

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

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Project Title	Wellness Room Expansion				
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Words (exclude Cover Page, Executive Summary, Reference List and Appendices)

Executive Summary

The wellness room at the University of Toronto's student residence, Chestnut Residence is set to undergo a revamp at the request of Lucy Chandler. It currently fails to foster an environment conducive to promoting mental well-being and ensuring user comfort. To address this deficiency, the team has decided that the solution needs to optimize the utilization of the room by incorporating the adjacent study room's space and integrating elements that cultivate a serene environment, enabling individuals to rejuvenate and prioritize their well-being. Considering the dimensions, facilities, auditory and lighting aspects of the environment of operations, and the users being 75% undergraduate first year students, the stakeholders of the project were also addressed, including UofT wellness staff, guests, and student groups. Utilizing this input, the team worked to create a room that stores people and can transmit wellness information; a design that is mentally stimulating, conducive to wellness, distraction-free, and comfortable for users.

Through individual and team brainstorming sessions, a total of 80 wellness room components were generated, which were then combined into 60 comprehensive solutions using a morphological chart. These solutions were further refined through multi-voting and a graphical decision chart, resulting in the selection of the top 3 solutions that best aligned with the detailed requirements. The 3 design solutions are tailored to the stakeholders and service environment, the graphical decision chart shows they best satisfy the objectives of providing a mentally stimulating ambience, being conducive to wellness, and being distraction-free. The following highlights the differences of each alternative design:

1. *EasyLife Wellness*

It is a single room with a recreational approach to wellness, prioritizing entertainment and encouraging cognitive stimulation. *EasyLife Wellness* fosters wellness through engaging leisure activities for students, including access to gym mats, a chair swing, music, and fiction books.

2. *Nature's Haven*

It is a single room aiming to isolate the user in a simulated natural environment, with the primary approach on wellness being focused on integrating biophilic elements such as an aroma diffuser, an indoor fountain, and a synthetic grass carpet to establish a mentally stimulating ambience. Users can also access guidance for calming activities through both auditory and visual means.

3. *DuoFusion Chambers*

The revamped rooms are separated by a movable bookshelf, creating two open areas for people to drop in to enhance wellness needs. This design prioritized the room being community oriented and easily alterable. It excels in its distraction-free environment and its comfortness by the presence of its soundproofing abilities.

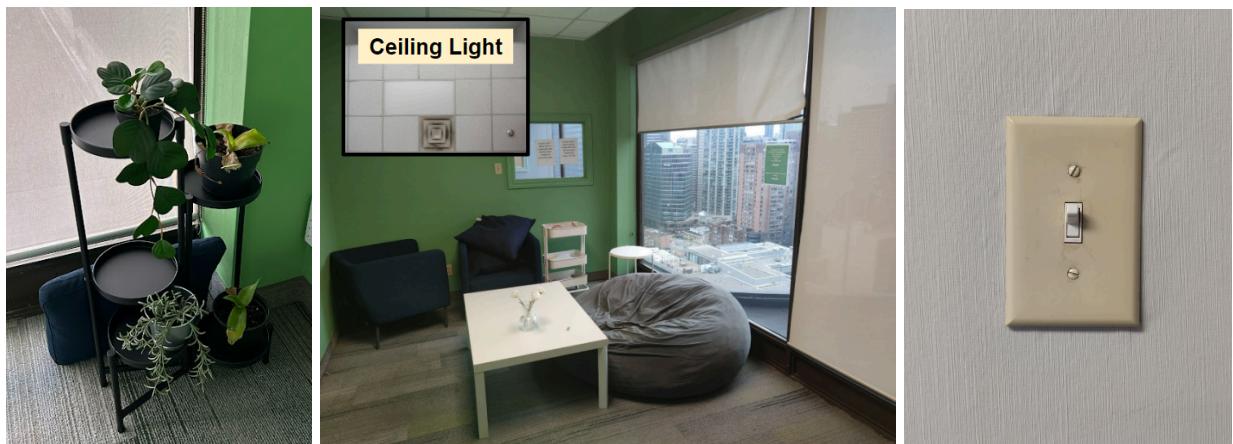
After applying the Pugh method, the team recommends *Nature's Haven* for its alignment with the objectives in terms of lighting, mental stimulation, and comfort. The team will assess the design's promotion of mental wellbeing through a virtual 3D model, comparing authenticity to natural ambiance by analyzing greenery ratio and light spatial patterns to the real world. Offering an improved space for wellness and relaxation at Chestnut Residence will attract more students and effectively enhance the overall mental well-being of the University of Toronto community.

1.0 Introduction

Chestnut Residence serves as a dormitory for students at the University of Toronto (UofT) during academic terms. Its amenities include the 28th floor wellness room. According to the Residence Life Coordinator and client, Lucy Chandler, this space is “under-utilized,” which its low booking rate confirms (Appendix A) [1, 2]. In a National College Health Assessment conducted to 4752 UofT students, over 70% share sentiments of being overwhelmed, depressed, and exhausted, motivating the necessity of this room [3]. This project proposes room innovations, with functional improvements and structural changes, designed after carefully considering a variety of ideas.

2.0 Problem Statement

The elements below demonstrate how the existing wellness room does not adhere to the design criteria for restorative spaces presented by the WELL building standards [4].



a) Wilting plants

b) Room's lighting elements

c) Binary switch

Figure 1. Plants deficient of care (a), fixed & limited lighting elements (b), binary light switch (c).

The insufficient wellness ambiance in the room is shown by the wilting plants, suggesting infrequent maintenance and disregard towards a biophilic design [5]. The binary lighting options are characteristic of limited user control over their surroundings, and a persistent buzzing noise demonstrates the intrusive nature of the existing environment (Appendix B). Thus, the gap is a conducive wellness room promoting mental well-being and user comfort.

The client therefore requests an optimization of the space that integrates components fostering a serene environment for individuals to collect themselves and for groups to host wellness events (Appendix C). The physical scope of this project is strictly outlined in red in Figure 2. It consists of the existing structure and contents of the wellness and study rooms, including the walls and electrical systems within them. The virtual scope is any technology that may be implemented in the room, as per the client statement, and excludes considerations to the website, booking process, or human resources allocation [1].

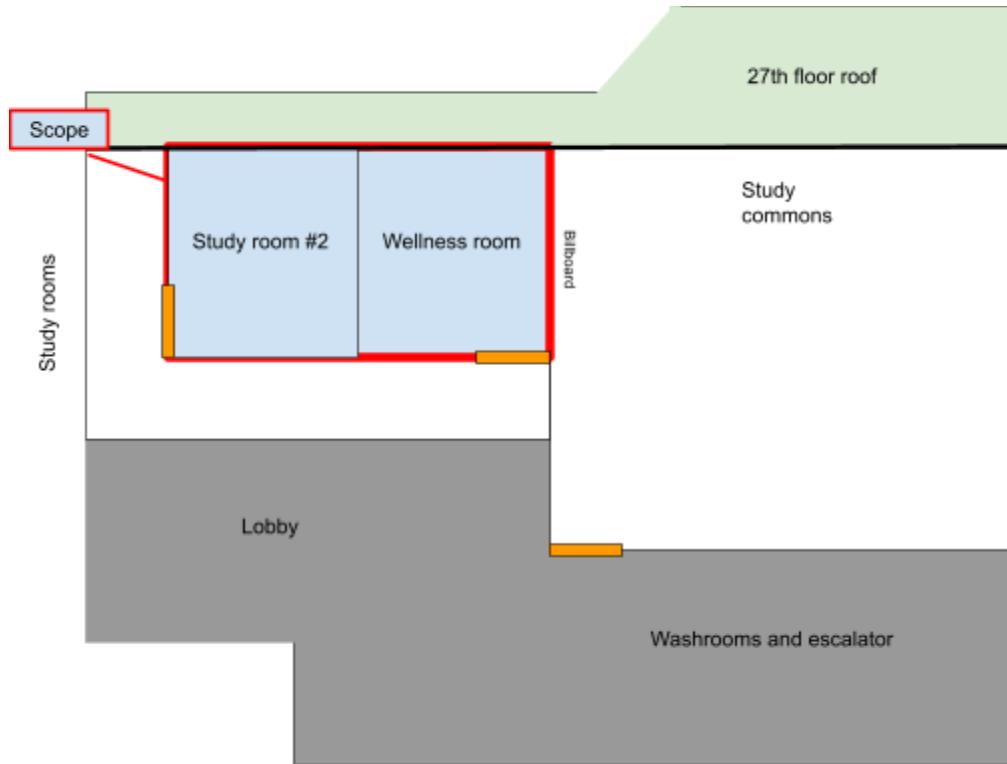


Figure 2. Basic Map of 28th floor

3.0 Service Environment

Elements of the revamped room will coexist with and adapt to the existing environment of the wellness and study rooms.

3.1 Physical Environment

Table 1 details the indoor conditions.

Table 1. Physical Environment of the Room

Aspect	Descriptions	Impact <i>The design should factor:</i>
Dimensions	Measurements detailed in floor plan (Figure 3)	Physical space restrictions.
Facilities	Facilities in the room can all be moved without tools. Details of each furniture are in Appendix D.	No fixed furniture.
Auditory	Noise reduction when doors are closed: 12-14 dB, resulting in ambient noise of 39-45 dB (Appendix E).	

Aspect	Descriptions	Impact <i>The design should factor:</i>
	Dysfunctional air-conditioner in the study room produces a constant buzzing of 1.5-9 kHz (Appendix C).	Client desires an improved soundproofing and lighting system (Appendix C) [1].
Lighting	<p>Toggle light switches connect to overhead lights.</p> <p>Curtains cover the four east windows; two of them are broken.</p> <p>Light intensity: 153-346 lux, averaging 266 lux (Appendix F).</p>	
Path to the Room	<p>Elevators service up to the 27th floor.</p> <p>Escalator and staircase connect the 28th floor. (Appendix G)</p>	Room inaccessibility to some mobility-impaired people.

