

Engineering Strategies & Practice II

University of Toronto
Faculty of Applied Science and Engineering
APS112: Conceptual Design Specification (CDS)

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Executive Summary

Chestnut Residence (Chestnut), located at 89 Chestnut Street houses over 1100 University of Toronto (UofT) students each year. Chestnut's Wellness Coordinator Makena Zimmerman recognizes that there is a current absence of sufficient space allowing for students to decompress from academic stress. This hinders Chestnut's initiative to promote a dynamic student life and prioritise students' wellbeing. To improve upon these shortcomings, there is a need to implement a designated wellness space. Makena Zimmerman, offers the availability of an unused mailroom within the residence, proposing the implementation of a Wellness Room design within this existing space.

The design will be constrained by the physical dimensions of the mailroom and must take into consideration the living beings of the room including its users, animals, and malevolent beings. Furthermore, the repurposing of the mailroom requires the consideration of multiple stakeholder perspectives including Chestnut staff and Chestnut Building Services who will be responsible for the upkeep of the room. The availability of a wellness space will allow for collaboration with other wellness services across the university including HealthyU and Discovery Pharmacy.

The primary function of the design is to enclose a physical boundary for its users, while secondary functions include allowing access to and from the room, facilitating communication, and hosting wellness-related events. To measure the success of any proposed design, the project's main objectives will measure its versatility and its ability to promote relaxation. Designs will be restricted by client-based constraints and the constraints delivered by building codes and accessibility regulations.

Upon formulating design requirements, the idea generation process began by first defining the possible activities that could be hosted in the design as well as defining the physical layout and amenities of the room. Several ideation methods were implemented to develop a list of over 110 full solutions, including structured brainstorming, rapid ideation, morph charts, and SCAMPER. With a comprehensive list of solutions developed the idea selection process began. A feasibility check, several rounds of multi-voting, and a Graphical Decision Chart reduced the design space to the top three designs that most accurately align with the design requirements:

- Design A: A versatile, large open space with an enclosed private office.
- Design B: An open room facing glass-enclosing walls.
- Design C: Three sectioned-off rooms with designated themes.

Design A was chosen as the proposed conceptual design given its strong versatility, sufficient elements that promote relaxation, and its adequate privacy. To measure the success of this design, measurements will be taken and compared against literature standards of holding spaces. Surveys will be conducted to assess the design's effectiveness of promoting relaxation. Following the testing period, the team will iterate and build onto their design accordingly, before moving forward with the implementation of the design.

1.0 Introduction

Chestnut Residence, located at 89 Chestnut Street, houses over 1100 UofT students every year [1]. Chestnut seeks to promote a balanced student experience by offering diverse amenities and resources to its residents [2]. Residence Community Wellness Coordinator, Makena Zimmerman is concerned with the lack of space available to offer resources and support that is conducive to students' wellness, impeding Chestnut's initiative of fostering a spirited community [3]. This document reviews the limitations of the current wellness room offered by Chestnut and highlights design requirements for improvement. This information will be used to propose designs and evaluate them accordingly.

2.0 Problem Statement

University students allocate substantial time to their education, often disregarding their wellbeing [4]. Wellbeing refers to the physical, emotional, and psychological health of students [4]. Negligence for one's wellbeing contributes to mental and physical health problems [5]. Studies indicate that students who self-reported higher stress were more predisposed to depression [6]. Researcher Dr. Liu highlighted a correlation between students' stress and academic performance, revealing that 87% of students reporting high anxiety demonstrated impaired academic performance [7, p. 31].

Chestnut recognises the importance of prioritising student wellbeing. Hence, the need is for there to be a space to promote wellbeing. Currently, residents have access to a small wellness room, requiring booked access [3]. This space does not allow drop-in programs, has low accessibility, and is implausible for hosting events, seen in Figure 1.

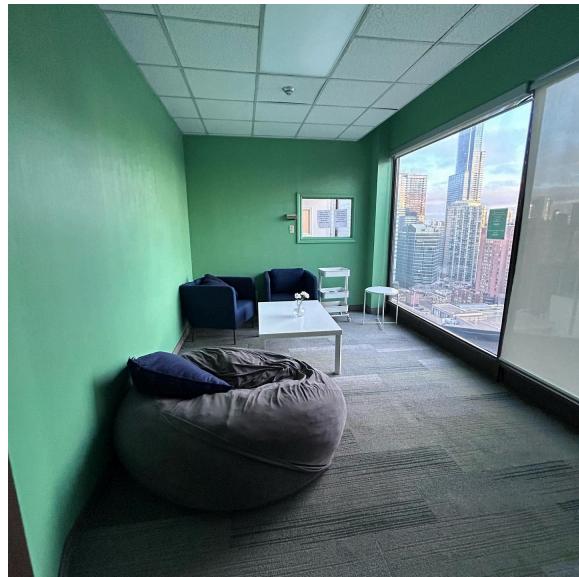


Figure 1: Current wellness room.

Due to its limited accessibility and physical size, there is currently no space to receive stress-relieving resources, including quiet meditation spaces, teaching stress-coping techniques, and encouraging open discussions surrounding wellness [8]. To bridge this gap, the mailroom located in Chestnut's basement will be repurposed into a space where residents can receive the aforementioned resources (Appendix A). A dedicated drop-in wellness room is an accessible space for students to decompress and relax, allowing

them to regulate their wellbeing separate from academics [9]. The design's scope is defined within the mailroom's boundary and infrastructure. A primary focus is placed on physical refurbishment, rather than conducting wellness programs within the room.

3.0 Service Environment

The Service Environment describes the physical, biological, and digital space in which the design must operate.

3.1 Physical Environment

A significant portion of the physical space—the mailroom—is wall-enclosed for storage. These walls are removable and the entire backroom is deemed usable, seen in Figure 2.



Figure 2: Interior of the mailroom seen when immediately entering the room (left) and the back storage space behind the walls of mail slots (right).

The ceiling heights are 1.99m and the dimensions of the mailroom are provided below (Figure 3). Table 1 summarises notable aspects of the physical environment.

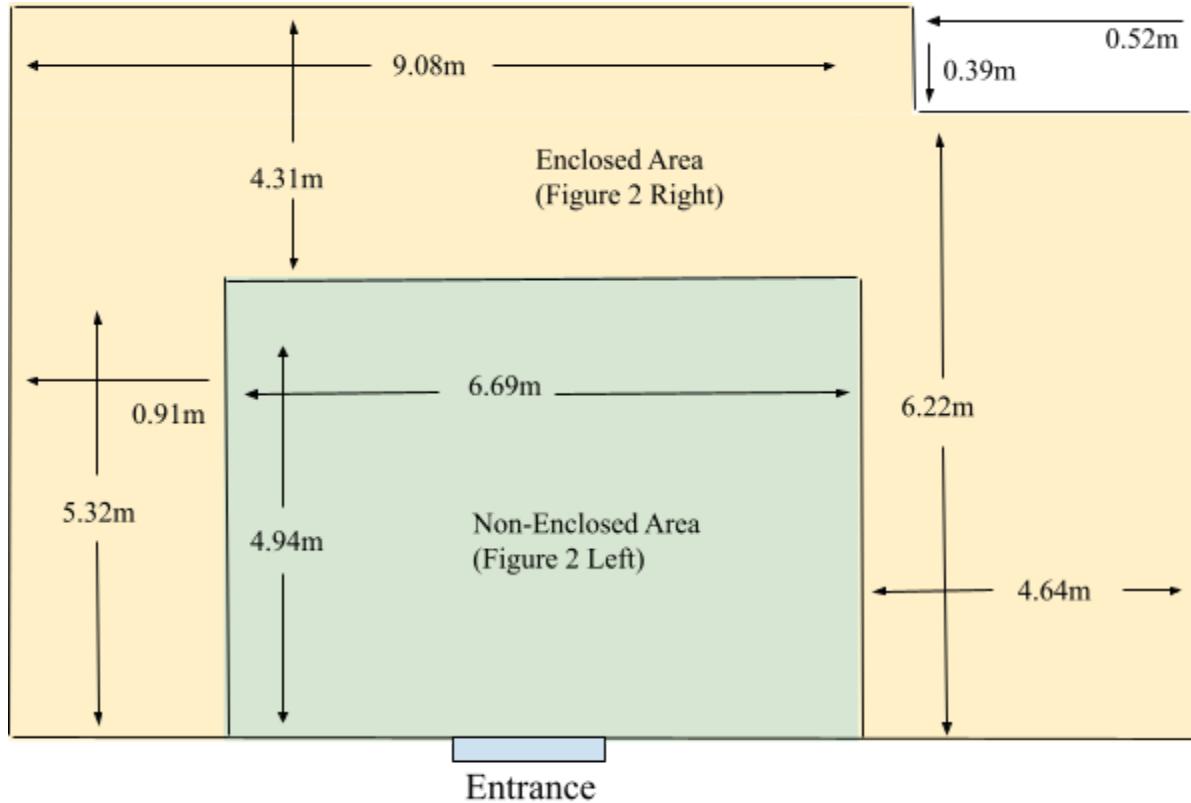


Figure 3: Mailroom floor plan. Left of Figure 2 in green, right of Figure 2 in yellow. Adapted from [3].

Table 1: Physical Environment Measurements

Subject	Description	Measurement
Lighting	<ul style="list-style-type: none"> • Windowless. • Situated underground. • Several non-functioning lights. 	<ul style="list-style-type: none"> • Light metre used for measurements. • 60-90 lux light range- 65 lux on average [10].
Sound Level	<ul style="list-style-type: none"> • Exceptionally quiet, current sound levels. 	<ul style="list-style-type: none"> • Audio amplitude- 1.7 dB [11].
Electricity	<ul style="list-style-type: none"> • Maintains North America's standard electric current [12]. 	<ul style="list-style-type: none"> • Standard voltage- 120V. • Standard frequency- 60Hz.
Temperature	<ul style="list-style-type: none"> • Below room temperature. 	<ul style="list-style-type: none"> • Temperature- 22°C (measured with thermostat).

Wall and carpet colours will be altered as per the client's requests (see Table 3). Hence, they will not be described within the physical environment.

3.2 Living Things

The user environment is divided into three main categories (Figure 4).

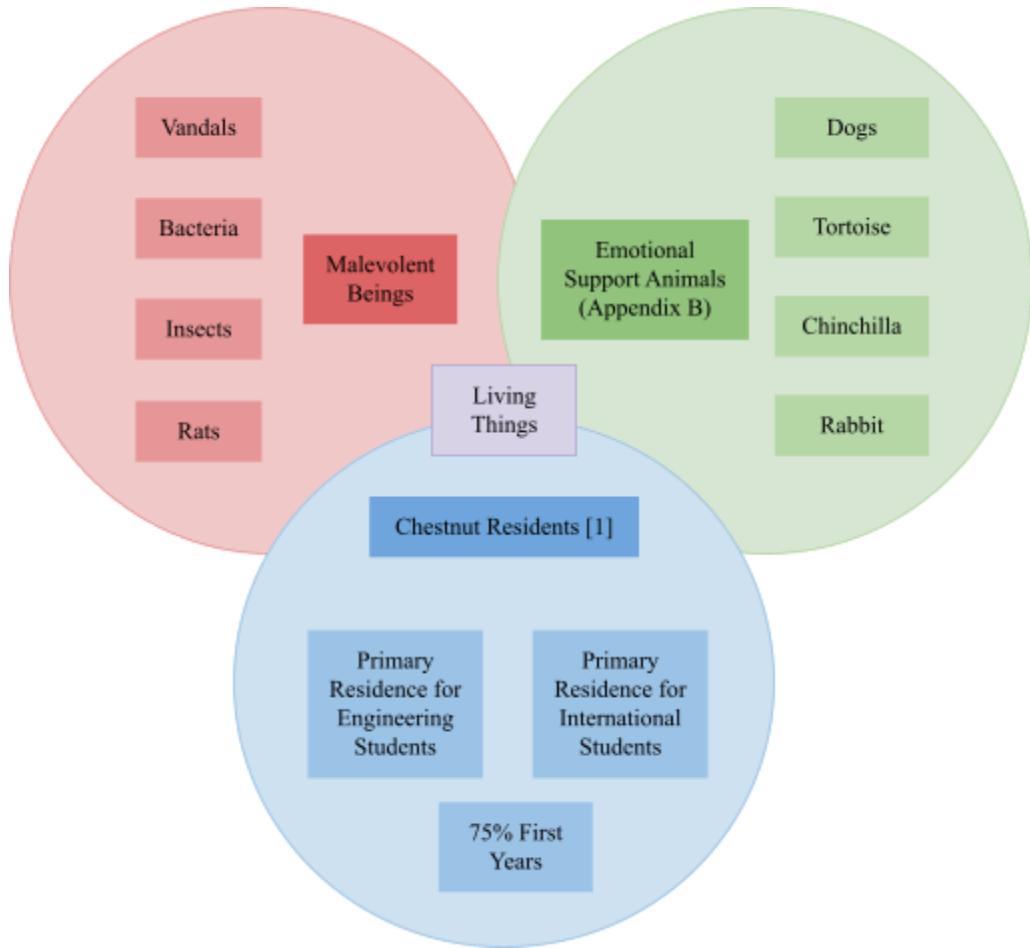


Figure 4: Main categories of living beings, relevant to the design.

3.3 Virtual Environment

Chestnut contains the following virtual systems:

- Uoft Residence Portal: Starrez [13].
- Chestnut Website [1].
- Chestnut Instagram [14].
- Wi-Fi: 110Mb/s [15].

4.0 Stakeholders

The Chestnut Revamp project directly impacts users residing at Chestnut and stakeholders that may be indirectly impacted by the design implementation. The following table summarises potential stakeholders and their interests in the design.

Table 2: Stakeholders and their Respective Interests

Stakeholder:	Interest:
UofT Indigenous Student Services	<ul style="list-style-type: none"> • Operates on unceded territories of the Huron-Wendat, Seneca, and Mississaugas [16]. • Shared ownership of the land should be acknowledged.
Residence Life Staff	<ul style="list-style-type: none"> • Residence Life Assistant Dean advocated for more engaging opportunities to benefit student wellbeing [17]. • Dean in charge of allocating funds from Chestnut's budget.
The United Steelworkers (USW) Residence Dons Unit	<ul style="list-style-type: none"> • Residence Dons (assistants), represented by the USW Union signed acknowledgements to "host recreational programming meant to enhance the experience of students" [19]. <ul style="list-style-type: none"> ◦ Chestnut's Dons have the duty to utilise available recreational spaces for programming that is conducive to residents' wellbeing.
Chestnut Residence Building Operations [20]	<ul style="list-style-type: none"> • Security: Must monitor who enters the concourse level. • Maintenance: Must ensure functionality of the room.
Animal Welfare Services	<ul style="list-style-type: none"> • Therapy animals are permitted (Appendix B). • Enforce the Provincial Animal Services Act as animals may be mistreated by users [21].
UofT's HealthyU Crew	<ul style="list-style-type: none"> • Chestnut Wellness Coordinators partner with HealthyU Crew to run programs and discussions surrounding student wellbeing (Appendix B).
Discovery Pharmacy	<ul style="list-style-type: none"> • Client anticipates partnering with Discovery Pharmacy to host health and wellness workshops (Appendix B).

