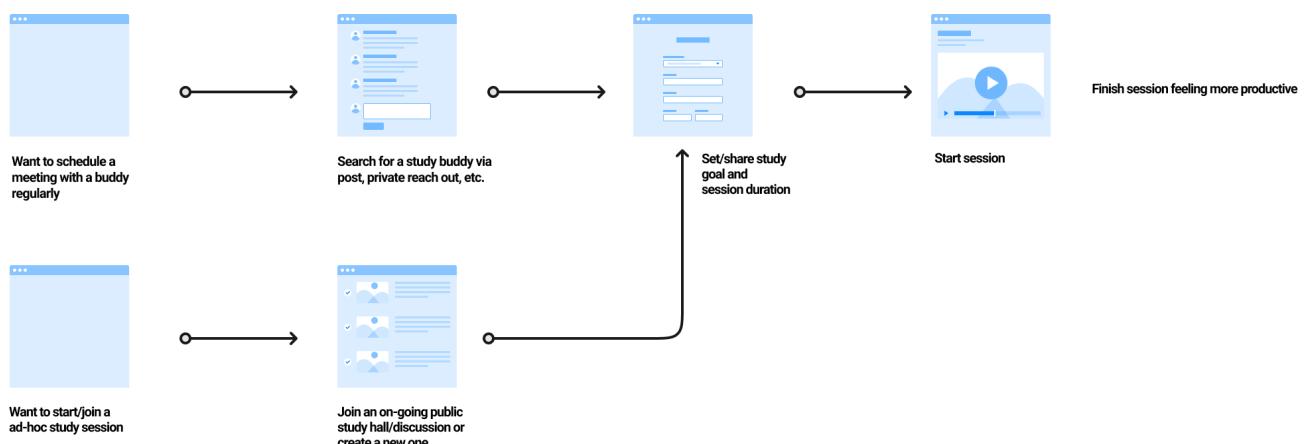
- Encourage **goals sharing** between study buddies during the session
  - **Progress status** on completing your goals that are visible to all group mates during a study session
  - Keeps tracks of personal study time for students, and visualize progress to students to give them a sense of accomplishment
2. Design the study session space that makes students comfortable to join and easy to interact with other students
- **Different study mode:** study hall session has different study modes that students can switch between. They can enter a discussion mode that is similar to zoom meetings, or a quiet reading mode where microphones and speakers are disabled.
  - Making use of **pomodoro study intervals** (25mins of study and 5mins of break time) as default when a student creates a study session. System will remind students when it is time to take a break together.
  - System allows users to play **short, interactive games such as Tetris** with a random game generator. This requires very low effort on the student's side and will serve as an icebreaker.
3. Reward system that **creates peak and end experience** that are memorable and help students to remember the study session positively
- During the study session, students will **unlock badges by checking off their goals list.**
  - Motivate users to **help each other** by providing a group reward if everyone checks off their goals in the session.
  - Provide **further incentives** by linking certain badges (e.g. helping others on homework questions) to credibility to become GSI or tutors
  - When study session ends, provide students a positive end experience with a summary of their overall study time, their accompaniments and badges they have earned

## 3b. User stories

Once we have the key features, we've worked to create 3 user stories to illustrate how a user might use our system to organize or attend study sessions.

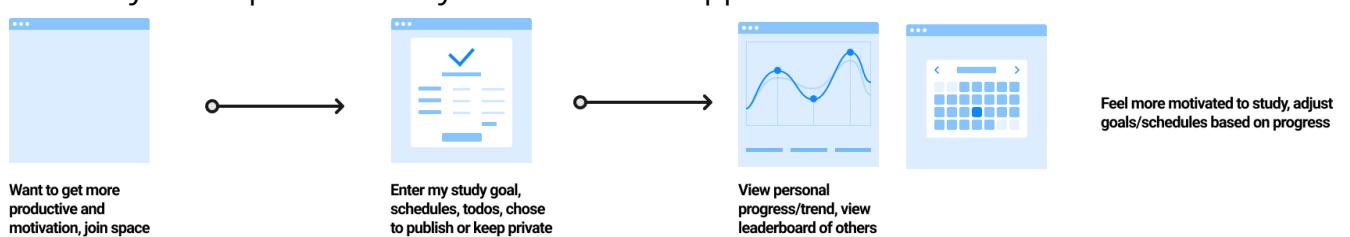
### User story 1: Productivity and focused session with a study buddy

In this story, a user would use our common space as a way to start or join a study session, either with classmates they are familiar with, or classmates they don't know well but share a similar progress or are working on the same homework.