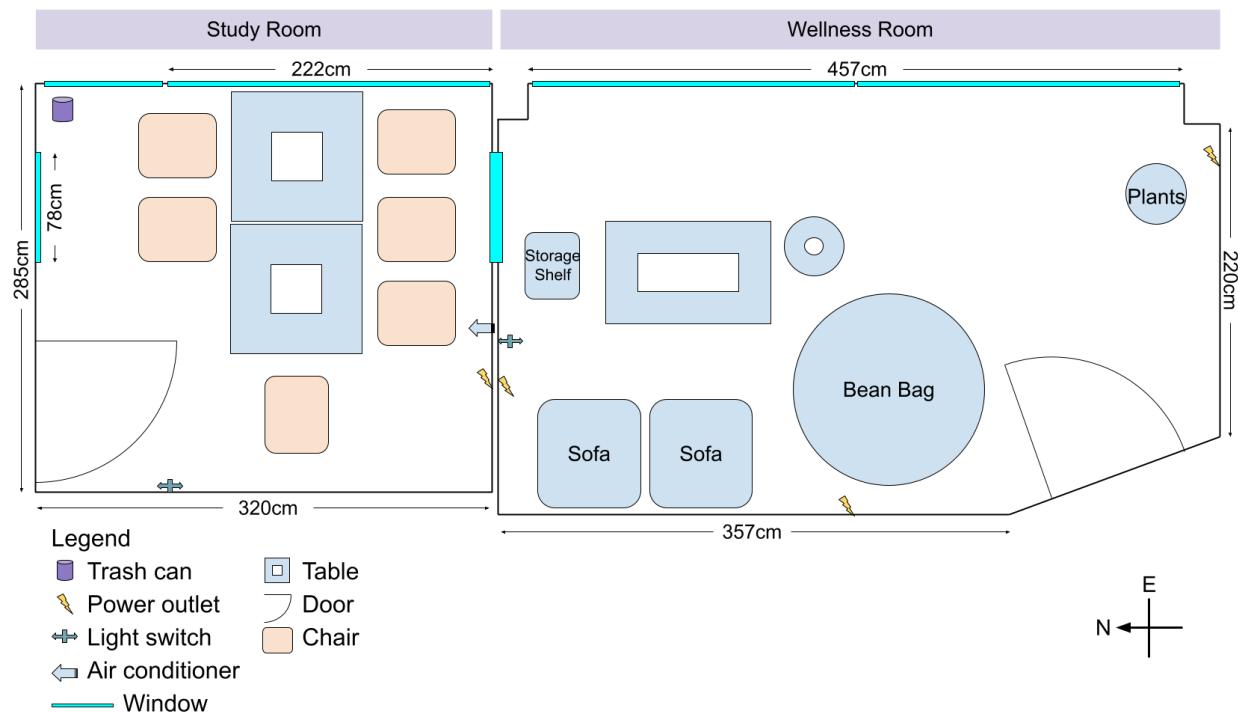


Figure 3. Current Floor Plans

3.2 Living Things

Table 2 details the living things the room must accommodate.

Table 2. Living Things With Access to the Room

Aspect	Descriptions	Impact <i>The design should factor:</i>
Users	~75% undergraduate first year students at Chestnut Residence [6].	Users physically interacting and damaging parts.
Service Animals	Service animals (Appendix C).	Animals damaging parts.
Plants	Four potted plants (Appendix D).	Plant maintenance exposing design to water.

3.3 Virtual Environment

Table 3 details the virtual service environment.

Table 3. Virtual Environment

Aspect	Description	Impact <i>The design should factor:</i>
Servicing Hours	Rooms are available 7am to 10pm by Online Booking [7]. Study room: maximum 2 hrs/day per person Wellness room: maximum 1 hr/day per person	Operational hours.
Wifi Condition	WiFi speed: 140 Mbps Signal strength: -56 dBm (Appendix H)	New technology implementation's virtual infrastructure use.

4.0 Stakeholders

Table 4 lists the stakeholders impacted by improvements to the room's capacity and capability.

Table 4. List of Stakeholders

Group	Stakeholders	Impact <i>The room can:</i>
UofT Wellness Staff, Guests	Chestnut Residence community wellness coordinators (CWCs) [1, 8] UofT Health & Wellness Centre workers Toronto Academic Health Science Network workers [9]	Economic: be a temporary office for coordinators, creating job opportunities Ethical: reduce needs for escalating use of wellness resources Social: host guests invited from the affiliated hospital network for educational programs
UofT Student Groups	UofT Students' Union & UofT Graduate Students Union [10, 11] UofT student clubs (i.e. UofT Mental Health Student Association) and workers (i.e. HealthyU Crew) [12, 13]	Social: host events relevant to the group Economic: provide new volunteer and work opportunities
UofT Other Staff	University Planning, Design and Construction and Chestnut Residence staff [14]	Legal: be a potentially unsafe workplace during construction and upkeep
Nearby Alternatives	Toronto Public Library, especially the Reference and Lilian H. Smith branches near Chestnut, and UofT libraries Other UofT college residents	Social: modify library's student usage, due to the similar user demographic as a wellness event space and public meeting room Economic: devalue, comparatively, other residence options

Figure 4 shows stakeholder importance in influence and interest.

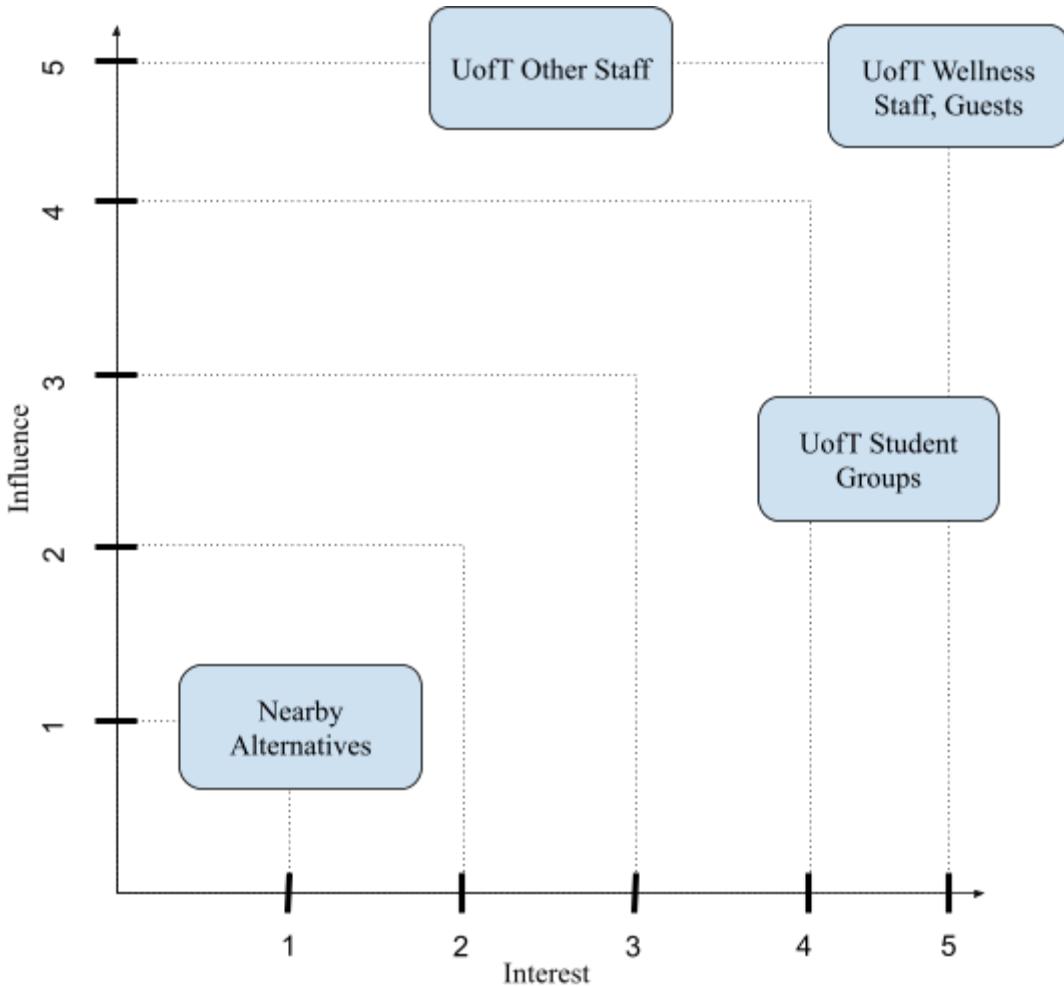


Figure 4. Stakeholder rankings.

5.0 Detailed Requirements

5.1 Functions

Using the Black Box and Functional Basis methods, the primary functions of storing people and objects and transmitting wellness information were decomposed into secondary functions, shown in Figure 5 (Appendix I).

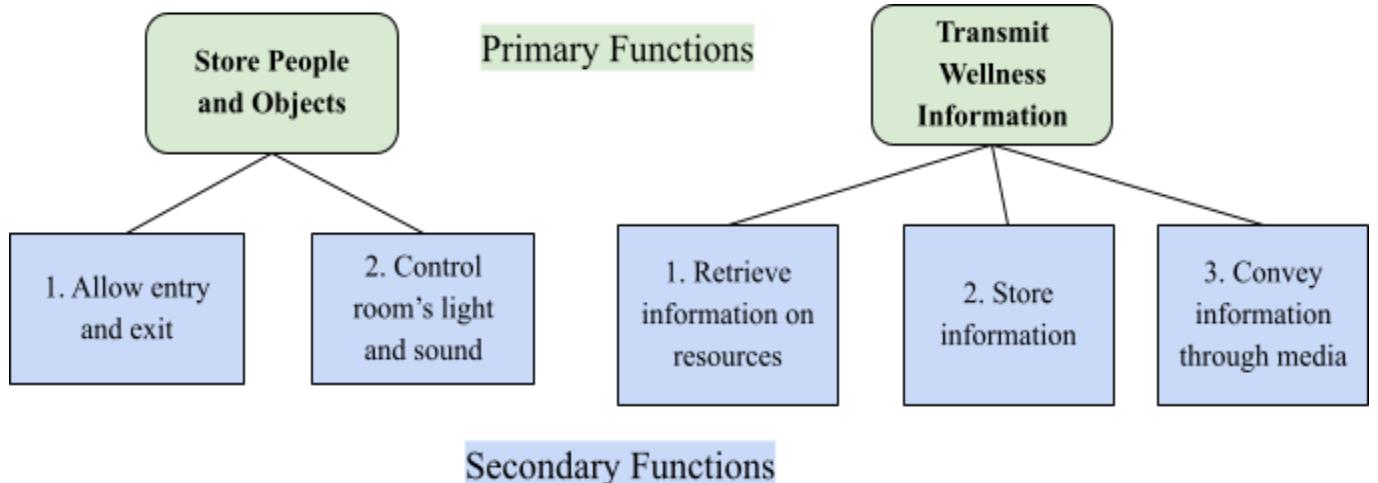


Figure 5. Diagram of project functions.