5.0 Detailed Requirements

The wellness space must meet the functionality expectations of a design that improves upon the current wellness room. The designs' success will be measured through objective goals and compared through their respective metrics. The design space is limited by the project's constraints.

5.1 Functions

Functions describe what the design must do to operate successfully. Upon analysing how the design space could be maximised, Functional Basis and Black Box Method (Appendix C) were used to determine the primary and secondary functions shown in Figure 5.

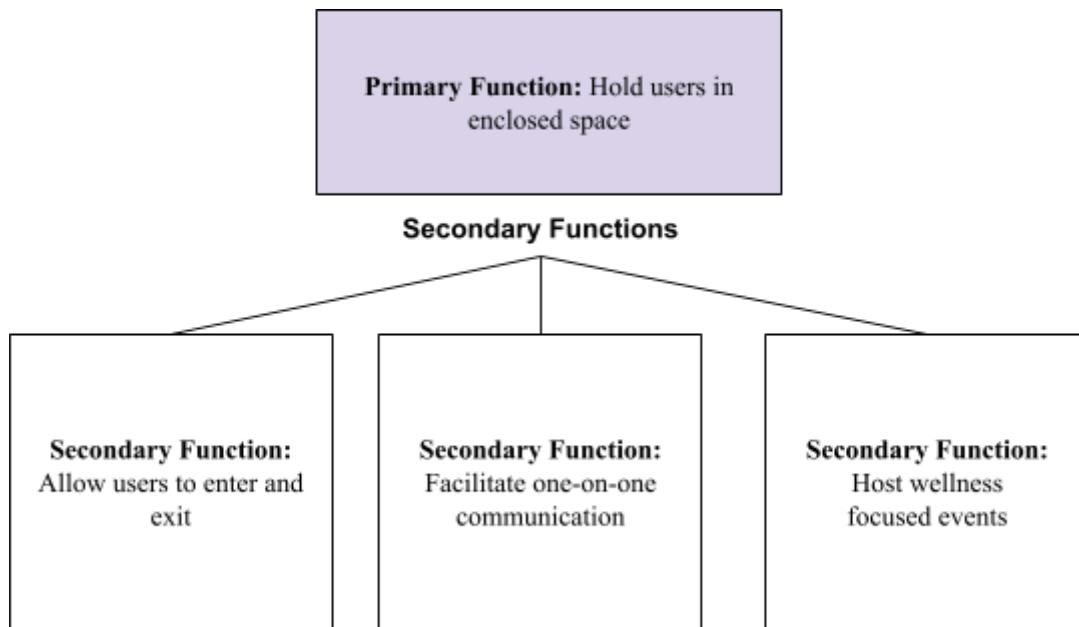


Figure 5: Primary and secondary functions.

5.2 Objectives

To gauge the success of proposed designs, a How-Why tree was used to develop relevant objectives (Appendix D). Objectives were developed with consideration to client preferences. Relevant excerpts of client meeting notes scribed by members are included in Appendix B to justify the goals and metrics. Using pairwise comparison, priority is assigned to each objective displayed in Table 3 (Appendix D).

Table 3: Objectives with Respective Goals, and Metrics

Objective Designs should (be):	Goals Design should (have):	Metrics The goal is met when it (has / meets):
Versatile and adaptable (Appendix B).	• Sufficient animal holding space.	• 3.0x3.0 metres [22].
	• Host large workshops and floor events.	• Capacity of number of residents per floor (≈ 50).
	• Sufficient storage space.	• 1.5x3.0 metres storage unit, preferred for single-room spaces [23].
Promote relaxation	• Warm, opposed to blue-hued lighting. Blue-hued lighting is linked to insomnia [24].	• Dimness of 50-100 Lux [10]. • Measures warmth of 2500-3000 K on colour temperature scale [25].
	• Warm, muted colour palette which is calming [26]. Muted tones have low contrast between RGB intensities [27].	• RGB colour codes within 30 points of one another (see Appendix D for sample palette).
Offer privacy	• Low sound reverberation (echoing).	• Preferred indoor range: 0.3-0.4 seconds [28].
	• Minimise noise transmission.	• Walls block minimum 45 dB.
Ergonomic	• Seating promotes good posture and offers comfortability [29].	• 13° - 15° backward incline angle. • Armrests > 47 cm apart. • Height ≈ 43 cm. • Recommended cushioning thickness of 3.5-5 cm.

5.3 Constraints

To define the design space boundaries, constraints were generated through the client and regulations relevant to the space (Table 4). Client preferences were detached from what the design must accomplish to function. The building codes define how the design must operate in its service environment.

Table 4: Constraints with Respective Descriptions, and Measurements

	Constraint The design must (satisfy):	Description & Measurement The design must (be/have):
Client-given constraints	Be drop-in [3].	<ul style="list-style-type: none"> Available to residents without pre-booking.
	Budget [30].	<ul style="list-style-type: none"> Cost < \$40,000.
Codes, standards, and regulations	Ontario Building Code [31].	<ul style="list-style-type: none"> Maintain public inaccessibility of electrical systems. Room temperature > 22°C. Minimum 0.4m² of floor space per occupant.
	Toronto Noise laws [32].	<ul style="list-style-type: none"> Not generate sound exceeding 50 dB.
	Accessibility for Ontarians with Disabilities Act [33].	<ul style="list-style-type: none"> Minimum 4 accessible chairs. Measures, 1.0x1.0 metre pathways for the average wheelchair [34].
	Fire Protection and Prevention Act [35].	<ul style="list-style-type: none"> No flammable materials within 1.5m² of exits No furniture within 1.5m of egress routes. Width of exit > 1.1m. Maximum 90N required force to open doors.

6.0 Generation, Selection, and Description of Alternative Designs

The following section outlines the processes undertaken to expand the design space through generation of ideas, followed by narrowing the design space to the ideas that best align with the project's objectives.

6.1 Idea Generation Process

From carefully defining the project's requirements, the design space was ready to be expanded through the use of the idea generation process summarised in Figure 6.

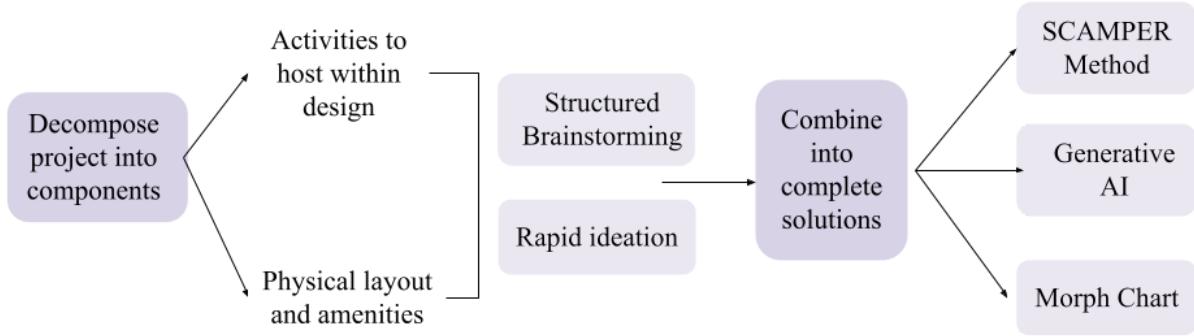


Figure 6: Idea generation process and summary of methods used.

Idea generation began by decomposing the project into the activities and the physicality of the design. Parallel methods were used to generate ideas for each subcomponent (Appendix E). With the project's subcomponents well defined, members developed full design solutions using “force-fitting” ideation methods including morphological charts and SCAMPER. These methods forced out-of-the-box thinking by making connections between randomised, solution components (Appendix F). Generative AI was employed by members to stimulate creativity (Appendix G).

6.2 Alternative Design Selection Process

The team emerged from the idea generation process with 117 complete designs. Through iteration and team-based decision making, three final designs were selected, wherein the process is summarised in Figure 7 below.

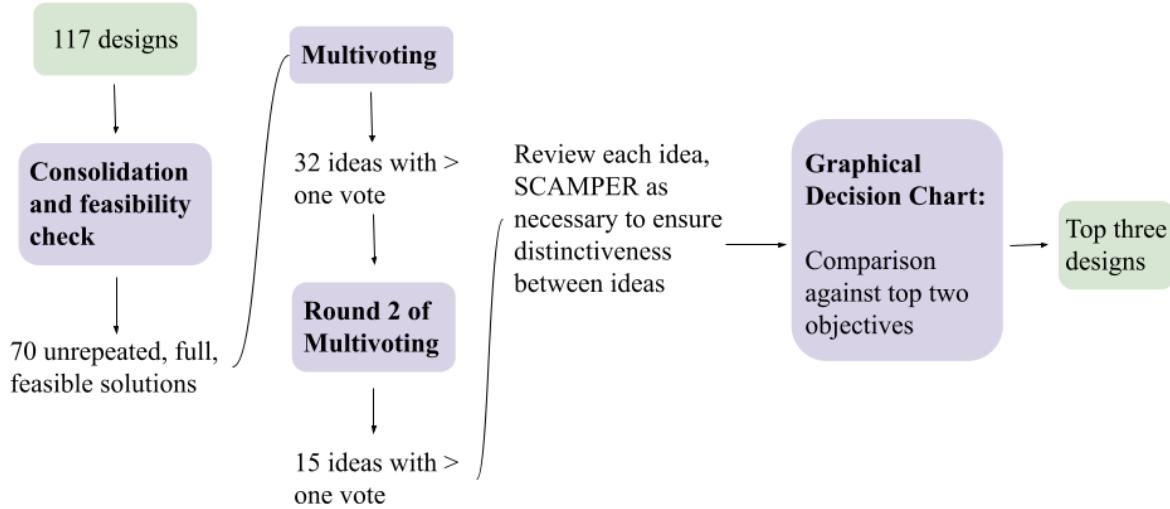


Figure 7: Alternative design selection process leading to three top designs. See Appendix H for further explanation and Appendix I for multivoting.

Figure 8 shows the Graphical Decision Chart employed to compare the top 15 designs.

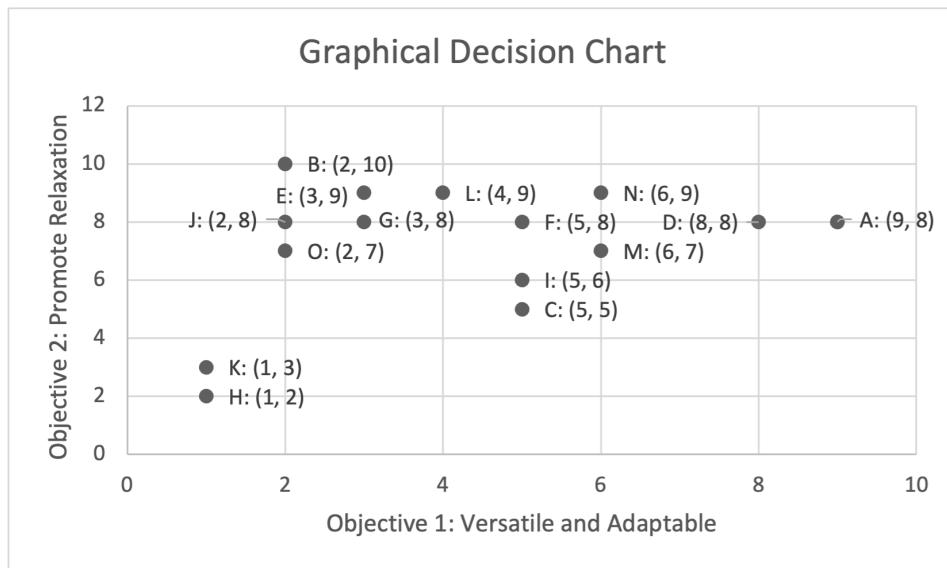


Figure 8: Graphical Decision Chart comparing the top solutions against the top two objectives: versatility / adaptability and promoting relaxation. See Appendix J for the rationale.

A common theme was the strong performance (K and H exempt) of promoting relaxation, with a greater struggle to provide versatility. Versatility results from the room's physical structure- walls and floor space- while promoting relaxation stems from amenities implemented. Thus, the three alternative designs

(chart's top right) were chosen to differ distinctly in physical structure, allowing further exploration of how the three designs may offer versatility in varying ways and ultimately leaving the choice of which design's layout best meets this objective.

6.3 Alternative Design Descriptions

Through the idea generation and selection process, three designs that best aligned with the project's objectives were established. All three designs require removing the walls of mailboxes shown in Figure 2.

6.3.1 Alternative Design A: Simplistic Wellness Hub

This design partitions the mailroom space into two. Current walls are removed, allowing subsequent space. The 4.60x5.60m left portion of the room is sectioned off by soundproof walls and allocated for private communication, while the remaining space consists of several amenities, open for recreational events. This design is shown in Figure 9 and evaluated in Table 5.



Figure 9: Visual of how Design A's layout and amenities.

Table 5: Design A Evaluation

Objective	Extent of achievement
Versatile and adaptable	
Sufficient animal space.	<ul style="list-style-type: none"> • Sufficient- > 3.0x3.0 metres. • Shift furniture as required- requires effort.
Host large-scale events.	<ul style="list-style-type: none"> • Consists of seating areas, projector and display screen. • Open floor-space allows for large activities.
Sufficient storage space.	<ul style="list-style-type: none"> • No designated storage space- room's openness allows for storage as required. • Items can be stored on desks / shelves.
Promote relaxation	
Warm lighting.	<ul style="list-style-type: none"> • Floor lamps typically emit soft (2700K) light [25].
Warm, muted colour palette.	<ul style="list-style-type: none"> • Grey floor tiles provide a muted tone. • Warm colours used for furniture.
Offer privacy	
Low echoing	<ul style="list-style-type: none"> • Soundproof walls made with fibreglass insulation and sound acoustic panels provide a private space [36]. • Soundproof walls dampen echoes.
Low noise transmission	<ul style="list-style-type: none"> • Wall material minimises transmission of noise between rooms.
Ergonomic	
Comfortable seating	<ul style="list-style-type: none"> • Variety of movable furniture provides comfort, and accommodates most users.