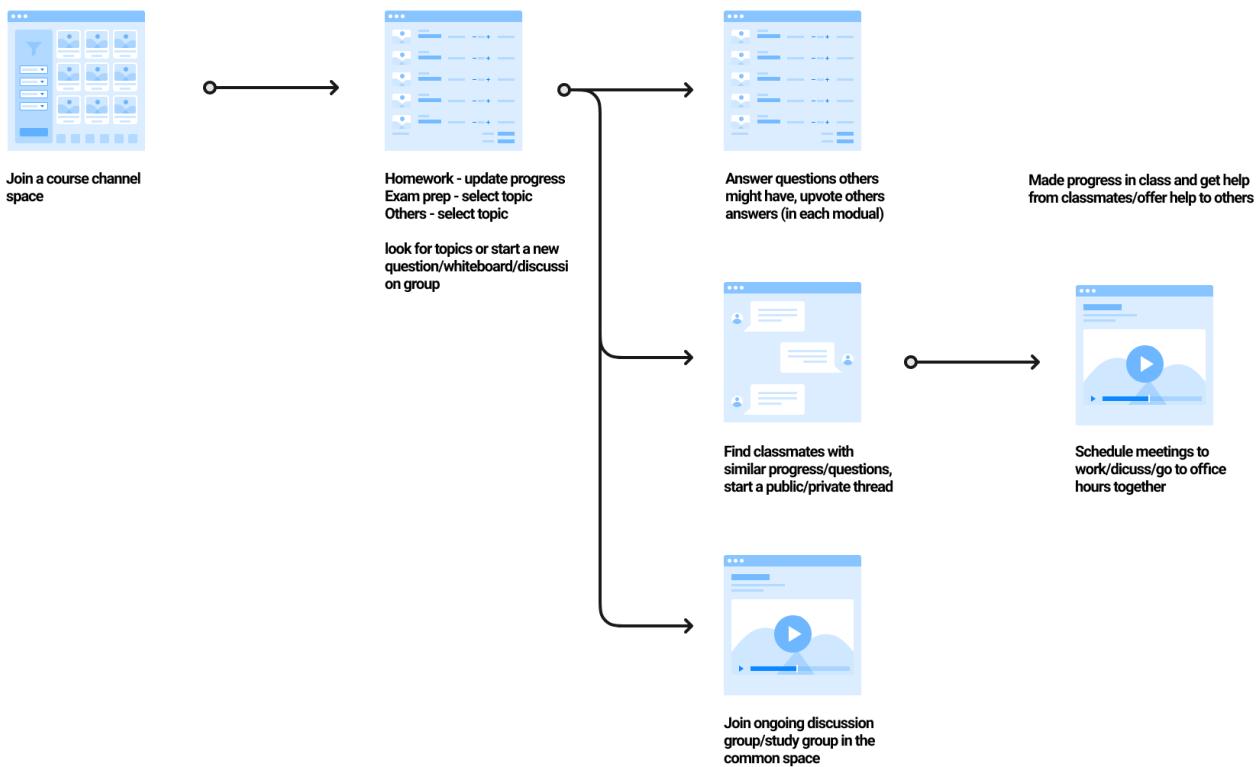
### User story 2: Individual workflow; increase motivation by progress sharing and seeing progress of peers.

In this story, a user would like to better understand how their study patterns have been over the week/month, and will be able to see a visualization of the aggregated time they have spent on study session on the application.