5.2 Objectives

Table 5 shows objectives in descending order of priority, ranked by pairwise comparison (Appendix J). Overall, they are designed to increase privacy, relaxation, and productivity through scientifically proven methods and ergonomic principles, while allowing wellness resources to be accessible to all users.

Table 5. Objectives, Goals, and Metrics

Objective <i>The design should be:</i>	Goal <i>The design should:</i>	Metric
Mentally stimulating in its ambience	Aim for 12% of natural green coverage ratio [5, 15]	Percentage
	Aim for 40-50% of shaded area along the floor [16]	
	Mimic natural lighting patterns (Appendix K) [16, 17]	Light colour and transmittance
	Only use materials with natural grains and textures such as wood, stone, concrete, brick, plants, and plant-like material [15]	Material type
Conducive to wellness and relaxation	Allow comprehensibility of wellness information through visual, auditory, and tactile cues (Appendix M)	Modes of communication
	Incorporate ten resources to collectively stimulate all five senses (Appendix M)	Number of stimulating resources
Distraction-free	Maintain sound levels to be within 45-50 dB at all times [18]	Decibels

Objective <i>The design should be:</i>	Goal <i>The design should:</i>	Metric
Physically Comfortable for users	Allow users to maintain a minimum distance of 1.2 meters from other users [19]	Meters
	Incorporate comfortable materials such as polyester woven fabrics [20]	Material type
	Ensure seat width ≥ 489 mm [21]	Millimetres
Community-oriented	Allow availability for one social event to occur every week (Appendix C)	Number of weekly events
	Enable users two methods of interacting with the UofT community (Appendix M)	Number of methods
Easily alterable	Only use modular, not fixed furniture [22]	Percentage

5.3 Constraints

The wellness room design shall comply with the criteria in Table 6 in accordance with structural building codes and the client's demands (Appendix N).

Table 6. Design Constraints

Constraint Category	Category <i>The design shall:</i>	Metric	Constraint
Client-based constraints	Be within client's budget and timeline	Budget Maximum maintenance duration covered by budget	$\leq \$25000$ 2 years (Appendix M)
	Provide different types of mentally stimulating resources	Minimum mentally stimulating resources present	8 different resources [23] (Appendix L)
	Require minimal maintenance	Time required for maintenance per month	< 1 hour
		Modifications made to human resources allocation	0 (Appendix M)
Research-based	Provide sufficient space	Minimum room capacity	3 occupants (Appendix N)

Constraint Category	Metric	Constraint	
	Provide tolerable sound insulation	Minimum space of room 7 m ² + 0.1 m ² /occupant [4]	< 70 dB [24] (Threshold of annoyance)
	Comply with Ontario Building Code	See Appendix N	

6.0 Design Alternatives

This section chronologically outlines how three feasible design alternatives are conceptualized. Processes utilize discipline strategies, research, and insights from client meetings to thoroughly explore the design space and establish criterion to measure designs by (Appendix M).

6.1 Idea Generation

Shown in Figure 6, ideation began with describing components, defined as singular features of the design.

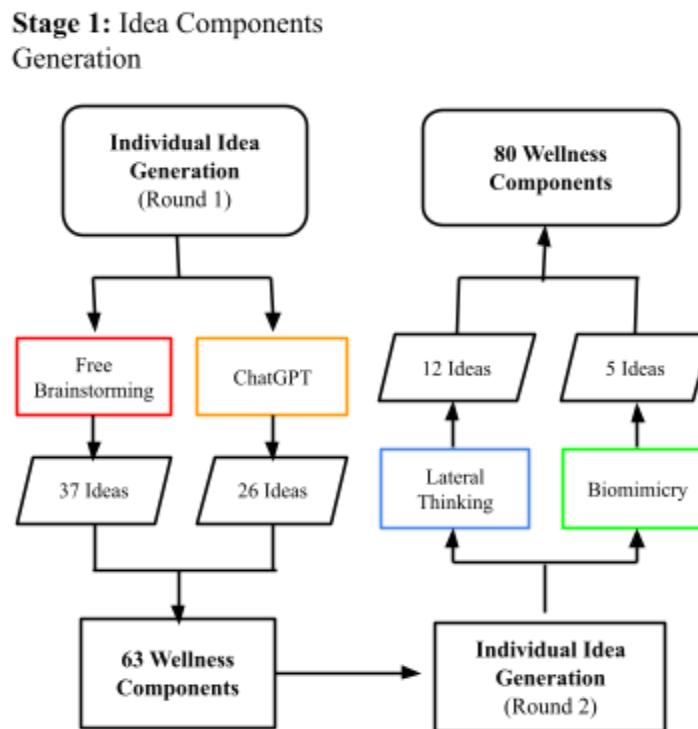


Figure 6. Flowchart outlining Stage 1

First, team members brainstormed idea components freely or with ChatGPT (Appendix O, P). Most of the 63 components generated were deemed widespread among existing wellness rooms. Hence, lateral thinking and biomimicry were employed to innovate and deviate from industry-standard solutions, creating 80 total components (Appendix Q-S).

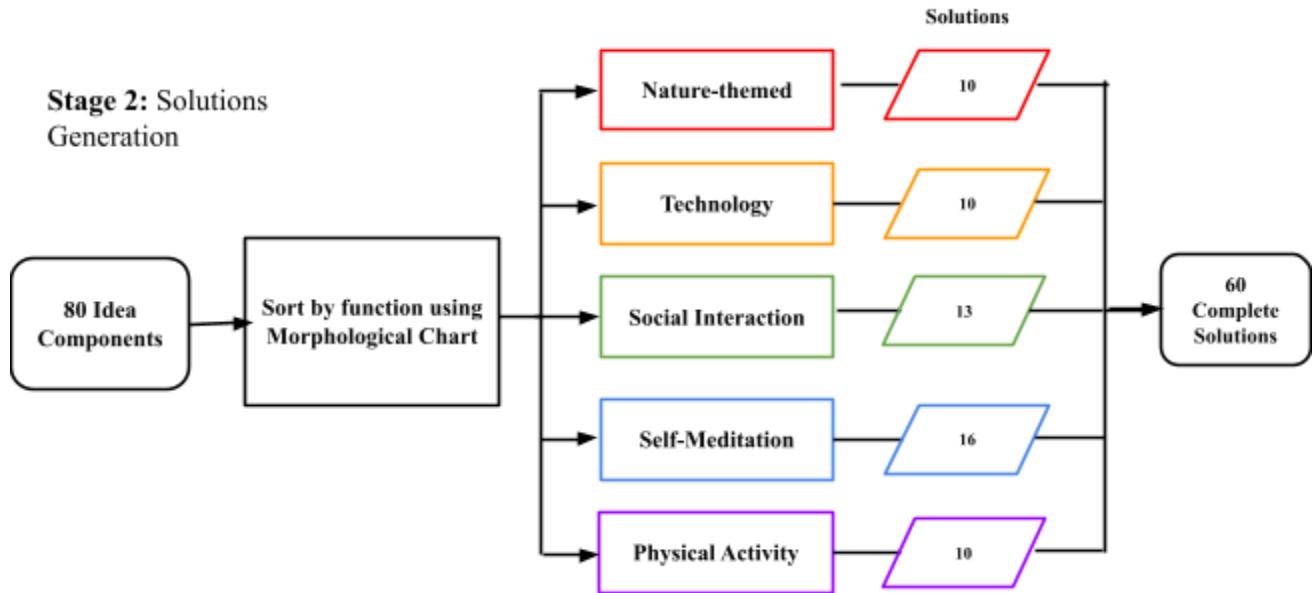


Figure 7. Flowchart outlining Stage 2

Components were combined and categorized as in Figure 7 using a morphological chart (Appendix T). Team members created solutions containing at least one component from each row in the morphological chart, to ensure every function is satisfied. Additionally, each solution needed a rationale, so that the components were not randomly shuffled together (Appendix U). This yielded 60 complete solutions with diverse themes (Figure 7).

6.2 Alternative Design Selection Process

The idea selection process is visualized in Figure 8, where the design space converges from 60 solutions to three feasible, unique alternative designs.

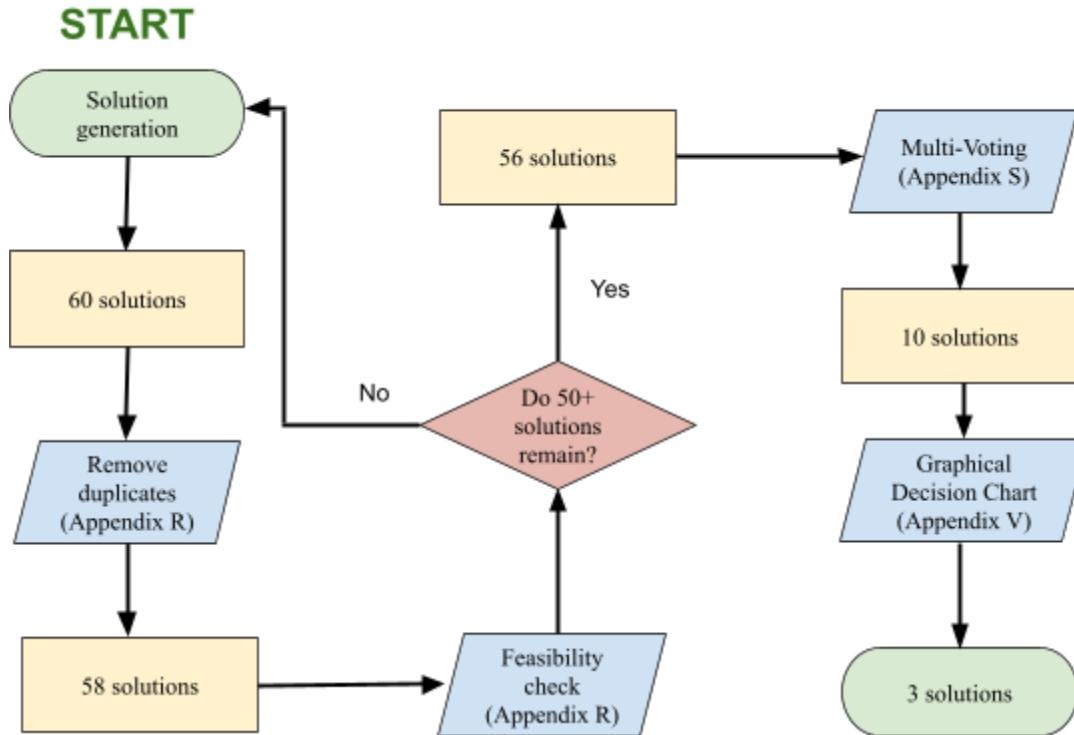


Figure 8. Flowchart outlining idea selection

6.2.1 Consolidation and Feasibility Check

All solutions were consolidated in a table that facilitated identifying duplicates through the Combination Code column, and a team discussion eliminated any solution that could not realistically fulfill all functions and constraints (Appendix S).