The room layout enables multipurpose activities, providing great versatility. The design exceptionally offers privacy, as the sound proof walls facilitate communication in a quiet and isolated environment. While this design satisfies all objectives, limitations include the lack of designated animal holding spaces. The design could accommodate this need when furniture is shifted, but requires effort to do so.

6.3.2 Alternative Design B: Glass-enclosed Nature Room

This design replaces the inner walls with glass. Plants and decorations behind the glass enhance visual appeal. The curtained area behind the right-hand wall, is a private space ($4.64 \times 6.22\text{m}$ area). The areas behind the left-hand and front walls allow space for shelves and cabinets, maximising storage. The non-enclosed middle area, ($6.69 \times 4.94\text{m}$) is available for recreational use. Bright, fluorescent lighting provides a light source to plants [37]. The design is shown in Figure 10 and evaluated in Table 6.



Figure 10: Visual of how Design B's layout and amenities.

Table 6: Design B Evaluation

Objective	Extent of achievement
Versatile and adaptable	
Sufficient animal space.	<ul style="list-style-type: none"> Sufficient area behind the centre glass wall- 9.08x4.31m.
Host large-scale events.	<ul style="list-style-type: none"> Open space at the centre of the room can be used as a recreational space.
Sufficient storage space.	<ul style="list-style-type: none"> Storage space behind glass walls. One-on-one space or left-hand area (0.91x5.32m) can be used.
Promote relaxation	
Warm lighting.	<ul style="list-style-type: none"> Bright, fluorescent lighting does not align with this objective.
Warm, muted colour palette.	<ul style="list-style-type: none"> Bright greenery may contrast with warm colours. Choice to implement decor having warm colours.
Offer privacy	
Low echoing	<ul style="list-style-type: none"> No indication of sound-proofing wall material- possible echoing. Carpeted floor allows for sound absorption.
Low noise transmission	<ul style="list-style-type: none"> Glass blocks a minimum of 36 dB of sound- less than the expected 45dB [38].
Ergonomic	
Comfortable seating	<ul style="list-style-type: none"> Bean bag chairs and couches offer comfort and a variety of seating choices.

This design primarily focuses on visual appeal and providing sufficient space for animals, users, and storage. Therefore, the design exceptionally achieves versatility / adaptability. Contrarily, the quality of relaxation is compromised by its harsh lighting, noise transmission through the glass, and emphasis on greenery. This is a trade-off for its strong performance in other aforementioned objectives.

6.3.3 Alternative Design C: Multifunctional lounge

This design partitions the room in three (right to left): a private, recreational, and yoga room. The 4.00x4.00m leftmost section is an enclosed, private space. The 4.24x5.25m centre section is a lounge space that accommodates recreational activities. The right-most 4.00x9.25m section is allocated for quiet activities, including yoga and meditation. The design is shown in Figure 11 and evaluated in Table 7.



Figure 11: Visual of how Design C's layout and amenities.

Table 7: Design C Evaluation

Objective	Extent of achievement
Versatile and adaptable	
Sufficient animal space.	<ul style="list-style-type: none"> • No dedicated animal space. • The yoga room may be arranged to accommodate animals as needed.
Host large-scale events.	<ul style="list-style-type: none"> • Lounge space and centre room offer multipurpose use.
Sufficient storage space.	<ul style="list-style-type: none"> • Lacks sufficient storage space.
Promote relaxation	
Warm lighting.	<ul style="list-style-type: none"> • Achieved well in the yoga room. • Brighter lighting in the recreational room, necessary for activities such as board games.
Warm, muted colour palette.	<ul style="list-style-type: none"> • Choice to implement a warm colour palette.
Offer privacy	
Low echoing	<ul style="list-style-type: none"> • No indication of sound-proofing wall material- possible echoing.
Low noise transmission	<ul style="list-style-type: none"> • Louder activities in the recreational room- possible noise leakage.
Ergonomic	
Comfortable seating	<ul style="list-style-type: none"> • Bean bag chairs and couches in the lounge space provide comfort and several seating choices.

The layout of the room accommodates several types of activities, sufficiently promoting relaxation. Its adaptability, however, is limited from the lack of storage space. Rearrangement of furniture is required for animal space and event hosting. Due to potential noise leakage, the design is further limited in terms of privacy.

7.0 Proposed Conceptual Design Specification

The Pugh Method was used to determine how the three alternative designs fulfil the project's objectives. The Pugh Method's datum serves as a baseline for comparison. The team selected Design M (see Figure 8) as the datum due to its proximity to the average of the three alternative designs. Appendix K provides further rationale.

Design A: The Simplistic Wellness Hub is the most closely aligned with client objectives, receiving a score of 3. A 3D modelling of the design is shown in Figure 12.

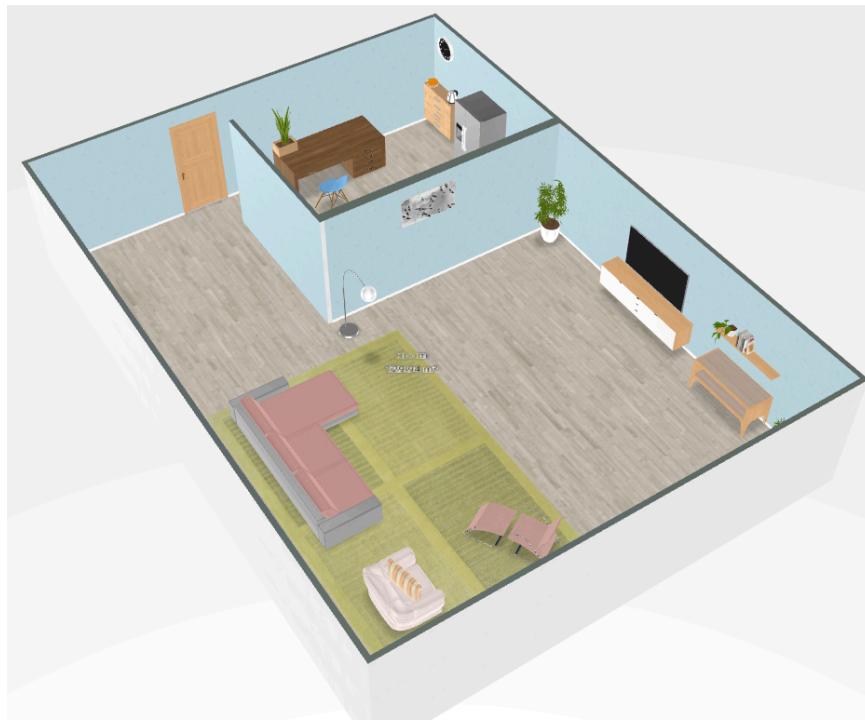


Figure 12: 3D model of Design A's room layout and implemented amenities.

Design A's versatility and adaptability is exemplified through its multifunctionality. The movable furniture allows for easy room reconfiguration, bridging the client's need for a space to host many large-scale activities. Comparison of occupant space to the room's space is shown in Appendix L. The design excels in offering privacy through its soundproof walls. Minimising noise transmission in the enclosed space ensures private communication, providing a space conducive to confidential discussions. The Wellness Hub promotes relaxation and ergonomics through design elements that enhance calmness and relaxation. This is vital to fulfilling the need to provide users with a space to decompress and stray away from academics.

Design A offers a comprehensive solution that meets the client's functional requirements and addresses their needs and preferences. Its emphasis on versatility, privacy, relaxation, and ergonomics ensure the outcome aligns with the client's desired result of fostering a welcoming space.

8.0 Measures of Success

The team will measure the design's ability to promote relaxation. A multiple choice and likert-scale questionnaire was developed to inquire how users perceive relaxation inducing factors (see Appendix M for the questions). The team will follow the steps summarised in Table 8:

Table 8: Steps to Implement a Questionnaire

Step	Justification	Duration (days)
Develop the Google Forms Questionnaire.	<ul style="list-style-type: none"> Questionnaires effectively take in user input. 	3
Distribute flyers around Chestnut containing questionnaire QR code.	<ul style="list-style-type: none"> Chestnut residents are the design's primary users. 	1
User response period.	<ul style="list-style-type: none"> Gain sufficient number of responses. 	7
Review results.	<ul style="list-style-type: none"> Success depends on if responses align with the objective goals (ie. greater preference for warmer lighting). 	5

Questionnaires provide primary, observational research, representative of the target demographic. Results will be cross-referenced with literature research to assess credibility in responses. The team will decide in the four week period to implement changes based on the responses. Responses will be compared to our objective metrics. If the majority ($> 50\%$) of respondents agree with the research, our objective has been met. If their consensus does not align, our objective is insufficiently met. However, it is important to note that questionnaires are prone to bias and maybe unreliable. Further consultation with the client is necessary.

9.0 Conclusion

Student wellbeing is a priority for Chestnut Residence. To bridge the lack of accessible space dedicated to student's mental and physical wellness, the project aimed to repurpose Chestnut's current mailroom into a wellness room where residents could benefit from stress-relieving resources in a non-academic atmosphere. Adhering to established design requirements and client expectations, the team produced three alternative designs. Of the three, the team proposed the Simplistic Wellness Hub Design, as it best satisfied the project's functions, objectives and constraints. Moving forward, it is up to the client to review and provide feedback regarding the designs, alternatively deciding which solution to proceed with.

10.0 References

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11.0 Appendices

Appendix A: 5 Whys method

The team has been tasked to convert the mailroom located on the concourse level at Chestnut Residence, into a wellness room. Using the 5 Whys method, the team will determine the client's needs regarding this project (see Figure 13 below). Based on our responses to the whys, the team will select the best response that encapsulates the project purpose.

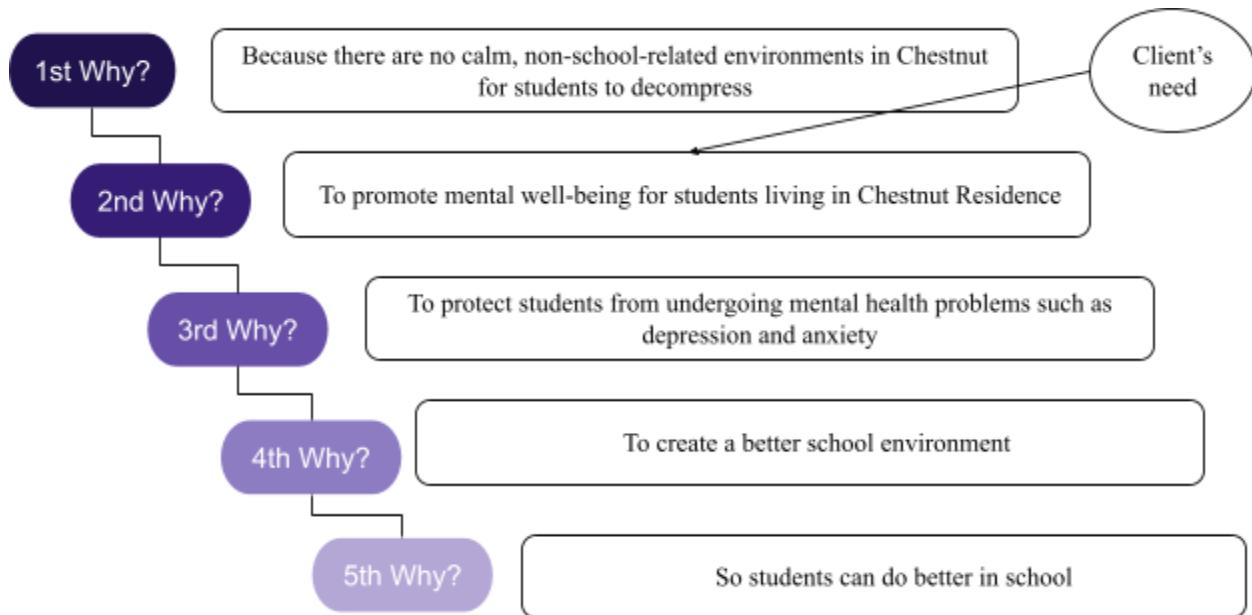


Figure 13: 5 whys tree used to identify the client's need.

Client's Need: To promote mental wellbeing for students living in Chestnut Residence.

Appendix B: Engineering Notebook Excerpts

Excerpts of notes recorded during the team's client meeting were used to gauge the client's needs and preferences throughout the development of the detailed requirements. The figures below (14-17) are extracted from team members' notebooks.

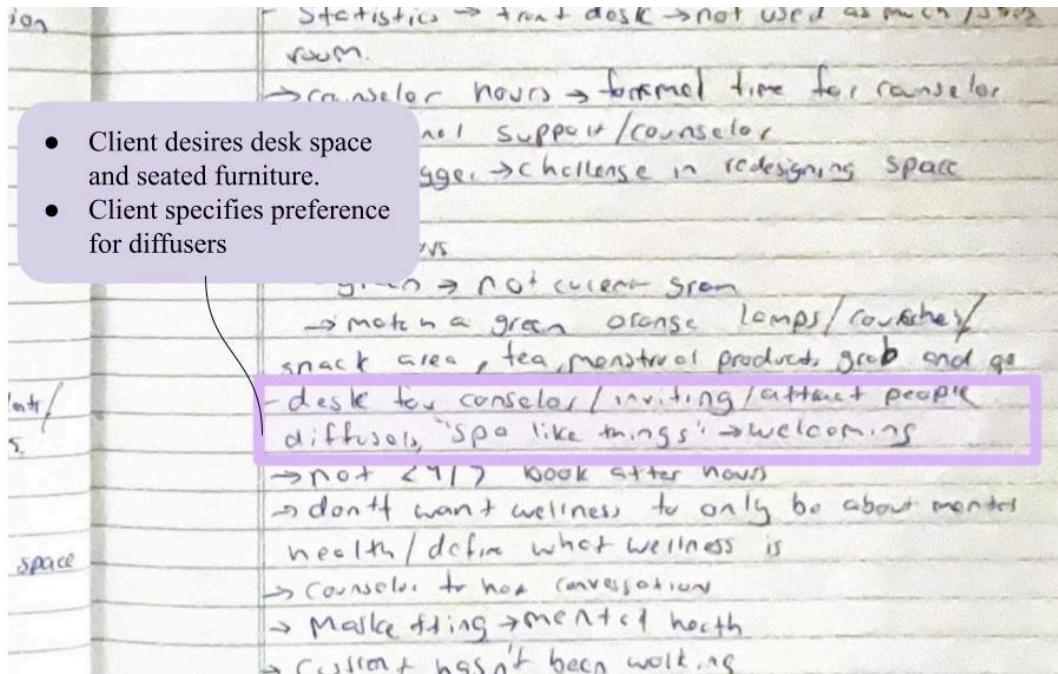


Figure 14: Kashan Ahmad's notebook identifying client's furniture preference.