### User story 3: Common interaction space for Q&A and course-based activity

In this story, a user would use our common space as a way to post questions, answer questions posted by classmates, and look up classmates with a similar homework progress so they can organize a study session together. This story has add-on features that we did not include in our demo, but will be a good future improvement to have.



### 3c. Product Details

#### Common Space

Users would first enter into the common space after login.

- Navigation:** The vertical navigation bar on the left would guide users to switch over spaces. The top one would lead to the user's personal space and bottom icons represent spaces that the user has joined so far.



2. **Ongoing sessions:** Ongoing public and private sessions shown on this page are associated with the currently selected space. Newest session will show on top, while the finished sessions will disappear.

Session Info  
Python Group Study  
Description  
In together learn to write data structures and start working on the Homework#1

Members      ⏰ Ends in: 09:31

Private Session Info  
INFO205 Group Study  
Description  
Review on lecture and recording together and work individually on the weekly reading reflection

Members      ⏰ Ends in: 44:31

Ask for permission to join

3. **Start a new session:** Users could choose either to start a new session or join existing ones. To start a new session, users would have to fill in a form to set up the session information, in which we ask about the session topic, description, visibility, and duration. Users who start new sessions would be automatically assigned as hosts. After clicking the "Start !" button, users would be redirected to the meeting page.

CS290

New Session

Create a New Session

Session Topic

Private

Session Start Time Now

Session End Time

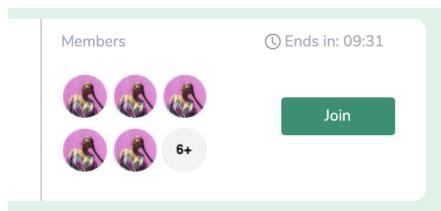
Description

Start !

Session Info  
Python Group Study  
Description  
In together learn to write data structures and start working on the Homework#1

Members      ⏰ Ends in: 09:47

- 4. Join existing sessions:** To join existing sessions, users could either click the “Join” button for public sessions or “Ask for permission to join” for private sessions. Joining a private session would need approval from the session host.



## Personal Space

### Avocado's room

Today's study time ↑  
**00:03:12 minutes**

Your study duration looks amazing. Keep up the good work! Don't forget to also get some fresh air

**Graph**

Day	Study Time (h)
Sun.	5
Mon.	6
Tues.	3
Wed.	11.5
Thu.	11.5
Fri.	6
Sat.	9.5

Week Month

A 3D isometric view of a room labeled "Avocado's room". The room features orange walls, a light blue floor, and a white ceiling. It contains a green circular rug, a blue desk with a chair, a red bookshelf, a green shelving unit, and a window with a pink frame. A small potted plant sits on the floor near the window.

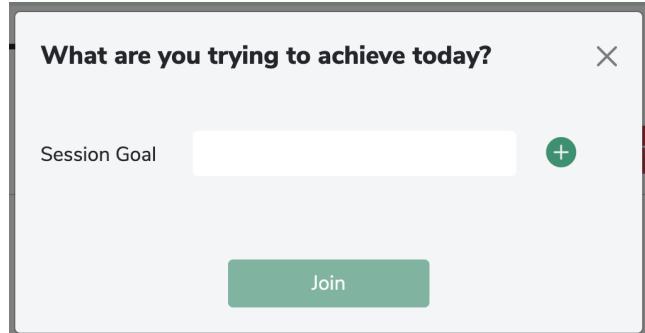
As its name suggests, this page is a dedicated place for each user. Here, users could review daily focused time compared to yesterday, summary of study time over week and month, as well as badges showcasing achievement made so far. We are in hope that this page would help encourage users to stay motivated and make them feel their hard-working is being recognized.

## Meeting Space

After joining the session, users will enter the session's meeting space. They will be able to interact with other session members or stay focused in silent mode.