6.2.2 Multi-Voting

Three iterations of multi-voting were performed to narrow down the solutions list (Appendix V). This systematic approach allows eliminating solutions in each theme, until what remains represent the best executions of the team's ideas.

6.2.3 Graphical Decision Chart

The ten remaining solutions were ranked using a three-dimensional Graphical Decision Chart made in Desmos, shown in Figure 9 [25].

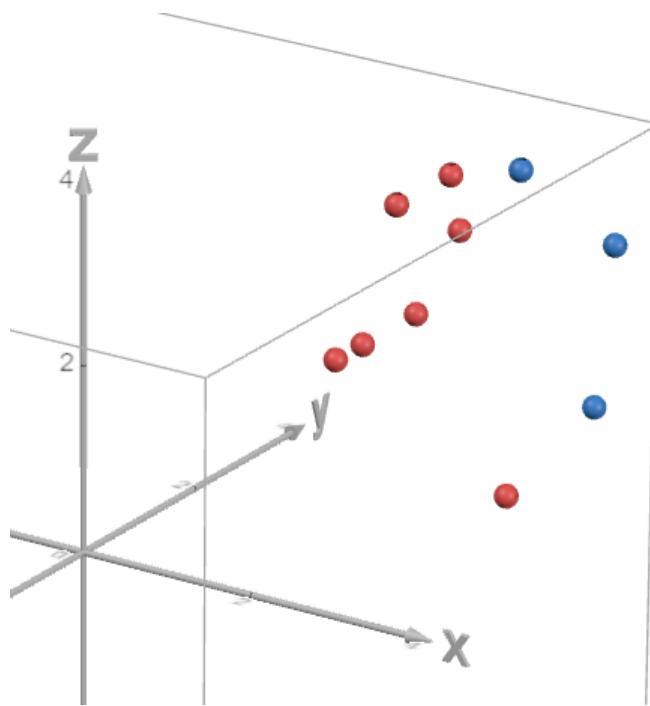


Figure 9. Graphical Decision Chart [25]

Each axis represents one of the project's three most prioritized objectives, together fulfilling the vision and need stated in the problem statement. These are the wellness conductivity (x-axis), availability of information sources (y-axis), and insulation from distractions (z-axis). Each solution's coordinates were decided through team discussion to find the top three solutions, coloured in blue in Figure 9, by their mode length (Appendix W).

6.3 Description of Alternative Designs

Three design alternatives are presented for the client's consideration. Floor plans and renders were produced using SmartDraw, Blender, or adapted from existing images [26, 27].

6.3.1 EasyLife Wellness (Design 1)

EasyLife Wellness provides users space for leisure activities that engage cognitive stimulation using elements depicted in Figure 10 [28].

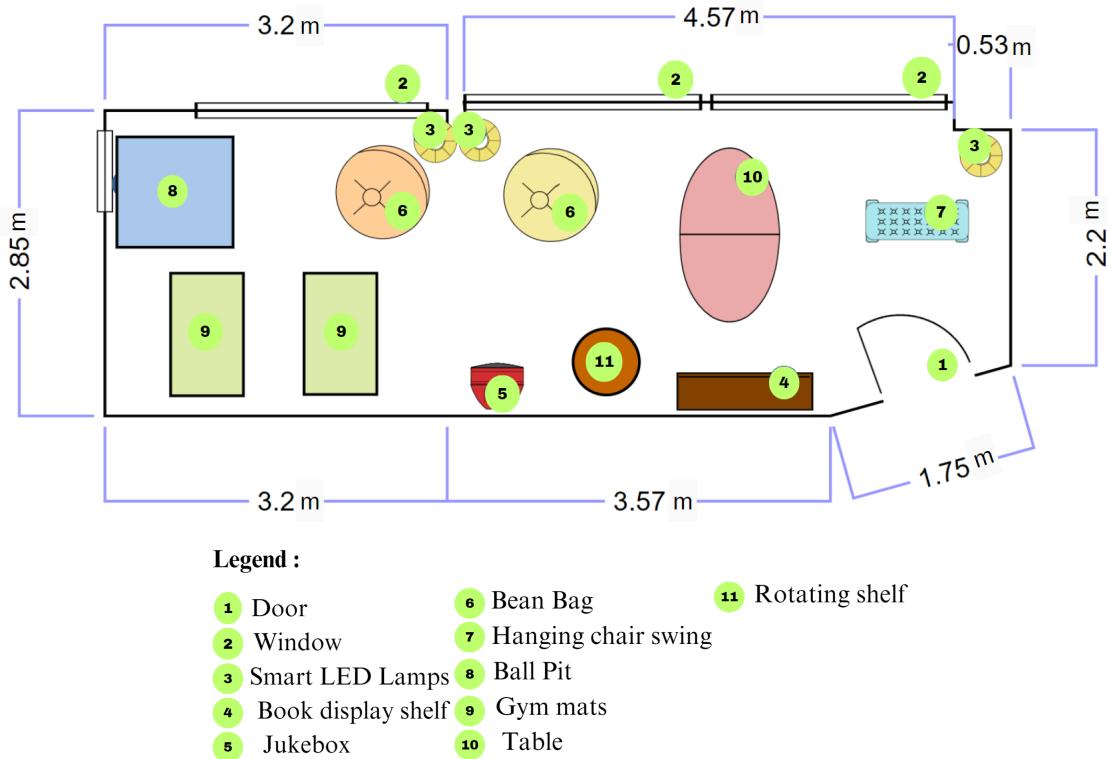


Figure 10. Floor Plan of *EasyLife Wellness*

The translucent, sliding window curtains and high absorption acoustic fabrics in conjunction with vinyl frames creates a thermally insulated, private environment [29, 30] (Figure 11).



Figure 11. *EasyLife Wellness* window design [26]

Furthermore, the wooden book display shelf can feature fictional books, magazines and newspapers, with the adjacent rotating shelf featuring hands-on activities (Figure 12, Appendix X).

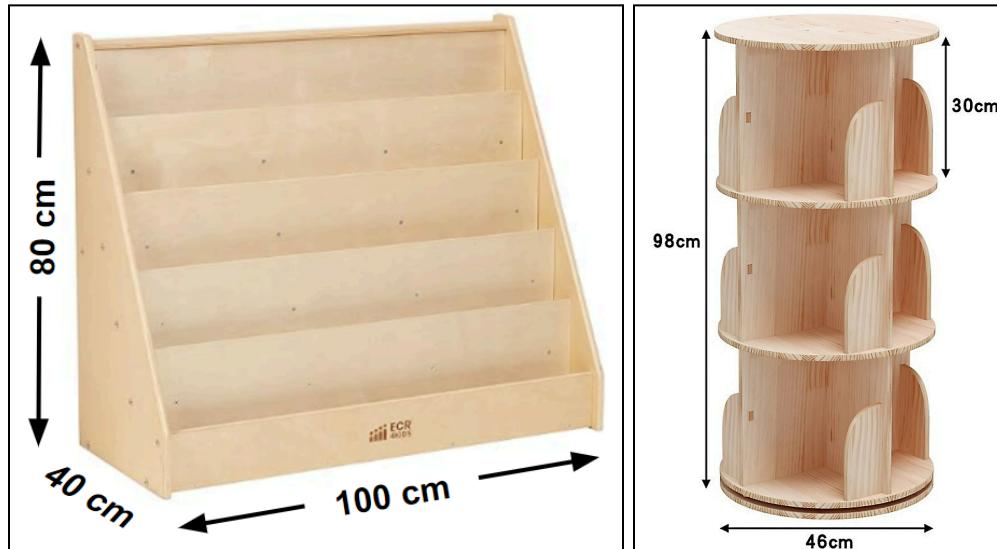


Figure 12. Shelves for wellness resources. Adapted from [31, 32]

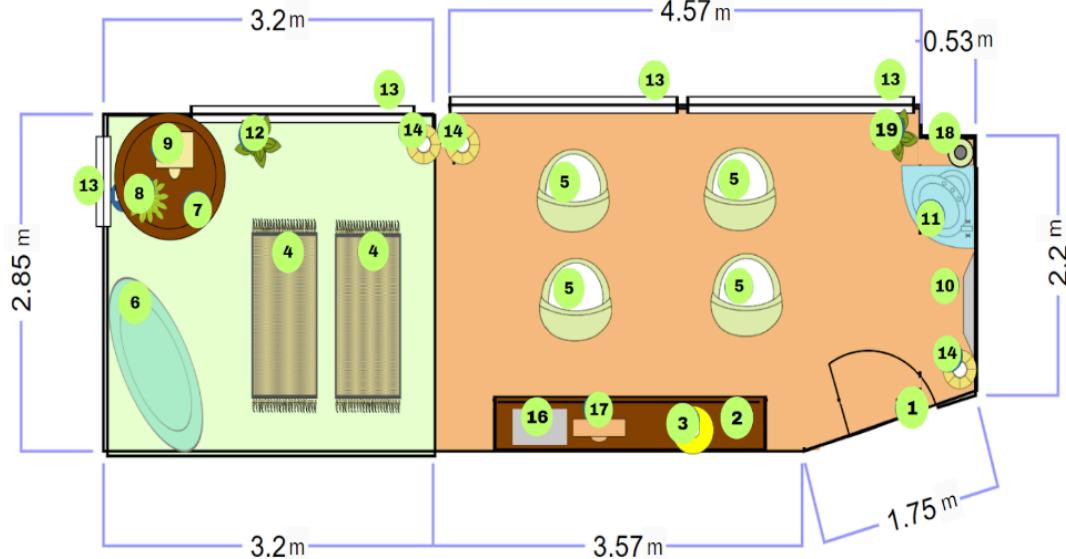
Table 7 assesses this design against the objectives.