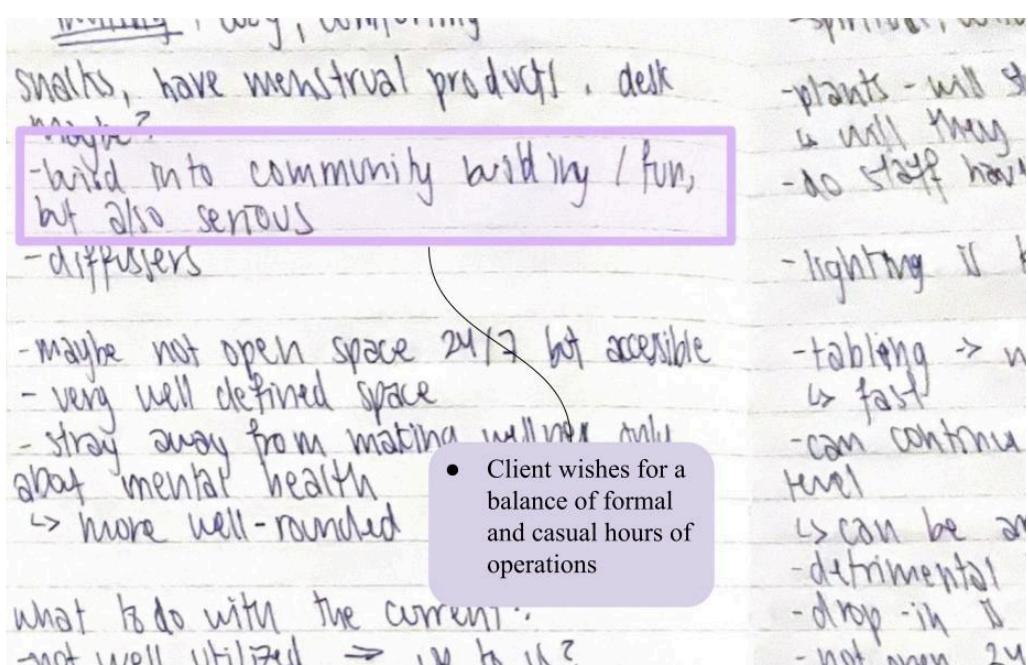


Figure 15: Grace Lin's notebook identifying client's goal for versatility in the operation of the design.

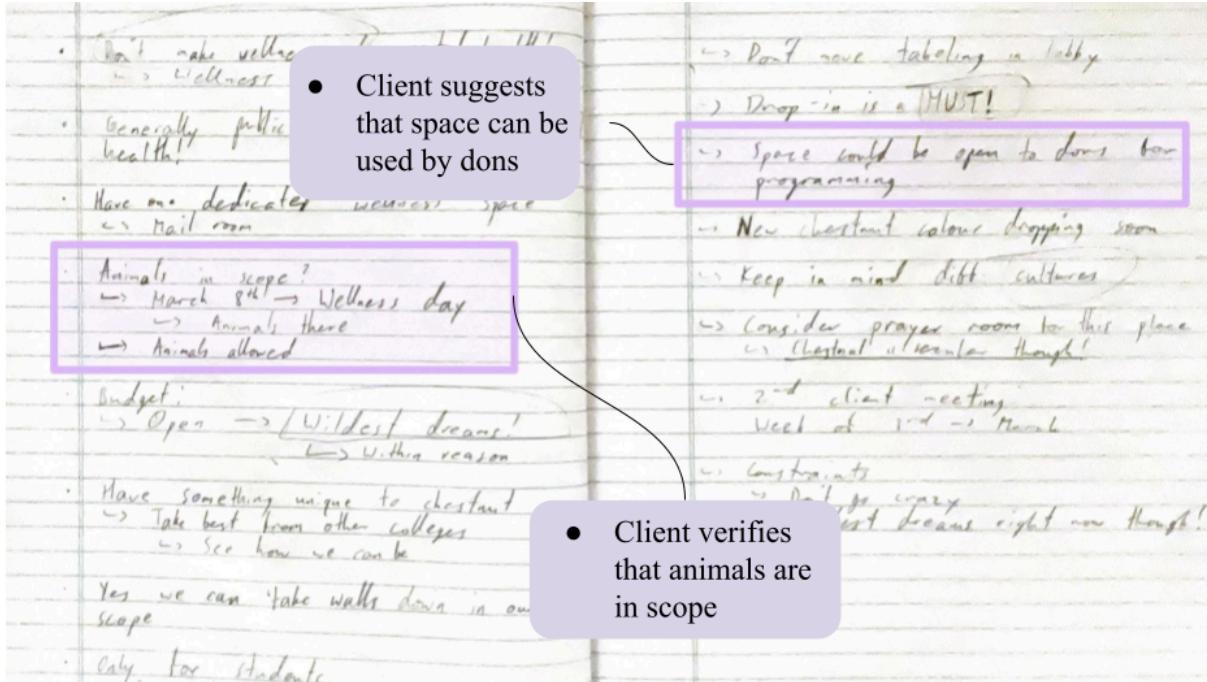


Figure 16: Omer Mumtaz's notebook identifying client's suggestions for the use of the space and verifying the possibility for animal users in the design.

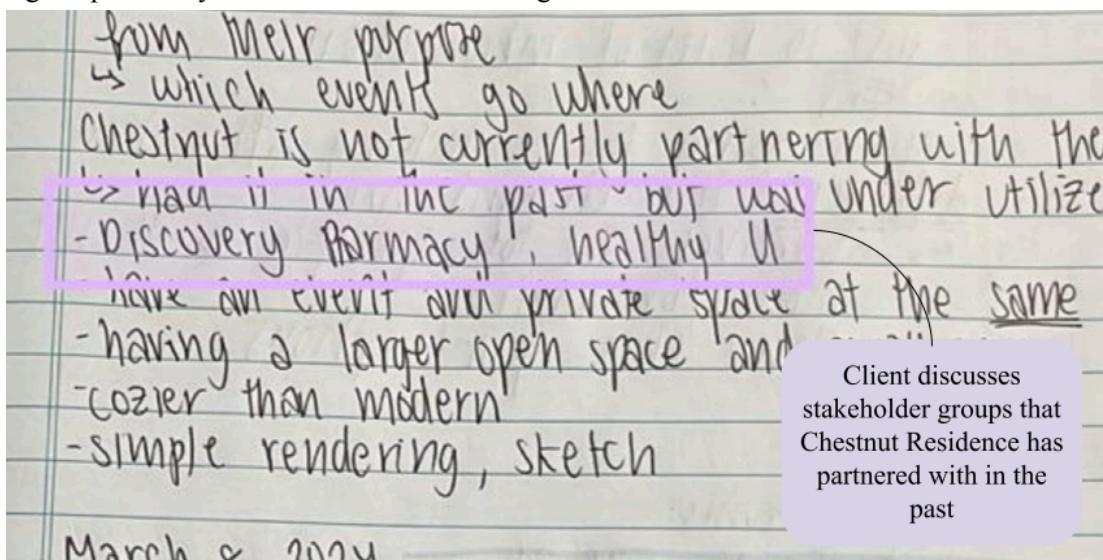


Figure 17: Grace Lin's notebook identifying stakeholder groups in which the client has partnered with in the past.

Appendix C: Tools Used to Develop Functions

To satisfy the expectations of the client's needs the functions were developed to most broadly address the design space, the following tools were used to develop the functions of the design.

Table 9: Black box method

	Input		Output
Mass	- Mass stored. - Mass leaving room.	Design	- Mass entered. - Indicate mass left.
Energy	- No energy associated with the main design itself.		- No energy associated.
Information	- Indicating when mass can be stored. - Information regarding wellness. - Negative atmosphere / spirit / mood.		- Indicating that mass has been stored. - Information regarding wellness received. - Positive atmosphere / spirit / mood.

Notes:

Functional basis:

- Store mass.
- Convey Information.
- Support mass (Support residents/students).
- Transmit information.
- Control mass, energy and information.

The function of a wellness room is:

- Provide a space for students to receive wellness resources.
- But a focus is placed on the redesigning of the room rather than conducting wellness events.
- Provide a tranquil space.
- Provide a space to foster student wellbeing.
- The function above is too vague, and does not represent exactly what the design must do. The design will essentially hold users within a space.
- Primary function: Hold users in enclosed space

Secondary functions:

- Allow users to enter and exit the room.
- Provide a space to facilitate one-on-one communication - Client suggested counsellor's within the room and aims to provide a space where students can socialise and speak to one another.
- Provide a space to host wellness focused events [3].

Appendix D: Tools Used to Develop Objectives

The following How-Why tree decomposes the team's measures for success into specific objectives and how the goals are attainable through measurable metrics. Metrics were adapted according to client preferences and through comparison and benchmarking to the existing wellness room, as seen in Figure 18 below.

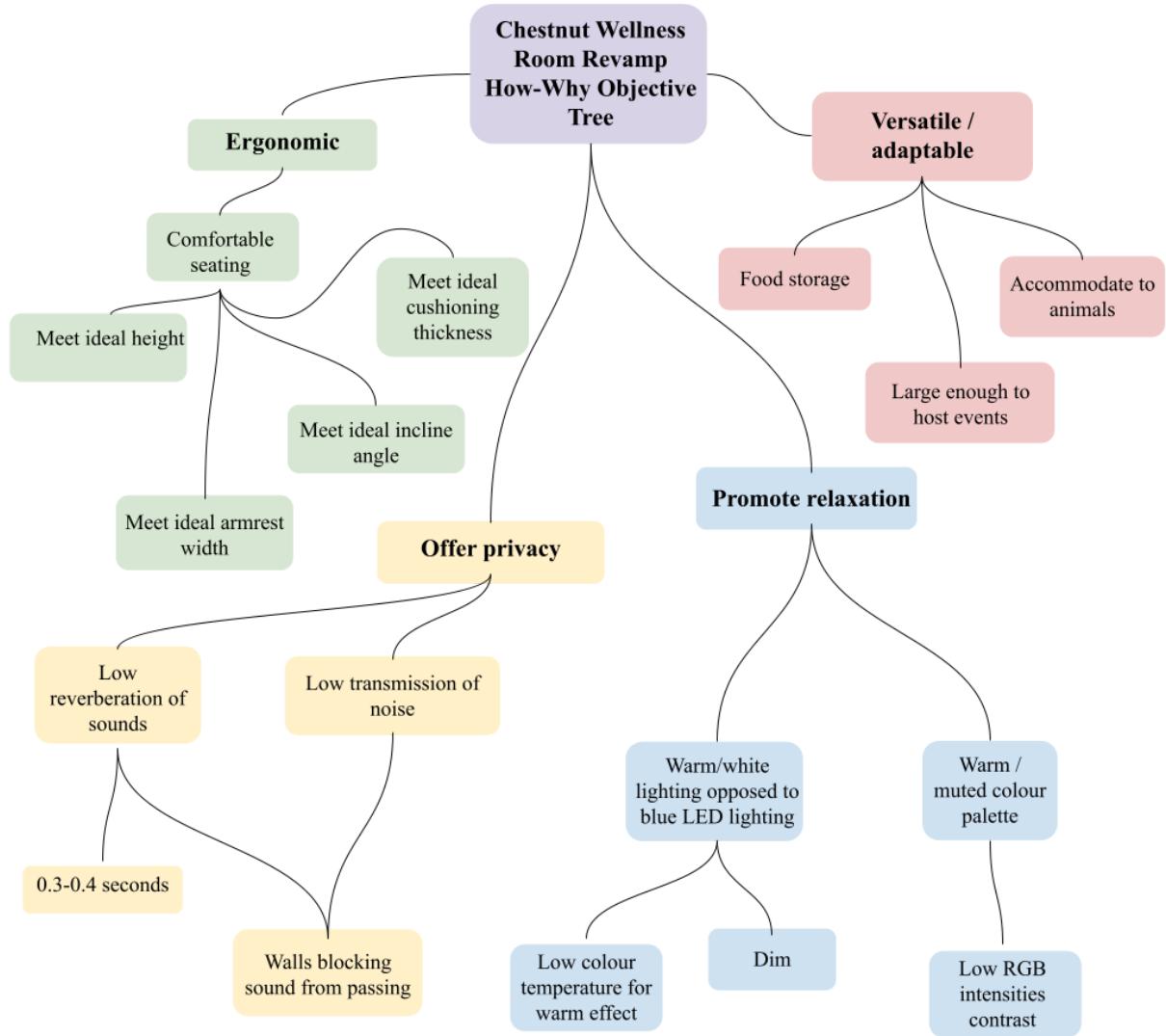


Figure 18: How-Why Tree used to generate the design's objectives.

The client has indicated many preferences for the interior of the room, including its colour palette. A sample colour palette choice is seen in Figure 19 below.

Color	Hex	RGB
	#f8d3c5	(248,211,197)
	#fceee9	(252,238,233)
	#dde6d5	(221,230,213)
	#a3b899	(163,184,153)
	#667b68	(102,123,104)

Figure 19: Sample Colour Palette. Adapted from [39].

To rank the importance of each objective, the following pairwise comparison (Table 10) helps determine the relative value of the objectives when compared with one another. The sum reflects the relative importance of the objective, with the largest sum implying the most important objective.

Table 10: Pairwise Comparison

	Ergonomic	Promote relaxation	Offer privacy	Versatile / adaptable	Total
Ergonomic	-	0	0	0	0
Promote relaxation	1	-	1	0	2
Offer privacy	1	0	-	0	1
Versatile / adaptable	1	1	1	-	3

Appendix E: Idea Generation Process and Tools Used

The team brainstormed ideas for the project's subcomponents using parallel methods:

1. Structured, individual brainstorming under a fixed time period.
2. The team reconvened with their ideas on a mind map which allowed for ease of removing repeated ideas and effortless visualisation of the current design space size.
3. Team leveraging their collaborative strengths through rounds of rapid ideation, allowing for a free exchange of ideas.

The following Figures (20-21) show the collaborative digital mind map used during the idea generation process. The mind maps ensure ease of visualisation of the design space.