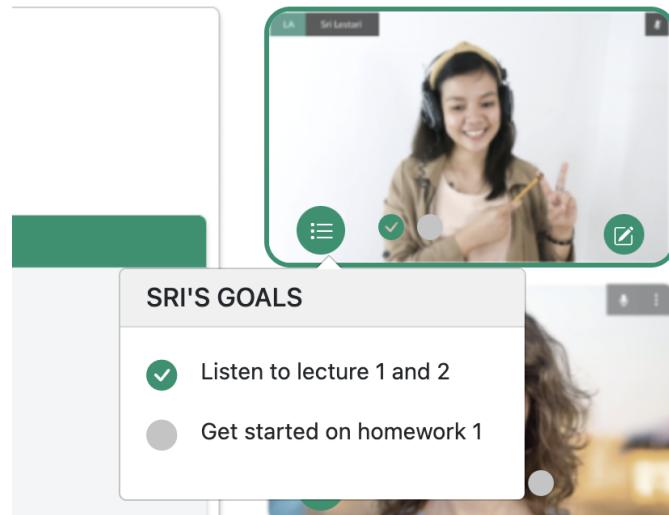
### 1. Input individual session goals:

Upon arriving at this page, we ask users to input their goals for this session. Users are required to write at least one and maximum five goals to move on. These goals will be shared with other session participants.



### 2. Update progress:

Users can click on the list button over the camera to check off completed tasks and the edit button to modify tasks. Other participants' to do lists are also visible yet read-only. Dots next to the list button indicate each participant's number of goals and the latest progress. The dots would be updated simultaneously as completion of tasks. The reasoning behind this design is that we want to form a working-together atmosphere which in hope would encourage everyone to stay focused and motivated.



### 3. Study modes:

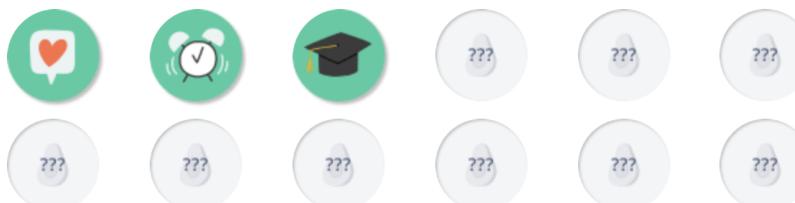
We have designed four study modes to accommodate users' different needs. Participants in the same session could be in different modes at the same time. These study modes are:



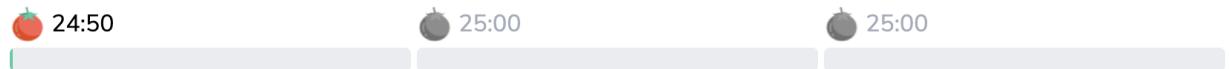
Study Mode	Description
Interactive mode	Users are able to see the floating mouse of other users in a collaborative whiteboard. They will be able to freely chat, play small games to bond with each other during break.
Focus mode	<b>Silent mode</b> (Every user in this mode will be muted. Chat, microphones features will be disabled.) During the pomodoro countdown, this mode provides users the simplest undisturbed mode with only a clock on the screen.
Read mode	<b>Silent mode.</b> Read mode is a newly developed pdf reader tool. Users can use the Read mode to do readings together as a group. The reader supported comments, highlighting sharing among the group.
Pressure mode	<b>Silent mode.</b> Pressure mode provides users that occasionally need peer pressure and the sense of being “supervised” to stay focused. Every user in this mode will be asked to continuously share their screen with others so that they are bound with others to stay focused on study tasks. The contents shared will be protected with a blurring mask to protect privacy.

4. **Badge system:** We created a rewards system to acknowledge users' achievements and keep them up. When accomplishing specific personal or group targets, users could earn associated badges. We have designed five badges, including Focus Master, Grandmaster, Reward Killer, Time Manager, and Social Anima, but we have not yet finalized the badge rules.

### Badges



5. **Pomodoro timer:** The pomodoro timer shown on the bottom of the meeting page indicates the session progress so far. We leveraged the pomodoro timer since we want our users to stay focused during the session, meanwhile always have a break between sessions to avoid overwhelming themselves.