Table 7. Objectives addressed by Design 1

Objective #	Assessment
1	<ul style="list-style-type: none"> Smart LED lights provide characteristics of natural lighting [33]
2	<ul style="list-style-type: none"> Shelves enable an attractive display of colourful book covers and store tactile resources including kinetic sand and fidget toys
3	<ul style="list-style-type: none"> Soundproof window curtain made of 90% Trevira CS, 10% Polyester [34]
4	<ul style="list-style-type: none"> Velcroing gym mats to walls provide maneuvering space
5	<ul style="list-style-type: none"> Door pockets store motivational notes written by community members
6	<ul style="list-style-type: none"> Window curtains and gym mats are easily moveable

6.3.2 Nature's Haven (Design 2)

Nature's Haven induces wellness by leveraging biophilic design principles to mimic a natural environment, depicted in Figure 13 [35].


Legend :

- | | | | |
|----------------------|--------------------|---------------------------|-------------------|
| 1 Door | 6 Hammock | 11 Indoor Fountain | 16 Speakers |
| 2 Elm Tree Bookshelf | 7 Tree Trunk table | 12 Plants | 17 DVD player |
| 3 S.A.D. Lights | 8 Bonsai Tree | 13 Window | 18 Leaf/Vine bin |
| 4 Yoga Mat | 9 Aroma Diffuser | 14 Floor lamps | 19 Plank flooring |
| 5 Egg Pod Chairs | 10 Bulletin Board | 15 Synthetic grass carpet | |

Figure 13. Floor plan of *Nature's Haven*

Distinguished from the previous design, this room provides user control over incoming natural light by letting them paste leaf and vine stickers onto the window. Figure 14 demonstrates a sample setup.

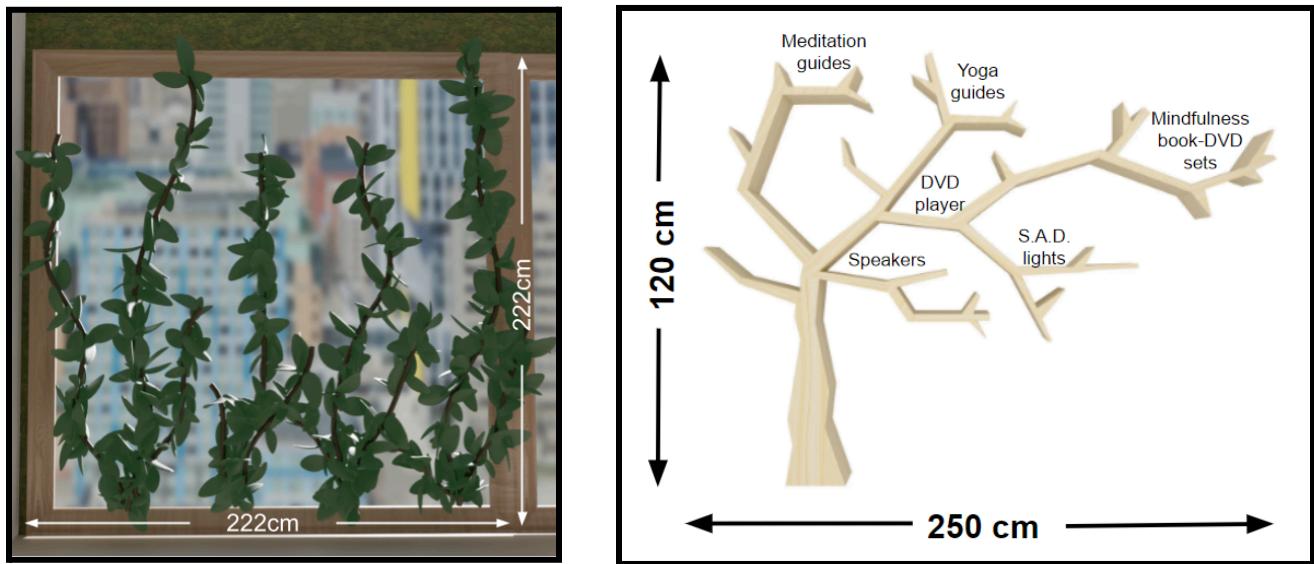


Figure 14. *Nature's Haven* window design (left) [26] and Elm Tree Bookshelf (right) [36]

Additionally, guidance for calming activities are in book-DVD sets categorized on the bookshelf in Figure 15.

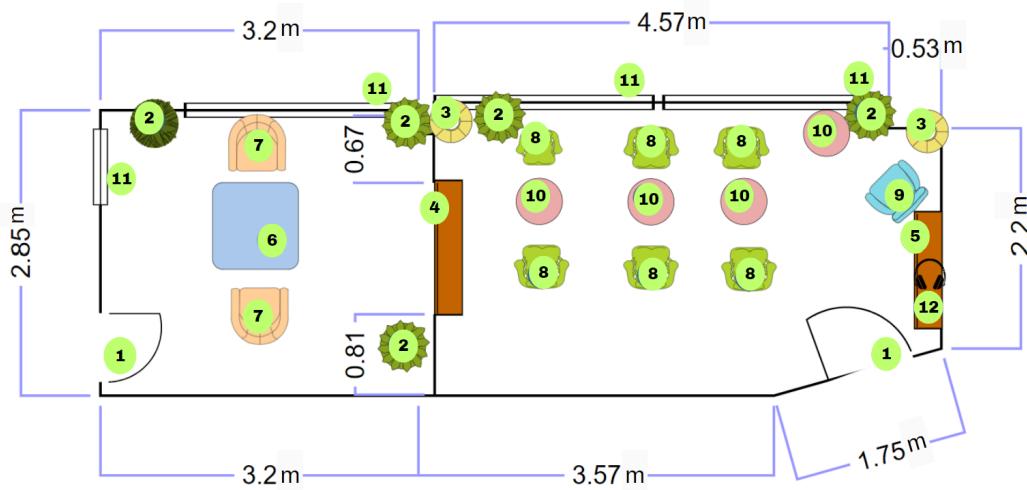
Table 8 details the objectives met by this design.

Table 8. Objectives addressed by Design 2

Objective #	Assessment
1	<ul style="list-style-type: none"> • Synthetic grass cover interior surfaces • Lighting is primarily natural, supplemented by LED lights that mimic sunlight • Mostly wood materials
2	<ul style="list-style-type: none"> • Auditory and visual forms of wellness information are provided • S.A.D. lights in chairs can provide 2,500-10,000 additional lux of light [37] • Aroma diffuser utilizing diluted, hypoallergenic essential oils stimulates olfaction [38, 39]
3	<ul style="list-style-type: none"> • Speakers play white noise or ambient nature sounds • Velvet in egg pod chair covers provide acoustic insulation [40]
4	<ul style="list-style-type: none"> • Hammocks and yoga mats are made using polyester woven fabrics
5	<ul style="list-style-type: none"> • Bulletin board let users leave positive notes to each other
6	<ul style="list-style-type: none"> • Yoga mats and hammocks are lightweight and modular

6.3.3 DuoFusion Chambers (Design 3)

Shown in Figure 15, the *DuoFusion Chambers* lets users choose between solitary and social activities.



Legend :

- | | | |
|---------------------------------|---------------------------------|---------------------------------------|
| 1 Door | 6 Foldable table | 11 Windows |
| 2 Plants | 7 Rolling chairs | 12 Noise cancelling headphones |
| 3 Floor Lamps | 8 Foldable saucer chairs | |
| 4 Sliding Bookshelf Door | 9 Rocking chair | |
| 5 Bookshelf | 10 Circular table | |

Figure 15. Floor plan of *DuoFusion Chambers*

Unique components of the design include a sliding door controlling the merging of the rooms and electrochromic smart glass for its windows letting users control the level of tint and hence, natural light transmittance (Figure 16) [41].

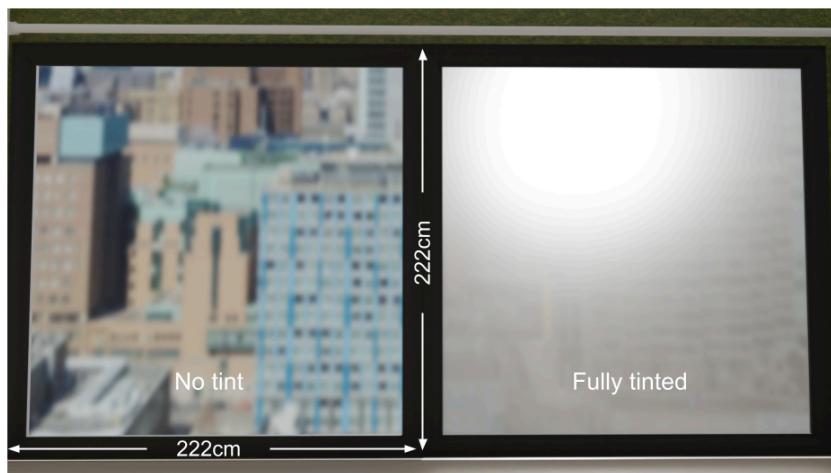


Figure 16. *DuoFusion Chambers* window design [26]

The sliding bookshelf door offers motivational books and e-readers (Appendix X), and when opened, merges the two rooms to permit larger capacity events that can elevate mental health (Figure 17) [41].



Figure 17. Sliding Bookshelf Door. Adapted from [42]

Table 9 evaluates this design based on the objectives.

Table 9. Objectives addressed by Design 3

Objective #	Assessment
1	<ul style="list-style-type: none"> • Mostly artificial lighting • Incorporates stone tables and wooden shelves
2	<ul style="list-style-type: none"> • E-readers have audiobooks installed
3	<ul style="list-style-type: none"> • Fabric wrapped acoustic panels in the wall insulate sound between the two rooms [43] • Noise cancelling headphones are available
4	<ul style="list-style-type: none"> • Rolling and saucer chairs are made using polyester woven fabrics
5	<ul style="list-style-type: none"> • Merged rooms can host communal events
6	<ul style="list-style-type: none"> • Foldable chairs and tables are particularly modular and movable

7.0 Proposed Conceptual Design Specification

The three design alternatives were evaluated using the Pugh Method Chart in Table 10, comparing how they fulfill all objectives compared to the existing Wellness Room, with justifications being in Appendix Y.