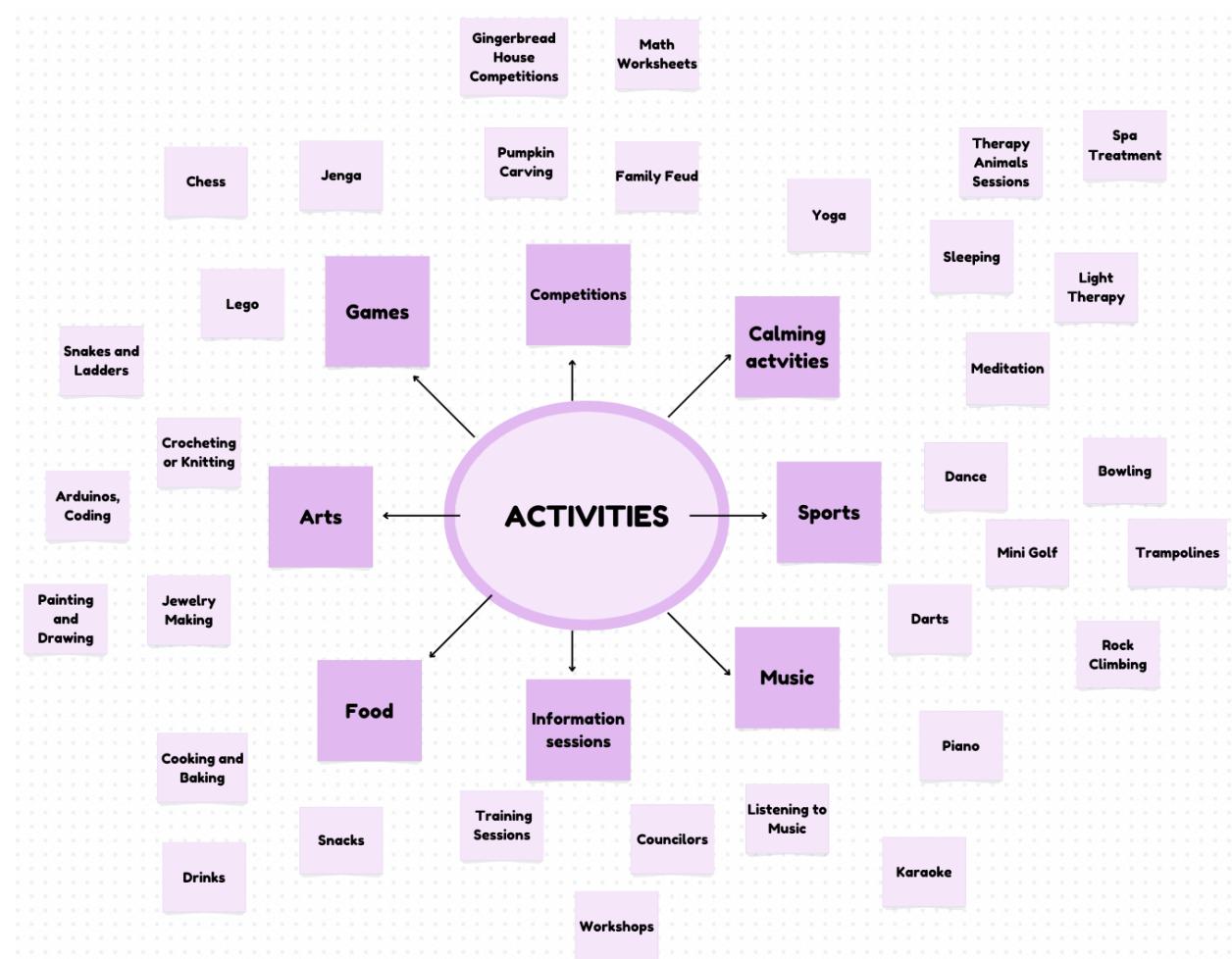


Figure 20: Brainstorming of the activities that could be hosted within the design.

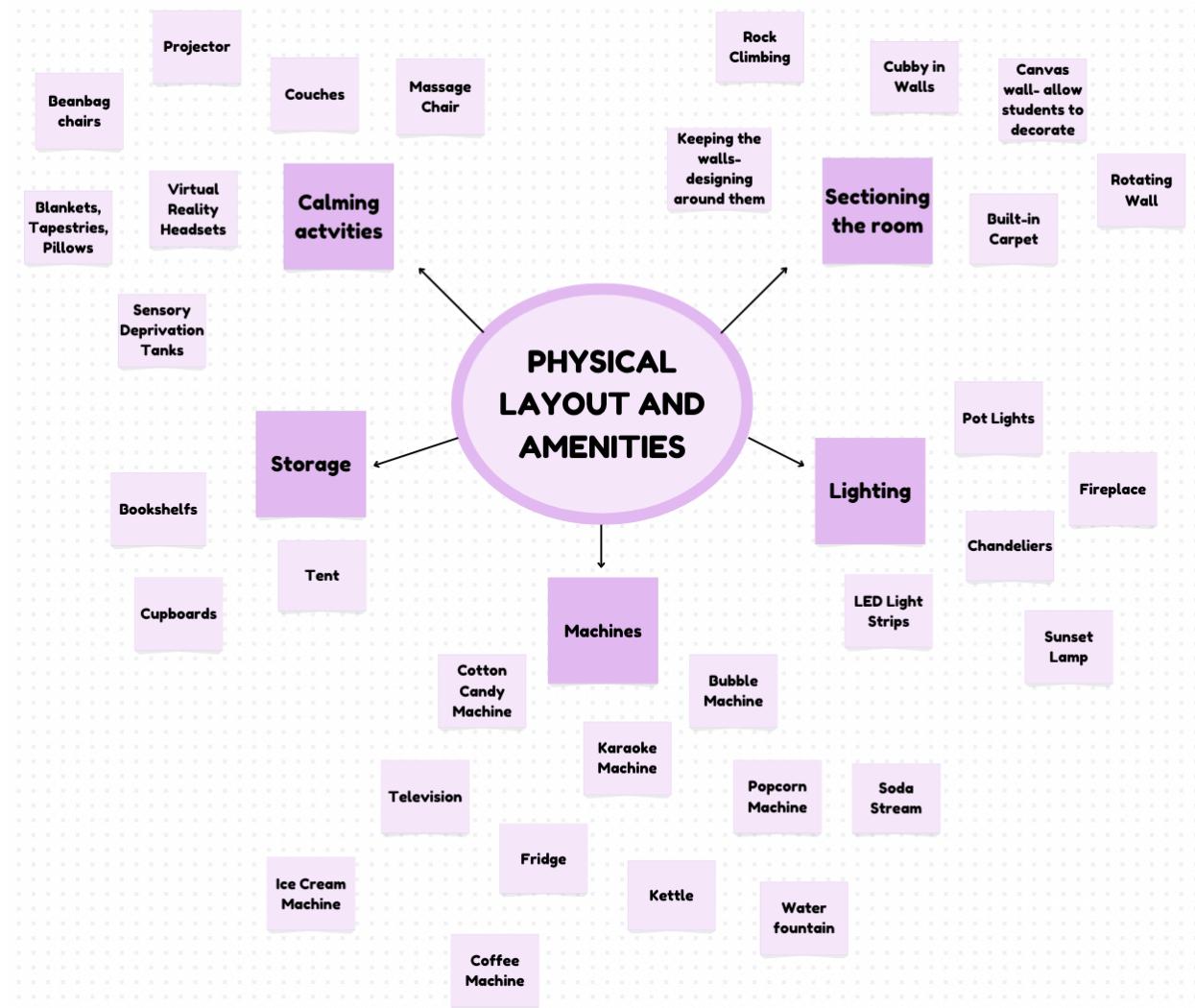


Figure 21: Brainstorming of the physical layout and amenities of the design.

Appendix F: Morph Charts

The following tables show a morph chart used during idea generation. It is noted that the primary function was used as a category, rather than the secondary function of “allowing users to enter and exit the room”. The highlighted colours correspond to ideas that were matched together.

Table 11: Morph Chart

	Secondary function	Primary function	Secondary function
	Facilitate one-on-one communication	Hold users in an enclosed space	Host wellness focused events
Means	Massage chairs, and couches	Private office space	Blank wall to allow students to decorate
Means	Sensory Deprivation Tank	Cubbies for seating	Karaoke machine
Means	Yoga mats	Rotating wall to section the room	Popcorn machine
Means	Fireplace	Bookshelf storage	Basketball hoop
Means	Foldable beds	Large open floor space	Television
Means	VR Headsets	Tent	Fridge

Table 12: Morph Chart 2

	Secondary function	Primary function	Secondary function
	Facilitate one-on-one communication	Hold users in an enclosed space	Host wellness focused events
Means	Table	Tent	Empty Room
Means	Sound-proof walls	Couches	TV
Means	VR	Meditation room	Projectors
Means	Hologram	Bean bag chairs	Canvas white wall
Means	Microphones	Indoor Swing Chair	Yoga mats
Means	Headphones	Carpet	Door hanging basketball net and mini golf set up

Appendix G: Chat GPT Prompts and Generated Responses

Generative AI such as Chat GPT was used during the idea generation process to stimulate creative thinking and provide inspiration. The following presents instances in which ChatGPT was used, the prompts that were given, and the responses that were delivered.

Question:

Can you give me a list of complete descriptions for distinct wellness room designs

Response:

Certainly! Here are descriptions of distinct wellness room designs tailored to different preferences and needs:

Zen Oasis:

- This wellness room is designed for ultimate tranquility and relaxation. Soft, neutral colors dominate the space, complemented by natural elements like bamboo flooring and potted bonsai trees. A Japanese-inspired Zen garden occupies one corner, featuring sand raked into soothing patterns and a miniature rock garden. A low, minimalist platform serves as a meditation area with floor cushions and a small water fountain for ambient sound. Paper shoji screens filter sunlight, creating a serene atmosphere.

Nature Retreat:

- Embracing the healing power of nature, this wellness room brings the outdoors inside. Large windows frame views of lush greenery, while a living wall covered in vibrant plants serves as the room's focal point. The floor is adorned with natural wood planks or cork tiles, providing warmth and texture. A cozy seating area features organic-shaped furniture and soft throws, inviting relaxation. Essential oil diffusers emit scents of fresh pine or citrus, enhancing the natural ambience.

Modern Sanctuary:

- Sleek and sophisticated, this wellness room embodies modern elegance. Clean lines and minimalist decor create a sense of spaciousness and calm. Neutral tones like gray, white, and taupe dominate the color palette, accented by pops of color from abstract art pieces. Recessed lighting with dimmer controls allows for customizable ambiance, while a state-of-the-art sound system provides immersive audio experiences. A floating yoga platform doubles as a meditation space, with integrated storage compartments for yoga props.

Bohemian Haven:

- Eclectic and inviting, this wellness room is a bohemian paradise filled with rich textures and vibrant hues. Persian rugs cover the floor, layered with floor cushions and poufs for a relaxed seating arrangement. Macrame plant hangers dangle from the ceiling, showcasing cascading ivy and trailing vines. A cozy reading nook features a hammock chair suspended from the ceiling, perfect for unwinding with a good book. A tapestry-lined meditation alcove provides a cozy retreat for mindfulness practices.

Scandinavian Serenity:

- Inspired by Scandinavian design principles, this wellness room exudes simplicity and warmth. Light oak flooring and white walls create an airy, minimalist backdrop, while cozy textiles like faux fur throws and knitted blankets add tactile comfort. A wood-burning stove or ethanol fireplace serves as a focal point, radiating warmth and coziness during colder months. Hygge-inspired accents such as sheepskin rugs and scented candles enhance the sense of hygge, or cozy contentment.

Futuristic Haven:

- Incorporating cutting-edge technology, this wellness room offers a glimpse into the future of well-being. Smart LED lighting systems adjust color temperature and intensity based on circadian rhythms, promoting relaxation or energizing activities as needed. Virtual reality headsets transport users to immersive nature scenes or guided meditation experiences, enhancing mindfulness practices. Biometric sensors monitor vital signs and provide personalized feedback on stress levels and relaxation techniques.

Artistic Retreat:

- Creativity is celebrated in this wellness room, where art and self-expression take center stage. Vibrant murals adorn the walls, depicting scenes of nature or abstract patterns designed to inspire contemplation. A dedicated art corner is equipped with easels, canvases, and a variety of art supplies for therapeutic creative expression. Soft, diffused lighting enhances the ambiance, creating a gallery-like atmosphere conducive to both relaxation and artistic exploration.

Coastal Haven:

- Inspired by the tranquility of the seaside, this wellness room evokes the calming essence of coastal living. Soft shades of blue and beige evoke the colors of sand and sea, while natural materials like driftwood and seagrass infuse the space with organic texture. Nautical accents such as rope details and shell motifs add a touch of maritime charm. A cozy window seat provides a peaceful spot for contemplation, offering views of rolling waves or tranquil lakeshores.

Each of these wellness room designs offers a unique experience tailored to different preferences, allowing individuals to create a personalized sanctuary for relaxation, rejuvenation, and self-care.

Appendix H: Idea Selection Process

Figure 7 in section 6.2 depicts the idea selection process that the team underwent. An elaboration on the steps taken is as follows:

1. An initial consolidation of the solution list eliminated repeated and unfeasible ideas.
2. Designs having merit, but lacking in completion were preserved for later use in the SCAMPER process.
3. Multivoting established a general consensus for designs that are not up to standard of the project's objectives and reduced the solution list to a manageable size of 15 (see Appendix J).
4. To ensure distinctiveness between the 15 designs, the preserved ideas were revisited through SCAMPER. This iterative step ensured that the designs were refined and that each solution offered distinct experiences.
5. The top 15 designs were compared with one another against the top two objectives: versatility / adaptability and promoting relaxation, using a Graphical Decision Chart.

Appendix I: Spreadsheet used for Multivoting

The following tables outline the spreadsheet used for multivoting, as well as the results of the voting displayed.