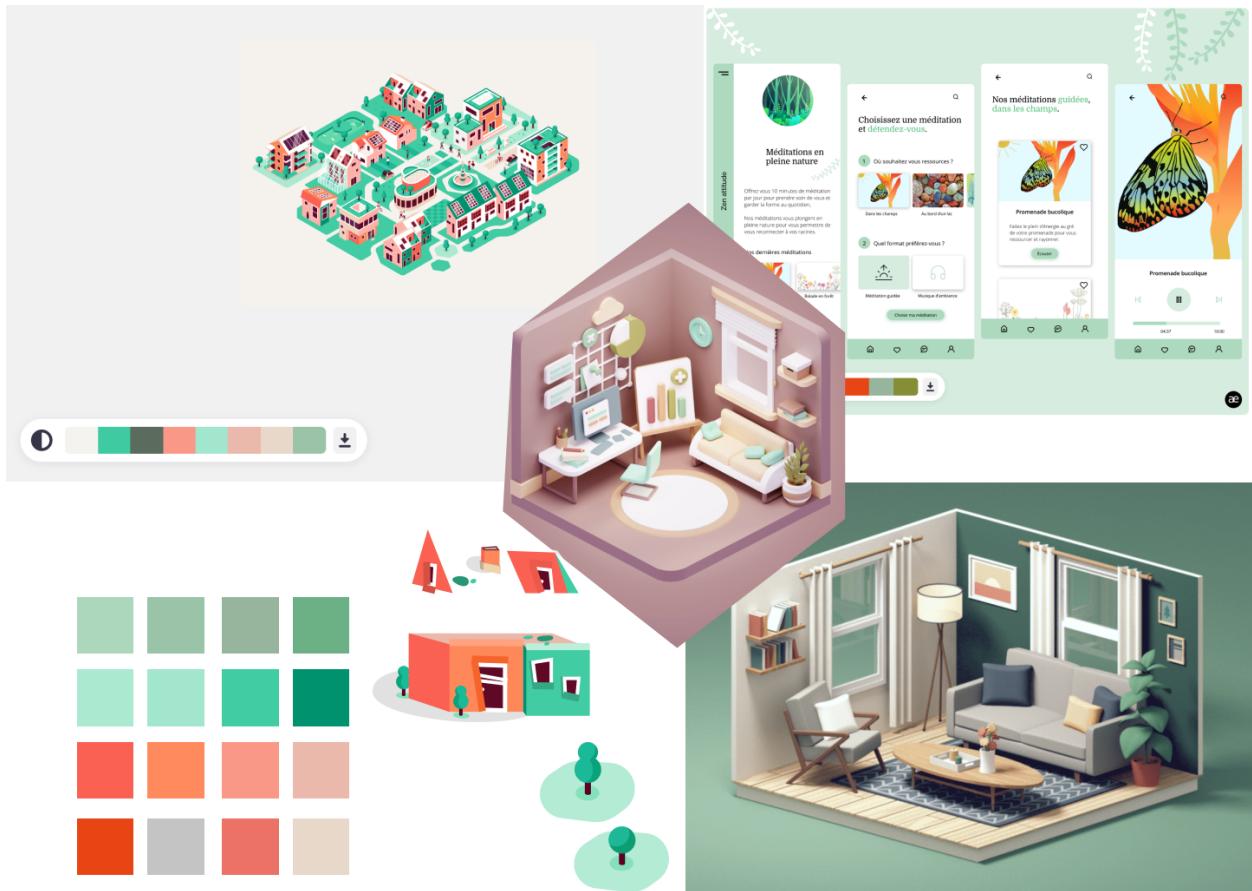


## Common Space - add on features

With the add on features enabled, common space will allow users that are in the same class (e.g. CS 61A) to enter a common interaction space. These are the additional features for users to perform course-based interactions:

1. **Assignment Leaderboard:** Users will be able to share their current progress on assignments which will be shown as a leaderboard. This feature can potentially help coursemates find each other with similar progress to form study groups or go to office hours together.
2. **Question Board:** Question Board congregated questions students have and enabled students to help each other out. Additionally, students will be able to upvote questions that they are also confused about. Students that are the most active could earn badges to become superstars that prove their proficiency in the subject and helpfulness to qualify as future GSI.