Table 10. Pugh Chart

Objective	Score (-2 to +2)			
	Datum	Designs		
		<i>EasyLife Wellness</i>	<i>Nature's Haven</i>	<i>DuoFusion Chambers</i>
1	—	+1	+2	0
2	—	+1	+2	+1
3	—	0	+1	+2
4	—	0	+1	+2
5	—	-1	0	0
6	—	0	+2	+1

Sum	—	+1	+8	+6
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In addition to having the highest Pugh Chart score, *Nature's Haven* is chosen for best addressing the project's gaps identified in the problem statement. These include incorporating sound insulation, multimodal lighting, and including biophilic features like the table mock-up in Figure 18. It provides mentally stimulating colors and textures that make the space "more inviting and calm" as the client requested [1].

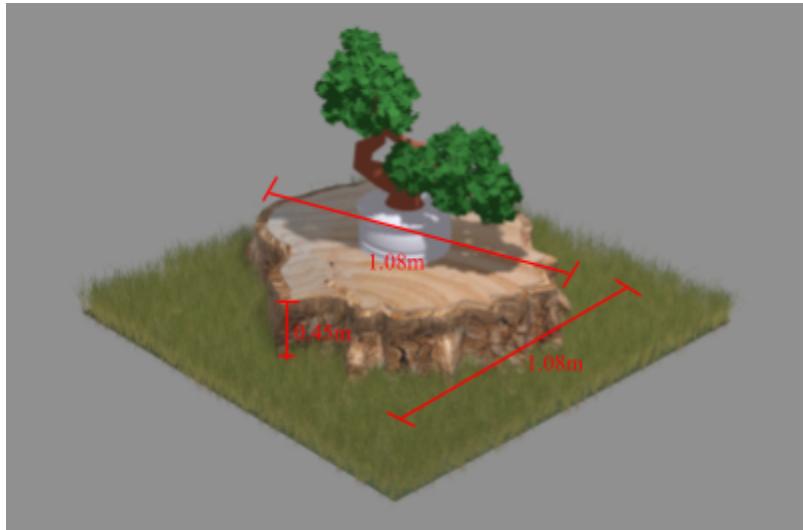


Figure 18. 3D Render of the tree trunk table, bonsai tree, and synthetic grass carpet

EasyLife Wellness provides LED lights and sound-absorbing curtains, and *DuoFusion Chambers* has fabric acoustic layers in walls. While they address the sound insulation and light gap, *Nature's Haven* provides more customizability. The SAD lights and sound-insulating covers in the chairs (Figure 19) allow users to adjust lighting and sound to their liking, and most importantly block the buzzing sound (Appendix C). This most fits the client's goal of using "technology to make this space more welcoming" for any student [1].

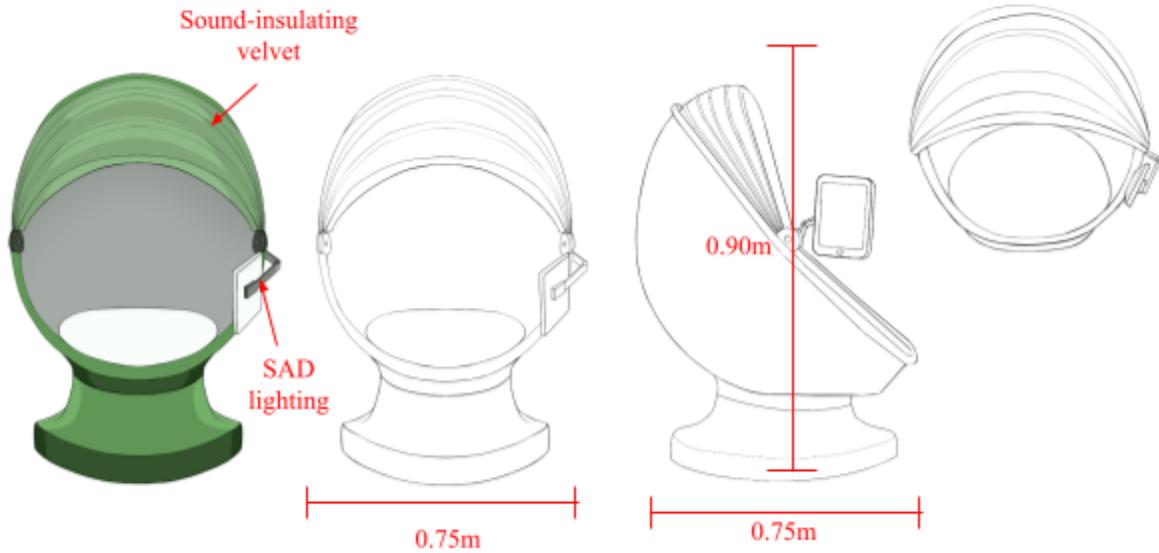


Figure 19. Orthographic projection of the egg pod chair

Furthermore, *Nature's Haven* aligns with the client wanting a design more “inviting” while “bearing structural changes in mind” [1]. Merging the study room provides approximately 9.12 m^2 more usable space (Appendix Z) than the current wellness room, hence more features could be implemented. *DuoFusion Chambers*, although versatile for hosting community events, does not provide the more spacious ambiance when it is split and used as a wellness room. Thus, *Nature's Haven* holistically satisfies the client’s gap, need, and wants best.

8.0 Measures of Success

Using the three-dimensional modeling software Blender, the team aims to simulate a virtual, interactive landscape of *Nature's Haven* [26]. The design’s authenticity in replicating a natural ambience will be evaluated, in accordance with Objective 1, through the test schedule summarized in Table 11.

Table 11. Testing Procedures and Plans

Week #	Goals	Procedure	Justification
1	Implement described design in a three-dimensional model	<ol style="list-style-type: none"> Based on the measurements in the Service Environment, create the structure of the room in Blender, removing the dividing wall Incorporate <i>Nature's Haven</i> physical components into the room, following the floor plan’s spacing (Figure 13) 	Existing industries utilize simulation-based models for design evaluation [52].

Week #	Goals	Procedure	Justification
2	Add elements to compute the room's natural green coverage ratio	<ol style="list-style-type: none"> 1. Implement colours, designs, and aesthetic features to the walls and furniture using Blender 2. Introduce object textures using resources in this website [44] 3. Add lighting elements including sunlight and other lights that would be available to users 4. Use the formula, $\frac{\text{Greenery Area}}{\text{Total Area}}$, to calculate the natural green coverage ratio [45] 	Enhancing details creates a more realistic environment, reflecting the intended design and facilitating accurate data collection [46].
3	Draw parallels between Human Centric Lighting and the lighting produced from the simulated environment	<ol style="list-style-type: none"> 1. For every one hour interval from 6 AM to 6 PM, choose ten evenly-spread points in the room at a horizontal plane of 1.2 meters above the ground and determine the Correlated Colour Temperature (CCT, measured in Kelvins) and photopic illuminance (measured in lux) using Blender [47] 2. Convert CCT into a melanopic daylight efficacy ratio (M-DER) and multiply M-DER and photopic illuminance to get the Melanopic Equivalent Daylight Illuminance (M-EDI) [50] 3. Compare these trends with recommended daytime, evening, and night M-EDI quantities. The results should qualitatively reflect the lighting demonstrated in Figure 20 [53] 	Simulating natural environments indoors in accordance with Human Centric Lighting may elevate physiological arousal, promote positive mood, and offer restorative effects [48, 49].

Note: The lighting varies in the room depending on the default settings of the lighting system installed. Users influencing the lighting is not considered.

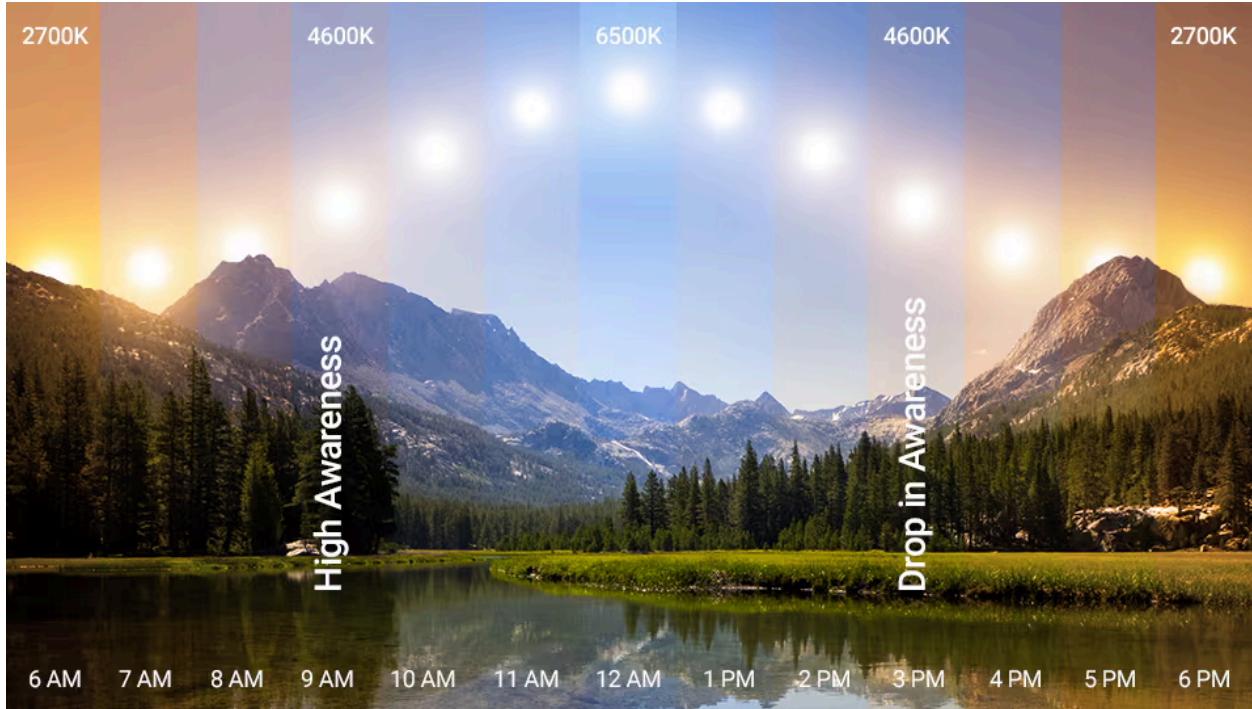


Figure 20. Natural color temperature values throughout the day. Adapted from [54].