Table 13: Round one of multivoting

	Notes: Repetition, Feasibility	Kashan	Grace	Cynthia	Wayne	Omer	Total Votes
Add comfortable couches to the edges of the wall, with dark brown hardwood flooring, and a carpet in the middle allowing users to interact and involve within sitting/board game activities		1	1	1		1	4
The room will have a carpet placed on a hardwood floor and a coffee table surrounded by couches that are pushed against the wall. Several bean bag chairs are added in various spots around the room. The couches face a flat screen television hung against a wall with a standing lamp to its right and shelves to its left.		1	1		1	1	4
Soft, neutral colours, complemented by natural elements like bamboo flooring and potted bonsai trees. A Japanese-inspired Zen garden occupies one corner and sand raked into soothing patterns and a miniature rock garden. A platform serves as a meditation area with floor cushions and a small water fountain.					1	1	3
Replace the walls with barbed wire and jail bars. Put lavish items such as food, money, and nature in the space behind the jail bars. Inside the “jail” there will be sparse items of food and ragged blankets. Users gathering in the room will feel like they are in jail.				1	1	1	3
Entire floor will be carpeted with a fluffy white rug. Curtains and silky drapes line the walls and ceiling. Pillows and blankets are laid on the floor with a long couch placed against the wall. A teardrop hanging chair is placed in the corner of the room.		1		1	1		3
Sound proof walls can be installed for the one-on-one space client for ensured privacy. Room can have a projector for events, meetings by dons, workshops, etc. Various lamps can be a source of light throughout the room that are of warm tones. Walls can be painted green to fit the chestnut aesthetic. Bean bag chairs and sofas can also be placed around the room.		1			1	1	3
Multi-sensory environment to promote immersive sensory experience: aroma diffusers, comfortable seating, varying textures (wall texture, soft, fluffy carpets), calming background music.		1		1		1	3

Room will have couches, sofas, and massage chairs in a small open space at the room's centre. A private office will be sectioned off at the back of the room and a television screen placed on the wall that separates the main room from the office					1	1	2
A living wall covered in vibrant plants serves as the room's focal point. The floor is adorned with natural wood planks or cork tiles, providing warmth and texture. A cosy seating area features organic-shaped furniture and soft throws, inviting relaxation. Essential oil diffusers emit scents of fresh pine or citrus.					1	1	2
Vibrant murals adorn the walls and blank canvases adorn the walls. A dedicated art corner is equipped with easels, canvases, and a variety of art supplies for therapeutic creative expression. Soft, diffused lighting including pots lights and chandeliers.					1	1	2
Make the centre of the room into a rotating platform. Replace the current walls that divide the mailroom and back storage space with glass walls so that when the platform rotates, the backroom will not rotate. Place greenery behind the glass. The rotating room will be lined with sofas and hammocks.					1	1	2
Psychedelic-style room with bigger-than-human sized furniture, vibrant coloured walls and paintings of abstract art. Incorporate human sized board games such as chess.						1	1
Room will have several cloud-like bean bag chairs around it. Small lights will be placed in faux clouds that hang from the ceiling. Colour palette of the room will be soft sky blue. Sheer curtains will divide the centre of the room from a closed off private space in the back.					1	1	2
The right side of the room will have a small animal holding pen, cat towers and a bird stand. Moving from right to left, the centre of the room will have a large "C" shaped sofa facing the entrance to the room with a coffee table. Moving more left, a bookshelf will be placed against the wall and a wall-enclosed office will be found at the leftmost back corner.						1	1
Upon entering the room, the entrance will lead to a narrow hallway which diverges into wall-enclosed rooms on either side of the room. Each room will have its own theme to it: the two rooms in which you have to walk the furthest down to reach, are designated quiet spaces. One may be converted into an office and desk space while the other will be an open yoga-studio-like space. One will be made into a kitchen and another can be used for storage. The two rooms closest to the entrance will be designated recreational areas with largest sofas, televisions, and bright lighting.					1	1	2

Various seating is placed on the sides of the room such as couches and bean bag chairs along with various recreational forms of entertainment including darts boards, board games, and crafts stations. At the centre of the room and will be left, there will be an elevated hard-wood stage open for multipurpose use. The entire back area currently enclosed by walls will be converted into an enclosed, private room as well as used for storage; bookshelves as well as food storage (fridges).			1	1			2
Section off main and office room. In the main room, add hardwood flooring. At the back end of the wall, add 5 automatic massage chairs. Section off main and office room. Paint the walls a light colour, add led light strips surrounding the edges of the main room. Add led lamps to the right corner edge. Add several mini fridges and tables to allow for storage. Add a embedded slot shelf to allow for easy access to brochures regarding mental health			1			1	2
Walls of the room contain blue “beds” that are able to be separated and placed on ground for resting/sleeping activities			1		1		2
Create a dim, relaxing space with a fireplace, comfortable couches, and a projector showing calming nature scenes. Include light therapy lamps and a massage chair. (gemini)				1		1	2
To allow the room to become a multipurpose space, in which several wellness related events could be held, a room can be sectioned off for 1-on-1 communication, with a grey carpet, and 2 couches placed opposite from one another. Section off an opposite portion of the room, allowing the storage of movable/rollable chairs, that can be exposed through the use of an motion divider. Remaining portion of room can be covered with hardwood floor,				1		1	2
Chiropractors can be readily available, with training offered through workshops and techniques on posters/placards.					1	1	2
Dynamic space for mindful movement practices. Movable furniture with wheels that secure and unsecure (properly). Built-in furniture is put next to the edges of walls to ensure maximum movement capacity.			1	1			2
The room will have one desk and chair in a separate room, separated from the main room with a wall. The main room will have no furniture and only pillows, blankets, and tents.		1					1
The room will be covered in imitation grass. There will be basketball hoops, dart boards, soccer nets and pot holes for mini golf. There will be benches along the walls of the room and a storage room in the back corner of the room.						1	1

A modern sanctuary themed room having clean lines and minimalist decor. Neutral tones like grey, white, and taupe, accented by abstract art pieces. Recessed lighting with dimmer controls, while a state-of-the-art sound system and speakers provide immersive audio experiences. A floating yoga platform using stairs to reach doubles as a meditation space, with integrated storage compartments for yoga props.		1						1
Room encapsulates the 90's style of retro diners having black and white chequered floors and vibrant red and turquoise booths for seating. A kitchen island will be found at the centre of the room, surrounding a fridge and small kitchen. Private, closed off booths can be found near the back ends of the room.							1	1
Place tv on the wall to the right, circle carpet mats spread around, led light strips around the room, allowing user to change colour theme, place several bean bags chairs available for user access, storage component embedded within left wall, and upon entrance, table with readily available snacks					1			1
Gaming PC's and consoles can be set up around the room with various video games pre-installed, such as Minecraft, Overwatch, CS 2, Valorant, Rainbow Six Siege, Roblox, Bloons TD 5, and more. Video games can be used as a form of stress relief and encouragement of wellness, through increasing reaction times.	REPETITIVE				1			1
Room can be split up into 3 sections. One for the one-on-one space, one for meditation, yoga, reflection, and one for relaxation and pure recreation. One-on-one space can have a residence life staff member regularly present. Yoga and meditation section can have yoga mats and an instructor that comes regularly. Relaxation section can have board games, bean bag chairs, couches, a TV, and can be free of anything academic.							1	1
Area for massage chairs and yoga, with controllable music player. Users can freely choose to play the music they want or simply enjoy the quiet while enjoying the massage.	REPETITIVE				1			1
The majority of the rooms will be covered with soft, comfortable carpeting, except for areas like the party room and plant area.					1			1
Sculptural seating areas to add to the creativity furniture that decorates the room. Curvilinear sofas and modular benches.		1						1
Large open space in the room with a sensory deprivation tank at its centre and LED coloured light strips	X						0	
Couches in the open floor space can be expanded into foldable beds. The room will be separated from the sleeping area and a food and storage area on the opposite end of the room.							0	

Hard wood floors will be covered by yoga mats on one side of the room. The other side of the room will have a rotating wall that reveals a private office space at the back.								0
The room will have no separating walls besides the walls that enclose the entire room. The walls will act as a blank canvas to allow students to decorate them with their own art. The room will have a white theme, including bookshelves, chairs, and desks.								0
The room will have dim pot lights and tents centred in the room with carpeted floors. An electric fireplace will be at the very centre of the room. Tents at the back of the room will be used as storage space.								0
The room will have a carpet placed on a hardwood floor and a small table surrounded by couches that are pushed against the wall. The other half of the room will be sectioned off and offer a dartboard wall and a basketball hoop attached on the wall.								0
The room will mimic a kitchen- it will have a marbled island at the centre of the room with a fridge and sink along the sides of the walls. A dining table and chairs will be placed on the other side of the island. Storage spaces such as a bookshelf are added.								0
Sensory deprivation tanks will be offered in a sectioned off portion of the room, separated by a wall. The main room will have a kitchen on the opposite side of the sensory deprivation tank room, as well as couches for seating in between the kitchen and the other room.	X							0
Persian rugs cover the floor, layered with floor cushions and pouffes for a seating arrangement. Macrame plant hangers dangle from the ceiling, showcasing cascading ivy and trailing vines. A cosy reading nook features a hammock chair suspended from the ceiling, perfect for unwinding with a good book. A tapestry-lined meditation alcove.								0
Smart LED lighting systems adjust colour temperature and intensity based on circadian rhythms. Virtual reality headsets transport users to immersive nature scenes or guided meditation experiences, enhancing mindfulness practices. Biometric sensors monitor vital signs and provide personalised feedback on stress levels and relaxation techniques. A sensory deprivation tank will be placed in the back corner of the room.	X							0
An empty room with white painted walls and minimal storage cabinets along the back of the room. The only thing that the room offers is VR headsets for each user.								0
The room will have a sectioned off space on the right hand side for an office. In the middle of the open floor space, there will be several hammocks. Faux leaves will line the walls of the room.								0

The room will be entirely opened and at the centre of the room there will be a stage. Chairs will be lined against the walls of the room to provide seating. Storage compartments can be found under the stage.								0
Futuristic room with sleek metallic walls and floor. Holograms will be projected across the walls. Several stations in the centre of the room with VR headsets.								0
Make the room cave-style with hard stone walls and dim pot lights. Tents and sleeping bags will be placed around the room. In the room's centre, there will be a fireplace.								0
Convert space into a beach-like setting with the floors filled with sand and the walls painted blue. Speakers will surround the room and play ocean sounds. A volleyball net can be found at the centre of the room. A shed can be placed within the room and used as a private space.	X							0
Tanning beds will be placed in rows in the room. Lighting will be orange to mimic the hot sun. Dressers will be used as storage along the back walls of the room. The right back corner of the room will have a small kitchen with a fridge and cabinet space so that food can be served during the tanning or massage sessions.								0
Place floor-to-ceiling mirrors on the entire back wall. Shelves line the right and left walls for storage. Yoga mats are placed in rows and speakers are embedded against the walls.								0
Room lighting will be colour-changing by use of LED lights. The entire room will be opened up with several forms of seating including hanging teardrop swings, rows of hammocks, and couches. Various forms of storage are incorporated against the walls including bookshelves and dressers.								0
Celestial theme with galaxy printed wallpaper and cosmic decor. Starry night sky ceiling mural with glowing stars and constellations. Futuristic furniture with sleek, metallic finishes and LED lights. UV blacklight effects and glow-in-the-dark elements for an otherworldly ambiance. Space music and cosmic soundscapes for meditation and relaxation. Hanging swings that mimic saucers.								0
Couches and various storage compartments placed on the sides of the room along with various recreational forms of entertainment including darts boards, board games, and crafts stations. A carpet will be placed at the centre of the room and will be left open for multipurpose use.								0

Couches and various storage compartments placed on the sides of the room along with various recreational forms of entertainment including darts boards, board games, and crafts stations. At the centre of the room and will be left, there will be an elevated hard-wood stage open for multipurpose use. The back right corner of the room will have an enclosed, private room furnished with a desk and office chair.								0
For a basic look, section off the room to the right to create a 1-on-1 communication room, with a desk, 2 chairs, and a led lamp. In main room, attach open cabinets embedded within the the end of the wall, paint room blue, and add a small table filled with snacks								0
For a natural look, paint walls beige, add plants, and attach wine leaves hanging off the wall	SCAMPER							0
For an open look, add beige-coloured floor tiles, paint wall white, and several light colour brown yoga mats laid within the floor	SCAMPER							0
Paint walls dark navy blue, with glow in the dark stars placed on roof and around the walls	SCAMPER							0
Paint the roof of the room light blue, with fluffy clouds attached to strings and walls. Place light coloured carpet around the floor to allow users to allow a sense of nature and open mind thinking								0
On the back end of the wall, place several food machines, including cotton candy machine, popcorn machine and soda stream. Place hardwood floor, with bean bag chairs, and a carpet placed in the middle								0
Dark painted walls, with led lamps and light strips placed around the room, and several fish fish tanks placed around the room. Place fluffy carpet in the middle to allow users to sit and relax								0
For the office component, add a desk and chair at the end of the small room, filled with several artificial plants and wine hanging off the wall. Add hardwood flooring. Brown desk and comfortable chair to allow user to communicate	SCAMPER							0
Designate a soundproofed space with a sensory deprivation tank and comfortable seating. Offer guided meditations and aromatherapy experiences.(gemini)	X							0
Section of the room into 3 parts, main room, communication room, and extra room containing fake grass, allowing for mini putt, dart boards and mini basketball nets	REPETITIVE							0
Create a white canvas wall allowing users to display their artistic abilities	SCAMPER							0
Bubble machine producing bubbles, with walls coloured light blue, and white clouds embedded within the painting of the wall. Fill room with carpet alongside various foldable chairs stored within an easily accessible compartment	X							0

Entrance to a circular room covered by curtains. Place fake grass on the floor, chandeliers hanging from the wall, and 2 lamps producing yellow light. Place several wool baskets, allowing a natural feel within the room								0
Huge speaker/base embedded into walls of the room, to allow for white noise or music for events. Motion controlled Disco Ball attached to roof, allowing it to fold back to hide behind roof when not used.								0
Back wall of the room contains a large embedded fridge, allowing users to grab snacks when feeling stressed.								0
Filled with wood tiles. Place several tablets around the walls of the room, placed on stands. Alongside each stand/Ipad, place yoga mats. This will allow users to undergo individual yoga/meditation tutorials/techniques to relieve stress								0
Farm themed room with hay bales. Couches can also be the same colour as the hay bales to match the aesthetic								0
Readily available noise cancelling headphones available for people wishing for a quiet space. Room can be filled with couches and users can put headphones on to listen to whatever they wish, or can listen to the readily available white noise or binaural beats.	SCAMPER							0
Multiple sensory deprivation tanks, VR headsets, and noise cancelling can be used to create an environment to escape into. Maintenance can be readily available, along with showers and changing rooms.	X							0
LED lights can be controlled by users, but normally should be set as warm tones to create a sense of relaxation. Walls and couches can also have warm tones, such as orange or beige.	REPETITIVE							0
Arduino boards along with electronic components and computers can be set up on desks for people to play around with for recreational use. Room's lighting can also be set up through programming, or a remote.								0
Dart boards can be set up on walls, along with board games, karaoke machines with a projector, Just Dance, etc. In general, the room can be recreation based.	REPETITIVE							0
Aromatherapy can be implemented through various essential oil diffusers with a selection of calming scents like lavender, chamomile, and eucalyptus. Information on the benefits of aromatherapy can be shown through posters on walls or placards	SCAMPER							0
Room can be technology free and only have non-electronic forms of recreation, such as board games, books, mini-golf, or more. Aesthetic of the room can be amish-y	SCAMPER							0
Massage chairs can be placed around the room, along with a masseuse that comes regularly and gives free massages, with foldable massage beds available throughout the room.	X							0