### 3d. Visual design



Moodboard

#### Color Choice

We wanted users to have a relaxing, noise-free environment to focus on study and interact with study groups. Thus we selected light mint green as our primary color scheme with a combination of vibrant orange to bring up the energy.

#### Graphic Design

The graphic design for Common Space and personal Space are also intentionally built to help users get into the flow they need to focus on their tasks. According to our user research, several learners claimed that if the external environment is too comfortable, it affects their productivity and ability to stay focused. We designed the personal space to mimic a study room, which would hopefully help users

facilitate their online private learning environment as well as visualize their achievements badges in a more vivid form as stickers in the room.

## **Section IV. Implementation**

### **4a. Tools and Frameworks**

We were debating between using vanilla JavaScript and using React JS for the frontend development. React JS has an advantage that it allows reusable components. Due to the tight schedule of development as well as the familiarity with the framework, our group decided to implement the website based on the vanilla JavaScript. However, in the future, we would move forward converting the code base to a React structure as it ensures higher code reusability and maintainability. Besides JavaScript, Bootstrap 5 is our main HTML framework. Instead of reinventing the wheel, we well leveraged Bootstrap's existing component system and adjusted the styling via CSS to make the product fit with our design.

### **4b. Data Storage**

We did research on different data storage systems including relational databases and NoSQL databases. At the beginning, we thought that using a Firebase NoSQL database would be a good way of storing data and we did build a Firebase database. However, later we realized that for the purpose of prototyping our website, a static website would be sufficient to achieve our goal. As a result, we developed an interactive prototype for our product. Nonetheless, in the future, if we are going to publish the product, we could use the microservices architecture for our website, which allows us to separate our website into smaller services. And each service can have its own server and type of database to best suit the needs of its functionality and use cases.

## 4c. Development Process

We used Git and Github to do the collaboration for developing the website. With best practices in mind, whenever we finish a smallest working component, we commit the code and push to our Github repository in order to make sure that the other team members can always get the newest code without doing duplicate work and that it is easy to reverse back to previous working code if there are some bugs breaking our website.

## Section V. Feedbacks & Future directions

### Feedbacks for prototype

Upon completion of the current prototype, we have a chance to demo the prototype to some of our classmates, and have gathered some feedback towards the product.

Feedback 1: "A lot of time I feel like zoom fatigue is caused by looking at yourself for too long, I feel like this product can decrease zoom fatigue with more study modes to choose from."

Feedback 2: "Catching up with classmates often requires making an official zoom appointment and sometimes that feels too official. This product makes the study hall easier to attend, not super official and more flexible."

Feedback 3: "Being on zoom meetings sometimes sometimes seems too transactional. The Pomodoro methods with break time encourages you to make small talks and play games with each other more instead of just meeting to get things done."

However, we would continue to conduct usability tests and acceptance tests with students around us to gather feedback on the features and overall user experience. And we would base on these feedback to iterate and improve our design.

## Future directions

We have leftover features yet to be realized including adding additional features to common space, enriching the rewards system, and implementing each screen mode. Additionally, if we plan to move forward with this product, we will need to reconstruct the current vanilla JavaScript based implementation to React in order to achieve a long-term code maintainability and component reusability. To equip the product for public use, we will need to design a backend system that could efficiently store and process all required user data, then integrate it with the current front-end implementation. Having both relational and NoSQL databases will be ideal for our data storage. A relational database can best suit for storing our user account information and friend relationships. Also, it can make sure that update and delete operations do not cause any data anomaly. On the other hand, a NoSQL database can well handle unstructured data such as chat messages and other text content. It can also scale easily as the numbers of users and data requests go up. If there are too many read requests to our database, we can create a cache layer to store the frequently read content to reduce the number of requests directly sent to the database. Also, we can use the database replication mechanism to create clone databases only for read purpose and update the content once a day. Furthermore, if the amount of users increases dramatically, we can use a load balancer to direct different users to different server machines in order to reduce the workload on each individual server and avoid single point of failure.