Three metrics will gauge the design's success:

1. Natural green coverage ratio falls between 5% and 20%, with success lying at 12%. Below 5% is too low to positively influence psychological responses, and over 20% is overwhelming [5].
2. Recommended M-EDI values throughout the day [53]:
 - a. Daytime M-EDI \geq 250 lux
 - b. Evening M-EDI \leq 10 lux
 - c. Nighttime M-EDI \leq 1 lux
3. Human Centric Lighting CCT values [55]:
 - a. Morning: starts from 2500K and gradually reaches 4000K
 - b. Midday: From 10 AM, 4000K and 5500K is optimal and moving further into the day, aim for anywhere between 5500K and 6500K
 - c. Evening: 4000K to 5500K can be used at around 2 PM gradually decreasing to 2500K to 4000K
 - d. Night: Low photopic illuminance and low CCT is optimal given that this space is not intended for nightlife

9.0 Conclusion

The proposed conceptual design for the Chestnut Residence Wellness Room Expansion is *Nature's Haven*. This design best meets the objectives, gap, and client's needs, as determined through the idea generation and design comparison processes, surpassing the existing room in conveying wellness information and providing a comfortable space for user relaxation. A prototype will be created in Blender to test lighting coverage from March 26 - April 15th, and the project's final presentation will be given on April 16th.

10.0 Reference List

- [1] Client Statement, University of Toronto. Accessed: [02 Feb 2024]. [Online]. Available: https://utoronto.sharepoint.com/:b/r/sites/001T_FASEAPS11220241TUT25/Shared%20Documents/General/Projects/Project121.pdf?csf=1&web=1&e=7hlaYx
- [2] "Home - Chestnut Residence," Chestnut Residence. Accessed: February 15, 2024 . [Online]. Available: <https://chestnut.utoronto.ca/>
- [3] "Report on Student Health and Well-Being - University of Toronto," University of Toronto Provost. Accessed: February 16, 2024. [Online]. Available: <https://www.provost.utoronto.ca/wp-content/uploads/sites/155/2018/03/Report-on-Student-Health-Well-Being.pdf>
- [4] WELL Standard. Standard: WELL V2. Accessed: February 16, 2024. [Online]. Available: <https://v2.wellcertified.com/en/v/mind/feature/7#>
- [5] "A quantitative study for indoor workplace biophilic design to improve health and productivity performance," Journal of Cleaner Production. Accessed: February 15, 2024. Date published: October 01, 2021. [Online]. Available: <https://www.sciencedirect.com/science/article/abs/pii/S0959652621033540>.
- [6] Chestnut Residence. Accessed: [10 Feb 2024]. [Online]. Available: <https://chestnut.utoronto.ca/prospective-residents/>
- [7] "StarPortal - University of Toronto," Accessed: February 15, 2024. [Online]. Available: <https://starportal.utoronto.ca/>
- [8] Chestnut Residence, "Meet the Team," Accessed: [11 Feb 2024]. [Online]. Available: <https://chestnut.utoronto.ca/about/meet-the-team/#opportunities>
- [9] TAHSN. Accessed: [11 Feb 2024]. [Online]. Available: <https://tahsn.ca/members>
- [10] University of Toronto Students' Union. "Mental Health & Wellness." Accessed: [11 Feb 2024]. [Online]. Available: <https://www.utsu.ca/mental-health-wellness/>
- [11] University of Toronto Graduate Students' Union. "Mental Health Support." Accessed: [11 Feb 2024]. [Online]. Available: <https://utgsu.ca/services/mental-health-support/>
- [12] University of Toronto Master of Health Administration. Accessed: [11 Feb 2024]. [Online]. Available: <https://www.uoftmha.ca/>
- [13] Student Life at University of Toronto. "HealthyU Crew." Accessed: [12 Feb 2024]. [Online]. Available: <https://studentlife.utoronto.ca/program/healthyu-crew/>
- [14] University of Toronto. "University of Toronto - School of Continuing Studies." Accessed: [12 Feb 2024]. [Online]. Available: <https://updc.utoronto.ca/>

- [15] "Best Ways to Include Natural Elements in your Office Design," Antham Construction Group Inc. Accessed: February 15, 2024. Date published: October 28, 2019. [Online]. Available: <https://anthamgroup.com/best-ways-to-include-natural-elements-in-your-office-design/>
- [16] S. Peng, C. Zhao, and Z. Xu, "Modeling spatiotemporal patterns of understory light intensity using airborne laser scanner (LiDAR)," ISPRS Journal of Photogrammetry and Remote Sensing, vol. 97, pp. 195–203, Nov. 2014. DOI: 10.1016/j.isprsjprs.2014.09.003. Available: https://www.researchgate.net/publication/266620536_Modeling_spatiotemporal_patterns_of_understory_light_intensity_using_airborne_laser_scanner_LiDAR
- [17] "What is Human Centric Lighting (HCL)?" ArchDaily. Accessed: February 15, 2024. Published: April 12, 2023. [Online]. Available: <https://www.archdaily.com/999175/what-is-human-centric-lighting-hcl>
- [18] "Guide to Office Noise Reduction," Framery. Accessed: February 16, 2024. Date published: October 03, 2023. [Online]. Available: <https://www.frameryacoustics.com/en/office-noise-reduction/>
- [19] "The Science of Personal Space: Why We Need Boundaries and 5 Ways to Deal When They're Crossed," Accessed: March 23, 2024. Available: <https://www.prevention.com/health/a28692075/personal-space/>
- [20] "A Comparative Study on the Comfort and Safety of the Seat Cover Fabrics", Accessed: March 24, 2024. Available: https://www.researchgate.net/publication/327976366_A_Comparative_Study_on_the_Comfort_and_Safety_of_the_Seat_Cover_Fabrics
- [21] "University-of-Toronto-Office-Ergonomics-Standard.pdf," University of Toronto Environment, Health and Safety. Accessed: February 15, 2024. [Online]. Available: <https://ehs.utoronto.ca/wp-content/uploads/2015/10/University-of-Toronto-Office-Ergonomics-Standard.pdf>
- [22] "The future of office design: How to future-proof your workspace for 2023 & beyond," Haiken. Accessed: February 15, 2024. [Online]. Date published: May 10, 2023. Available: <https://www.haiken.com/insights/the-future-of-office-design>
- [23] "Health Education & Prevention Program, '8 Dimensions of Well-Being,' Colorado State University Pueblo, Accessed: March 24, 2024. [Online]. Available: <https://www.csupueblo.edu/health-education-and-prevention/8-dimension-of-well-being.html#:~:text=Wellness%20comprises%20of%20eight%20mutually,being%2C%20and%20quality%20of%20life>
- [24] Ontario Building Code, O Reg. 332/12, s.9.5.3(1)
- [25] Desmos. Desmos [Software]. Available: <https://www.desmos.com/>. Accessed: 23 Mar 2024.
- [26] Blender Foundation. Blender [Software]. Available: <https://www.blender.org/>. Accessed: 20 Mar 2024.
- [27] SmartDraw Software, LLC. SmartDraw [Software]. Available: <https://www.smartdraw.com/>. Accessed: 22- Mar 2024.

- [28] Desmos. "Desmos 3D." Available: <https://www.desmos.com/3d/d8c150cab7>. Accessed: 23- Mar- 2024.
- [29] "Useful information about the sliding applications." Helaform. Accessed: 24 Mar 2024. Published: 12 Apr 2023. [Online]. Available: <https://helaform.com/useful-information-sliding-applications/>
- [30] "Window frame." Energy Education. Accessed: 23 Mar 2024. Published: 12 Apr 2023. [Online]. Available: https://energyeducation.ca/encyclopedia/Window_frame
- [31] "ECR4Kids Birch Hardwood Single-Sided BookCase Display Stand for Kids, 5 Shelves, Natural." Amazon.ca. Accessed: 23 Mar 2024.[Online]. Available: <https://www.amazon.ca/ECR4Kids-Hardwood-Single-Sided-Display-Shelves/dp/B0028XBXJY>
- [32] "Toytexx 3 Tier Rotating Bookshelf, 360° Solid Wood Rotating Stackable Shelves Bookshelf Organizer For Home, Bedroom, Office," TheBay.com [Online].Accessed: 23 Mar 2024. Available:<https://www.thebay.com/product/toytexx-3-tier-rotating-bookshelf-360%C2%B0-solid-wood-rotating-stackable-shelves-bookshelf-organizer-for-home-bedroom-office-8b56ab0394744b2f8f8265861e dd6382.html>
- [33] S.-T. Oh and J.-H. Lim, "CRI-Based Smart Lighting System That Provides Characteristics of Natural Light," Information, vol. 14, no. 12, p. 628, Published: Dec. 2023, Accessed: 23 Mar 2024. [Online]. Available: <https://doi.org/10.3390/info14120628>
- [34] "High Absorption Acoustic Fabrics - Acoustic Curtains and Solutions - Products - Gerriets," Accessed: 23 Mar 2024. [Online]. Available: www.gerriets.com.https://www.gerriets.com/us/products/acoustic/high-absorption-acoustic-fabrics/
- [35] Terrapin Bright Green, "14 Patterns of Biophilic Design," *Terrapinbrightgreen.com*,Published: Sep. 12, 2014. Accessed: 23 Mar 2024. [Online]. Available: <https://www.terrapinbrightgreen.com/reports/14-patterns/>
- [36] "Solid Wood Tree-Shaped Bookshelf Living Room Background Sofa Art Shelf Office Floor Custom Creative Bookcase", Accessed March 25, 2024, [Online]. Available: https://www.aliexpress.com/item/1005004471584615.html?src=google&aff_fcid=b137a317214f42d6b74 2bb292b6fd4c2-1711313424798-01089-UneMJZVf&aff_fsk=UneMJZVf&aff_platform=aaf&sk=UneM JZVf&aff_trace_key=b137a317214f42d6b742bb292b6fd4c2-1711313424798-01089-UneMJZVf&termi nal_id=adbc1852335b46899054af4c8b66a5f6&afSmartRedirect=y
- [37] Campbell PD, Miller AM, Woesner ME. Bright Light Therapy: Seasonal Affective Disorder and Beyond. Einstein J Biol Med. 2017;32:E13-E25. PMID: 31528147; PMCID: PMC6746555.
- [38] "Organic and Hypoallergenic Scents," Accessed March 25, 2024, [Online]. Available: [https://aromaretail.com/organic-and-hypoallergenic-scents/#:~:text=Hypoallergenic%20means%20design ed%20to%20reduce,volatile%20organic%20compounds%20\(VOC's\)](https://aromaretail.com/organic-and-hypoallergenic-scents/#:~:text=Hypoallergenic%20means%20design ed%20to%20reduce,volatile%20organic%20compounds%20(VOC's))