Main theme can be stress relief. Room can have a variety of stress relieving activities and utilities such as bean bag chairs, regular stress relief workshops, posters with breathing exercises/stress relief methods, stress balls, etc.	REPETITIVE							0
Wellness room can be repurposed into a kitchen. There can be fridges for food storage. Room can also have a stove, sink, oven, microwave, cabinets, tables, and an outside chef available at certain hours. Nutritionists can also host workshops to help users get the body they want.								0
Room can be nature themed with various plants and greenery placed throughout the room. Plants should be regularly taken care of and watered by residence life staff, or users. Walls and couches can be green to fit the aesthetic	REPETITIVE							0
Speakers can be installed to play niche/natural noises to create a sense of relaxation. Layout can be nature themed like idea 15.	SCAMPER							0
Make wellness room a library with no academic books, only novels, fiction, or science/math books that aren't affiliated with any UofT courses. Couches and tables can be placed around the room with computers available for use.								0
Diversity can be the main theme for the room with various workshops on self acceptance, self-identity, microaggressions, accepting yourself, etc. Posters and pamphlets can be placed around the room that have encouraging messages and more.								0
A bright and quiet solitary area with separating walls in the edge	SCAMPER							0
The room should be soundproof and include a comfortable bed and sensory deprivation tank to provide a total personal space and free students from the environment shared by two people in Chestnut.	X							0
Light therapy area with various kind of light that can be controlled by the user	SCAMPER							0
Area with many plants, including tropical plants, rainforest plants, and various other styles	REPETITIVE							0
Animal area with rabbits, lizards, hamsters, and other creatures	SCAMPER							0
Party room with various board games and a multiplayer gaming console that allows friends to play together. (separated by soundproof walls)								0
Movement area with ball pits, trampoline, and darts	SCAMPER							0
A secret cubby, hidden in a corner of the room, where those who discover it can leave their name.	SCAMPER							0
A message board on the wall where you can write words you want to say to others.	REPETITION							0

The walls should be grayish-white, while the ceiling should be white. The lighting should be warm-toned, like white with a hint of orange.	SCAMPER						0
Place some Lego or a sandbox in the middle of the room, so that people can build their “masterpieces” and show them to others.	SCAMPER						0
The room should be equipped with air purifiers and ventilation systems, and there should be no noticeable odors. Since different people have different preferences for scents, they should be able to choose from a variety of fragrances themselves.	REPETITION						0
Snacks, a coffee machine, and hot chocolate on one side of the wall.	SCAMPER						0
Marine fish tank that provide a sense of life	SCAMPER						0
Pull-out sliding doors to allow for private consultation space when needed, but also allow for general space to be expanded for events.	SCAMPER						0
A blank wall to allow students to create collaborative mural artwork gathered over multiple years. To promote cultural exchange and retain the memory of past residents.	REPETITIVE						0
Small glow-in-the-dark stars splattered across the room and walls that are only visible when the lights are turned off.	REPETITIVE						0
Maximize vertical storage space to allow for further adaptability of the room. Install wall and ceiling-mounted racks, shelves, and cabinets.	SCAMPER						0
The area can be separated into two (~2) staircase steps. Divide the room into two ‘zones’. Comfortable, quiet, meditation, soft, sofa area and a louder, sports, kitchen, food etc area.							0
Acoustic, sound-absorbing materials on the walls to reduce noise levels and promote a more peaceful environment.	SCAMPER						0
Retractable furniture. Foldable chairs and tables to be able to store away when necessary and to bring out to use when necessary.							0
Themed zones. Divide area into mindfulness, creativity, active etc. zones. Differentiate each zone by slight changes in colour and decoration to create a distinct environment.							0
Small reading nooks/cushioned seatings embedded into the walls. Fairly lights and peaceful/pretty decorations.							0
Small shelves for brochures, magazines, online resources etc. near the front (aligned with the walls) to provide educational information related to health (nutrition, mental health, stress management), wellness, and personal development.	SCAMPER						0

Cork flooring to provide that soft, bouncy feeling. Provides comfortability for long-standing periods, sound absorption and further sensory floor elements.	SCAMPER							0
Air purifier- fresh, nice air is mandatory for wellness. Place them on tables or install them on walls, ceiling etc.	SCAMPER							0
Interactive fitness walls to promote fitness wellness and maximize vertical space: climbing holds, resistive bands etc.								0
Interactive water features/designs. Calming tabletop fountains and water stream decoration add to the ambiance of the room.	SCAMPER							0
Mirror decorations covering a certain amount of wall and ceiling area to make the room appear bigger than it is.	SCAMPER							0
Slippers are offered to visitors to maintain the cleanliness of the room but still allow visitors to feel comfortable and restful.	SCAMPER							0
Small stone pathway. Stepping on stones is a convenient foot massage and improves blood pressure. Can also add lighting to emit a small glow which adds a whimsical touch.	SCAMPER							0

Table 14: Round two of multivoting:

Idea Name	Notes: Repetition, Feasibility	Kashan	Grace	Cynthia	Wayne	Omer	Total Votes
Sound proof walls can be installed for the one-on-one space client for ensured privacy. Room can have a projector for events, meetings by dons, workshops, etc. Various lamps can be a source of light throughout the room that are of warm tones. Walls can be painted green to fit the chestnut aesthetic. Bean bag chairs and sofas can also be placed around the room.		1	1	1	1	1	5
Soft, neutral colours, complemented by natural elements like bamboo flooring and potted bonsai trees. A Japanese-inspired Zen garden occupies one corner and sand raked into soothing patterns and a miniature rock garden. A platform serves as a meditation area with floor cushions and a small water fountain.		1		1	1		3
The room will have a carpet placed on a hardwood floor and a coffee table surrounded by couches that are pushed against the wall. Several bean bag chairs are added in various spots around the room. The couches face a flat screen television hung against a wall with a standing lamp to its right and shelves to its left.		1	1				2

Replace the current walls with glass. Put lavish items such as food, money, and nature in the space behind the glass walls, as well as use that space for any extra storage space. This will mimic windows. Inside the room itself there will be many forms of seating, and a large open space at the centre of the room that can be used a recreational space. There will be an office in the corner of the room.				1	1			2
Multi-sensory environment to promote immersive sensory experience: aroma diffusers, comfortable seating, varying textures (wall texture, soft, fluffy carpets), calming background music.					1		1	2
Section off main and office room. In the main room, add hardwood flooring. At the back end of the wall, add 5 automatic massage chairs. Section off main and office room. Paint the walls a light colour, add led light strips surrounding the edges of the main room. Add led lamps to the right corner edge. Add several mini fridges and tables to allow for storage. Add a embedded slot shelf to allow for easy access to brochures regarding mental health				1			1	2
Vibrant murals adorn the walls and blank canvases adorn the walls. A dedicated art corner is equipped with easels, canvases, and a variety of art supplies for therapeutic creative expression. Soft, diffused lighting including pots lights and chandeliers.					1			1
Psychedelic-style room with bigger-than-human sized furniture, vibrant coloured walls and paintings of abstract art. Incorporate human sized board games such as chess.						1		1
Various seating is placed on the sides of the room such as couches and bean bag chairs along with various recreational forms of entertainment including darts boards, board games, and crafts stations. At the centre of the room and will be left, there will be an elevated hard-wood stage open for multipurpose use. The entire back area currently enclosed by walls will be converted into an enclosed, private room as well as used for storage; bookshelves as well as food storage (fridges).				1				1
A modern sanctuary themed room having clean lines and minimalist decor. Neutral tones like grey, white, and taupe, accented by abstract art pieces. Recessed lighting with dimmer controls, while a state-of-the-art sound system and speakers provide immersive audio experiences. A floating yoga platform using stairs to reach doubles as a meditation space, with integrated storage compartments for yoga props.					1			1

Gaming PC's and consoles can be set up around the room with various video games pre-installed, such as Minecraft, Overwatch, CS 2, Valorant, Rainbow Six Siege, Roblox, Bloons TD 5, and more. Video games can be used as a form of stress relief and encouragement of wellness, through increasing reaction times.						1	1
A living wall covered in vibrant plants serves as the room's focal point. The floor is adorned with natural wood planks or cork tiles, providing warmth and texture. A cosy seating area features organic-shaped furniture and soft throws, inviting relaxation. Essential oil diffusers emit scents of fresh pine or citrus.					1		1
The room will be covered in imitation grass. There will be basketball hoops, dart boards, soccer nets and pot holes for mini golf. There will be benches along the walls of the room and a storage room in the back corner of the room.						1	1
Room can be split up into 3 sections. One for the one-on-one space, one for meditation, yoga, reflection, and one for relaxation and pure recreation. One-on-one space can have a residence life staff member regularly present. Yoga and meditation section can have yoga mats and an instructor that comes regularly. Relaxation section can have board games, bean bag chairs, couches, a TV, and can be free of anything academic.						1	1
Area for massage chairs and yoga, with controllable music player. Users can freely choose to play the music they want or simply enjoy the quiet while enjoying the massage.					1		1
Room encapsulates the 90's style of retro diners having black and white chequered floors and vibrant red and turquoise booths for seating. A kitchen island will be found at the centre of the room, surrounding a fridge and small kitchen. Private, closed off booths can be found near the back ends of the room.							0
The right side of the room will have a small animal holding pen, cat towers and a bird stand. Moving from right to left, the centre of the room will have a large "C" shaped sofa facing the entrance to the room with a coffee table. Moving more left, a bookshelf will be placed against the wall and a wall-enclosed office will be found at the leftmost back corner.							0
Add comfortable couches to the edges of the wall, with dark brown hardwood flooring, and a carpet in the middle allowing users to interact and involve within sitting/board game activities							0
Entire floor will be carpeted with a fluffy white rug. Curtains and silky drapes line the walls and ceiling. Pillows and blankets are laid on the floor with a long couch placed against the wall. A teardrop hanging chair is placed in the corner of the room.							0

Room will have couches, sofas, and massage chairs in a small open space at the room's centre. A private office will be sectioned off at the back of the room and a television screen placed on the wall that separates the main room from the office								0
Make the centre of the room into a rotating platform. Replace the current walls that divide the mailroom and back storage space with glass walls so that when the platform rotates, the backroom will not rotate. Place greenery behind the glass. The rotating room will be lined with sofas and hammocks.								0
Room will have several cloud-like bean bag chairs around it. Small lights will be placed in faux clouds that hang from the ceiling. Colour palette of the room will be soft sky blue. Sheer curtains will divide the centre of the room from a closed off private space in the back.								0
Upon entering the room, the entrance will lead to a narrow hallway which diverges into wall-enclosed rooms on either side of the room. Each room will have its own theme to it: the two rooms in which u have to walk the furthest down to reach, are designated quiet spaces. One may be converted into an office and desk space while the other will be an open yoga-studio-like space. One will be made into a kitchen and another can be used for storage. The two rooms closest to the entrance will be designated recreational areas with largest sofas, televisions, and bright lighting.								0
Walls of the room contain blue "beds" that are able to be separated and placed on ground for resting/sleeping activities								0
Create a dim, relaxing space with a fireplace, comfortable couches, and a projector showing calming nature scenes. Include light therapy lamps and a massage chair. (gemini)								0
To allow the room to become a multipurpose space, in which several wellness related events could be held, a room can be sectioned off for 1-on-1 communication, with a grey carpet, and 2 couches placed opposite from one another. Section off an opposite portion of the room, allowing the storage of movable/rollable chairs, that can be exposed through the use of an motion divider. Remaining portion of room can be covered with hardwood floor,								0
Chiropractors can be readily available, with training offered through workshops and techniques on posters/placards.								0
Dynamic space for mindful movement practices. Movable furniture with wheels that secure and unsecure (properly). Built-in furniture is put next to the edges of walls to ensure maximum movement capacity.								0

The room will have one desk and chair in a separate room, separated from the main room with a wall. The main room will have no furniture and only pillows, blankets, and tents.								0
Place tv on the wall to the right, circle carpet mats spread around, led light strips around the room, allowing user to change colour theme, place several bean bags chairs available for user access, storage component embedded within left wall, and upon entrance, table with readily available snacks								0
The majority of the rooms will be covered with soft, comfortable carpeting, except for areas like the party room and plant area.								0
Sculptural seating areas to add to the creativity furniture that decorates the room. Curvilinear sofas and modular benches.								0

Appendix J: Rationale for the Top 15 Designs Compared in the Graphical Decision Chart

The following table below describes each of the 15 designs used in the Graphical Decision Chart and summarises the rationale for the score of each design.

Table 15: Score justification of the objectives in the Graphical Decision Chart

	Idea	Score	Justification
A	Sound proof walls can be installed for the one-on-one space client for ensured privacy. Room can have a projector for events. Various lamps can be a source of light throughout the room that are of warm tones. Walls can be painted green. Bean bag chairs and sofas can also be placed around the room.	Versatility/adaptability: 9 Promotes relaxation: 8	<ul style="list-style-type: none"> Mainly composed of open space with a small office in the corner. Movable furniture is considered. Sound proof walls and warm lighting aid in promoting relaxation.
B	Soft, neutral colours, complemented by natural elements like bamboo flooring and potted bonsai trees. A Japanese-inspired Zen garden occupies one corner and sand raked into soothing patterns and a miniature rock garden. A platform serves as a meditation area with floor cushions and a small water fountain.	Versatility/adaptability: 2 Promotes relaxation: 10	<ul style="list-style-type: none"> Low versatility due to the implementation of the garden. Platform is the only element providing versatility for events. Strong elements that promote relaxation.
C	The room will be covered in imitation grass. There will be basketball hoops, dart boards, soccer nets and pot holes for mini golf. There will be benches along the walls of the room and a storage room in the back of the room.	Versatility/adaptability: 5 Promotes relaxation: 5	<ul style="list-style-type: none"> Average performance for versatility- offers an open space and space that can be used for storage, but no designated space for animals. Offers diverse amenities for the users, but no distinct aspects of the design promote relaxation.
D	Replace the current walls with glass. Put lavish items such as nature in the space behind the glass walls, as well as use that space for extra storage space. Inside the room itself there will be many forms of seating, and a large open space at the centre of the room that can be used as a recreational space. There will be an office in the corner of the room.	Versatility/adaptability: 8 Promotes relaxation: 8	<ul style="list-style-type: none"> Accounts for storage space and animal holding space, but has a smaller open space. Decorations are implemented to promote relaxation.
E	Multi-sensory environment to promote immersive sensory experience: aroma diffusers, comfortable seating, varying textures (wall texture, soft, fluffy carpets), calming background music.	Versatility/adaptability: 3 Promotes relaxation: 9	<ul style="list-style-type: none"> Does not describe how the room will be used for storage or activities. Incorporates several elements that promote relaxation
F	Section off main and office room. In the main room, add hardwood flooring. At the back end of the wall, add 5 automatic massage chairs. Section off main and office room. Paint the walls a light colour, add led light strips surrounding	Versatility/adaptability: 5 Promotes relaxation: 8	<ul style="list-style-type: none"> Low adaptability due to the massage chairs that would be difficult to remove. Does account for various forms of storage.

	the edges of the main room. Add several mini fridges and tables. Add a embedded slot shelf to allow for easy access to brochures regarding mental health		<ul style="list-style-type: none"> Incorporates several elements that promote relaxation including the colour palette.
G	Vibrant murals adorn the walls and blank canvases adorn the walls. A dedicated art corner is equipped with easels, canvases, and a variety of art supplies. Soft, diffused lighting including pots lights and chandeliers.	Versatility/adaptability: 3 Promotes relaxation: 8	<ul style="list-style-type: none"> No distinct element that suggests that this design is particularly adaptable. Has sufficient open floor space. Allows for the expression of artistic freedom which promotes relaxation.
H	Psychedelic-style room with bigger-than-human sized furniture, vibrant coloured walls and paintings of abstract art. Incorporate human sized board games such as chess.	Versatility/adaptability: 1 Promotes relaxation: 2	<ul style="list-style-type: none"> The large-sized furniture reduces the versatility of the room. The psychedelic style is subjectively relaxing.
I	Various seating is placed on the sides of the room such as couches and bean bag chairs along with various recreational forms of entertainment including darts boards, board games, and crafts stations. At the centre of the room there will be an elevated hard-wood stage open for multipurpose use. The entire back area currently enclosed by walls will be converted into an enclosed, private room as well as used for storage.	Versatility/adaptability: 5 Promotes relaxation: 6	<ul style="list-style-type: none"> Average performance for versatility- offers an open space and space that can be used for storage, but no designated space for animals. Offers diverse amenities for the users, but no distinct aspects of the design promote relaxation.
J	A modern sanctuary themed room. Neutral tones like grey, white, and taupe, accented by abstract art pieces. Recessed lighting with dimmer controls. A floating yoga platform using stairs to reach doubles as a meditation space, with integrated storage compartments for yoga props.	Versatility/adaptability: 2 Promotes relaxation: 8	<ul style="list-style-type: none"> Low versatility due to the implementation of the sanctuary and yoga platform. Strong elements that promote relaxation are accounted for such as the lighting.
K	Gaming PC's and consoles can be set up around the room with various video games pre-installed. Video games can be used as a form of stress relief and encouragement of wellness, through increasing reaction times.	Versatility/adaptability: 1 Promotes relaxation: 3	<ul style="list-style-type: none"> Low versatility due to the implementation of video game stations. Video games are subjectively relaxing.
L	A living wall covered in vibrant plants. The floor is adorned with natural wood planks or cork tiles, providing warmth and texture. A cosy seating area features organic-shaped furniture and soft throws, inviting relaxation. Essential oil diffusers emit fresh pine or citrus.	Versatility/adaptability: 4 Promotes relaxation: 9	<ul style="list-style-type: none"> Lower versatility due to the implementation of the plant wall. Strong elements that promote relaxation including the choice of textures and scent.
M	The room will have a carpet placed on a hardwood floor and a coffee table surrounded by couches that are pushed against the wall. Several bean bag chairs are added in various spots around the room. The couches face a flat screen television hung against a wall with a standing	Versatility/adaptability: 6 Promotes relaxation: 7	<ul style="list-style-type: none"> Average performance for versatility- offers an open space, but no designated space for storage or animals. Amenities that promote relaxation are included.

	lamp to its right and shelves to its left.		
N	Room can be split up into 3 sections. One for the one-on-one space, one for meditation, yoga, reflection, and one for relaxation and pure recreation. Yoga and meditation section can have yoga mats. Relaxation section can have board games, bean bag chairs, couches, and a TV.	Versatility/adaptability: 6 Promotes relaxation: 9	<ul style="list-style-type: none"> Average performance for versatility since each room is dedicated to separate uses. If they have dedicated uses, it may be difficult to use it for other purposes. Considers several activities that could promote relaxation.
O	Area for massage chairs and yoga, with controllable music player. Users can freely choose to play the music they want or simply enjoy the quiet while enjoying the massage.	Versatility/adaptability: 2 Promotes relaxation: 7	<ul style="list-style-type: none"> Lower versatility due to the implementation of the specific amenities. Above average for relaxation for the consideration towards noise.

Appendix K: Pugh Method Chart

The Pugh Method (Table 16) was employed to aid in the selection of the proposed conceptual design, most accurately aligning the project's requirements. The datum serves as a baseline for relative comparison and is described as follows:

Table 16: Pugh Chart

	Datum- Design D	Design A	Design B	Design C
Versatile / adaptable	S	+2	+1	-1
Offer privacy	S	+2	0	+2
Promote relaxation	S	-1	+1	+1
Ergonomic	S	0	-1	0
Sum	0	3	1	2

Design M (DATUM): The room will have a carpet placed on a hardwood floor and a coffee table surrounded by couches that are pushed against the wall. Several bean bag chairs are added in various spots around the room. The couches face a flat screen television hung against a wall with a standing lamp to its right and shelves to its left. The enclosed backroom will be used for storage.

The datum incorporates amenities found in several of the alternative designs, including the seating and television. The datum solely involves implementing these amenities in the current mailroom space, and unlike the alternative designs, does not make any adjustments to the physical layout of the space, such as adding or removing walls.

Appendix L: Measurements of the Proposed Conceptual Design

The versatility and adaptability of our design will be measured through estimations and calculations on our prototype blueprint shown in Figure 22.

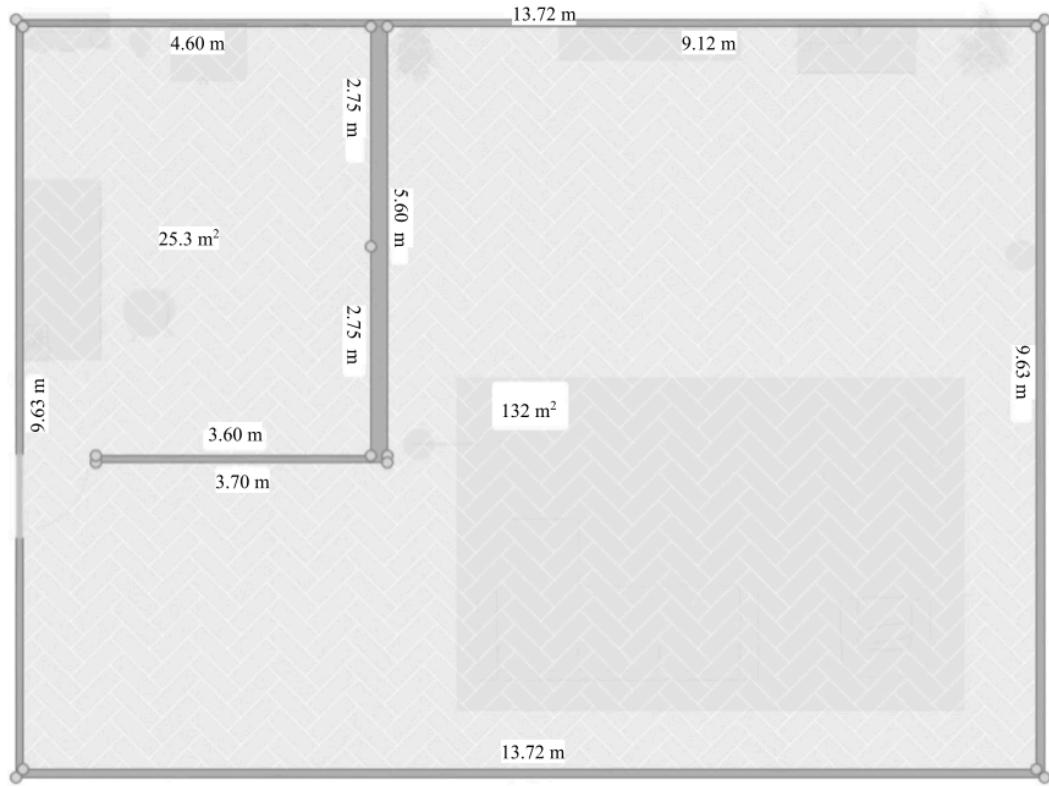


Figure 22: Blueprint prototype of 3D modelling of Design A (see Figure 12).

What differentiates this design's layout from others is the area occupied by the enclosed space and its placement. The recreational area is 132 m^2 . One occupant requires $\approx 1.86\text{m}^2$ (20 ft^2) of space [40]. With consideration to the metric of hosting 50+ users, this requires $\approx 92.90\text{m}^2$. The design sufficiently accommodates this objective.

Appendix M: Measures of Success Questionnaire Questions

A questionnaire will be used to assess the design's performance of promoting relaxation as well as allow the team to build upon the design accordingly. The following list of questions have been developed for the questionnaire:

- 1) What colour lighting makes you feel the most relaxed
 - a) 5 point scale of colours going from warm to bright white
- 2) What colour shade makes you feel the most relaxed
 - a) 5 point scale with different shades of red
 - b) 5 point scale with different shades of orange
 - c) 5 point scale with different shades of yellow
 - d) 5 point scale with different shades of green
 - e) 5 point scale with different shades of blue
 - f) 5 point scale with different shades of purple
 - g) 5 point scale with different shades of brown
- 3) What do you normally listen to when you want to feel more relaxed?
- 4) Would you say you are more relaxed in a quiet environment or a generally loud one?
 - a) 5 point scale from quiet to loud
- 5) When looking to relax, would you prefer a minimalist design or a cluttered approach?
 - a) 5 point scale from cluttered to minimalist

The team will use a Google Form questionnaire. A sample question was developed and shown in Figure 23 below.

Chestnut wellness questionnaire

Survey for users of new potential wellness room

What colour lighting do you believe makes you feel the most relaxed

2000K

2700K

Figure 23: Sample question (question 1) extracted from the team's questionnaire.

Appendix N: Attribution Table

Tutorial #:	0127	Team #:	173
Assignment:	Conceptual Design Specification	Date:	March 26, 2024

The Attribution Table is a major resource used by your TA in determining whether there was equal contribution to the team assignment. If your TA determines that there was significant under contribution, then they may apply an individual penalty to the under contributing team members' grade. As a future professional engineer you should NOT sign any document you have not read and do not agree with.

The Attribution Table must be completed, signed by all team members, and included as an appendix of your assignment AND uploaded to your MS Teams team channel. Teams who do not submit a completed form, including those that submit an incomplete form, such as one missing a team member's signature, will receive zero on the assignment. The team may submit a petition to the ESP Office if they feel the lack of signature is through no fault of the team.

The Attribution Table should accurately reflect each team members' contribution to the document. Be sure to keep a copy of this form for the team's records.

If there are irreconcilable differences that are preventing all team members from signing the attribution table then each team member must write a letter (<one page) explaining their position on the difference and suggest a solution. These letters much be submitted to the TA.

As with any engineering statement this attribution table must be backed by credible evidence. In most cases this will be found either in the Google Docs document revision history, or your engineering notebook. Making fraudulent claims in an Attribution Table displays intent to deceive and is a serious academic offence.

Section	Student Names				
	Kashan Ahmad	Omer Mumtaz	Cynthia Wei	Wayne Wang	Grace Lin
Executive Summary	FP				WD, MR, FP
Introduction	FP				WD, MR, FP
Problem Statement (Revision)	ET, FP, RS2				FP
Service Environment (Revision)	FP		ET, FP	MR, ET	FP

	Kashan Ahmad	Omer Mumtaz	Cynthia Wei	Wayne Wang	Grace Lin
Stakeholders (Revision)	FP	MR, ET, FP			ET, FP
Functions (Revision)	MR, ET, FP	FP			ET, FP
Objectives (Revision)	FP	FP	ET, FP		MR, RS1, FP
Constraints (Revision)	FP	FP		WD, MR, ET, FP	FP
Idea generation	FP	FP	ET		WD, MR, ET, OR1, FP
Idea selection	FP	FP	ET		WD, MR, ET, OR1, FP
Alternative Design Descriptions	WD, MR, RS3, ET, FP	WD, MR, ET, FP		WD, MR, ET	ET, OR2, FP
Proposed Conceptual Design	FP	FP	WD, MR, ET		ET, OR2, FP
Measures of Success	ET, FP	WD, MR, ET, FP			ET, OR2, FP
Conclusion	WD, MR, ET			ET	FP
Reference List	FP				WD, MR, FP
Appendices	ET, FP	ET	WD, ET		WD, ET, OR1, FP

Fill in abbreviations for roles for each of the required content elements using the abbreviations found on the next page. You do not have to fill in every cell.

RS – Research (give details below) WD – Wrote Draft MR – Major Revision ET – Edited	FP – Final Proofread of COMPLETE DOCUMENT verifying for flow and consistency OR – Other (give details below)
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If you put RS (research) please add a number identifier such as RS1, RS2, etc. Give the research question / topic:

RS1: Researched aspects that promote relaxation

RS2: Researched stress relieving resources

RS3: Materials used for soundproof walls and relaxing lighting colour temperatures

If you put OR (other) please add a number identifier such as OR1, OR2, etc. Explain the role below:

OR1: Created flowcharts and mind maps

OR2: Created Drawings and Models

By typing your name below to sign, you verify that you have:

- Read the attribution table and agree that it accurately reflects your contribution to the associated document.
- Written the sections of the document attributed to you and that they are entirely original.
- Accurately cited and referenced any ideas or expressions of ideas taken from other sources according to the standard specified by this course.
- Read the University of Toronto Code of Behaviour on Academic Matters and understand the definition of academic offence includes (but is not limited to) all forms of plagiarism. Additionally, you understand that if you provide another student with any part of your own or your team's work, for whatever reason, and the student having received the work uses it for the purposes of committing an academic offence, then you are considered an equal party in the offence and will be subject to academic sanctions.

Student #1 Name

Kashan Ahmad

Student #4 Name

Omer Mumtaz

Student #2 Name

Grace Lin

Student #5 Name

Wayne Wang

Student #3 Name

Cynthia Wei