- [39] Choi NY, Wu YT, Park SA. Effects of Olfactory Stimulation with Aroma Oils on Psychophysiological Responses of Female Adults. *Int J Environ Res Public Health.* 2022 Apr 25;19(9):5196. doi: 10.3390/ijerph19095196. PMID: 35564590; PMCID: PMC9102723.
- [40] "Which Fabric Works Best for Soundproofing Your Venture?" Accessed March 25, 2024, [Online]. Available: <https://www.direct-fabrics.co.uk/blog/which-fabric-works-best-for-soundproofing-your-venture/>
- [41] Martino J, Pegg J, Frates EP. The Connection Prescription: Using the Power of Social Interactions and the Deep Desire for Connectedness to Empower Health and Wellness. *Am J Lifestyle Med.* 2015 Oct 7;11(6):466-475. doi: 10.1177/1559827615608788. PMID: 30202372; PMCID: PMC6125010.
- [42] "DOUBLE SLIDING DOOR - Style 4", Accessed March 25, 2024, [Online]. Available: <https://maderrashop.com/double-sliding-doors-style-4/>
- [43] "Optimizing the use of acoustic materials in office buildings," *Scientific Reports.* Accessed: February 15, 2024. [Online]. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8526837/>
- [44] "Textures for 3D Artists," Accessed March 25, 2024, [Online]. Available: <https://www.polygona.com/textures>
- [45] K. Mihara, "How does green coverage ratio and spaciousness affect self-reported performance and mood?" Accessed March 25, 2024, [Online]. Available: <https://www.sciencedirect.com/science/article/abs/pii/S0360132323009666#:~:text=The%20effect%20of%20green%20coverage,in%20a%20chamber%20%5B25%5D>
- [46] "Towards a Simulation Framework for Smart Indoor Spaces." NCBI. Accessed: 23 Mar 2024. [Online]. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7763950/>
- [47] Rissanen, S. M., & Härmä, M. (2021). "The Effect of Working Time Arrangements on Work–Life Conflict and Mental Well-Being among Employees in Finland: A Cross-Sectional Study." *International Journal of Environmental Research and Public Health,* 18(24), 12961. doi:10.3390/ijerph182412961. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8929548/>
- [48] Browning MHEM, Mimnaugh KJ, van Riper CJ, Laurent HK, LaValle SM. Can Simulated Nature Support Mental Health? Comparing Short, Single-Doses of 360-Degree Nature Videos in Virtual Reality With the Outdoors. *Front Psychol.* 2020 Jan 15;10:2667. doi: 10.3389/fpsyg.2019.02667. PMID: 32010003; PMCID: PMC6974516.
- [49] ["How To Simulate A Natural Daylight Environment Using Artificial Lighting: A Study on the Circadian Cycle and Ways to Control it by Light," in ResearchGate]. Available: https://www.researchgate.net/publication/262536062_How_To_Simulate_A_Natural_Daylight_Environment_Using_Artificial_Lighting_A_Study_on_the_Circadian_Cycle_and_Ways_to_Control_it_by_Light
- [50] ["Lighting Design Strategy L1: Daylight," WELL v2 Building Standard]. Available: <https://v2.wellcertified.com/en/v2.2/appendix/l1>.

- [51] "What is Electrochromic Smart Glass?" Smart Glass World. Accessed: 25 Mar 2024. [Online]. Available: <https://www.smartglassworld.net/what-is-electrochromic-glass>
- [52] "Fathi, A. S., & O'Brien, W. (2023). A simulation-based approach for evaluating indoor environmental quality at the early design stage. Science and Technology for the Built Environment." ResearchGate. Accessed: 24 Mar 2024 [Online]. Available: https://www.researchgate.net/publication/369048724_A_simulation-based_approach_for_evaluating_indoor_environmental_quality_at_the_early_design_stage
- [53] [Allied Scientific Pro, "Human-Centric Lighting (HCL) and Circadian Parameters," Allied Scientific Pro Blog]. Available: <https://www.alliedscientificpro.com/blog/welcome-to-our-blogs-1/human-centric-lighting-hcl-and-circadian-parameters-177>.
- [54] [Flexfire LEDs, "Circadian Rhythm Lighting," Flexfire LEDs]. Available: <https://www.flexfireleds.com/circadian-rhythm-lighting/>.
- [55] ["Human Centric Lighting," MySupplier]. Available: <https://mysupplier.com/human-centric-lighting.html>.

Appendix A: StarRez Booking

Figure 22 is a screenshot of the booking for the current wellness room on StarRez taken on February 15th. This portrays the vacancies in bookings of the room from February 16th to February 24th.

Figure 22. The booking page of the wellness room, showing that the room is currently under-utilized

Appendix B: Buzzing Video Recording From HVAC System Above the Study Room

Link to video recording: <https://youtu.be/nhSMFNpFiEU>

Appendix C: Client Meeting #1 Notes

Parts of the Project Requirements document cites a document summarizing and organizing the information provided during the first client meeting, seen here [Client Meeting #1 Notes](#). Proof towards the validity of the client meeting notes is shown in Figure 23 by images of team member Aileen Sun's engineering notebook.

	2024-02-02
	Client Meeting #1
	location: Chestnut 28 th floor
	Notes: Client took over a rest team member, not originally client
goal:	- larger wellness room ↳ office ↳ soundproof mental health room - aspects desired: elements of wellness, lighting, seasonal affected disorder lighting, 3 ppl capacity, not entertainment, sound system for white noise / calming music, quiet and soundproof room between student and counsellor
need:	↳ soundproof, lighting are <u>required</u> , rest is preferred - client is new - her ^{OPM} is lack of publicity, and also it's badly setup so they don't wanna publicize - \$25 K as a reasonable use initial budget + 2 yr maintenance period ↳ more money being invested can be discussed down the line - restrictions: don't impact rest of space around, that would impact students ↳ can take down walls ↳ don't take up too much existing space ↳ can merge additional space ↳ client says to notice it's 28 th floor - beam bay; used often - column bays; used sometimes (interactive for ppl who don't want to talk) ↳ fidget toys - Good things abt current room: windows, beam bay daily, otherwise complete redesign is good ↳ room height is good, could be bigger

- two very minor to see outside but not much
 (looks like a jail cell rn)

↳ SAD light: light at a particular frequency to
 give energy, helps m h, ^{fake} sunlight

- Staff: comm wellness coordinator, temp workspace ^{office}
 programming with off campus ppl, come in year round

- bookable: there's a heavy backlog, we don't know but
 don't much space to change.

↳ lockbox with email method and security idea?

↳ small kiosk that may work, streamline would
 be great

↳ in general, do not know scope; but can suggest

- 1 person / day for what is to allow the 1000 ppl

↳ may be 2-3 hr / day makes sense given under-
 utilization

↳ bookable option has 1-3 choices

- current design in privacy:

- limited material in space causes underutilization

- concourse-facility team - or front desk - ask for blueprints/plans

- don't know sound buzzing could be lighting

↳ also vents are ~~disguised~~ ^{hides}

- maybe strike on + curve, floor

- drop-in and bookable space, heavily both options would
 be great.

↳ bookable is also ~~the~~ ^{on} office

- setting up a comm system would be allowed

→ are they similar or catered to diff needs? art, gal, etc.
 is sound proof, comm, while drop-in is like a com hub

- wellness revamp this year: green walls, new carpet,
 some furniture removed and put in. No structural

in 10 yrs probably

- ↳ massage chair taken out (bc noise, conid)
- ↳ added arts and crafts, beanbag chair
- no food in room bc allergy
 - priority? decor and structural changes both
 - ↳ soundproof, lighting perceived to be "more" our job than decor
 - less accessibility concerns; do concern door knob not works for mobility, etc.
 - technology: open to as much as ppl can put in
 - ↳ own opinions matter bc we are the demographic
 - ↳ projector ok, no tv
 - modify registration is not in scope, but allowed, just not priority
 - publicity: at the elevator maybe
 - drop in and bookable may be combinable for program purposes (if it's possible with some proof no due), separate though in general
 - ↳ programs ~1 a week
 - space too small for events but they want to
 - ↳ religion sharing circles
 - ↳ workshops to come with roommates
 - ↳ sharing circles / conflict res
 - ↳ not physical ^{activity} space
 - ↳ if we do prayer room consider which may interests are facing
 - more intimate and themed than lobby events
 - ↳ "personal development" events
 - max 12 ppl in full room; ^{+2 dogs?} MAX 2 ppl
 - animals? if we can incorporate, yes
 - ↳ note elevator-accessible thresholds, maybe not dogs
yes cats

Figure 23. Screenshots of client email meeting notes in a member's engineering notebook

Appendix D: List of objects

Table 12 shows the movable objects with detailed features in the current wellness room and the study room.

Table 12. List of Objects

Room	Name (×count)	Dimension [Width×Length×Height cm] & other properties	Photo (if applicable)
Wellness Room	Rectangular Table	78×118×45 White	
	Circular Table	Diameter=45, Height=52 White	
	Book Shelf	38×47×78 White, some books, drawings, markers inside	
	Sofa (×2)	75×72×72 Dark blue, one back cushion on each	
	Bean Bag	Diameter≈135 Grey	

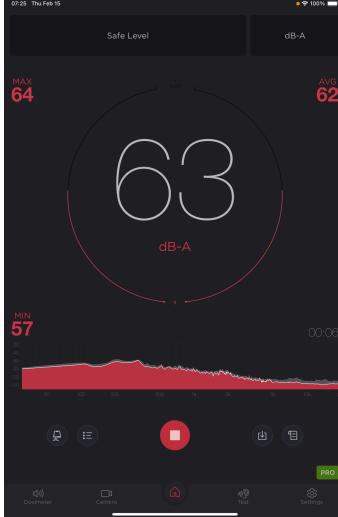
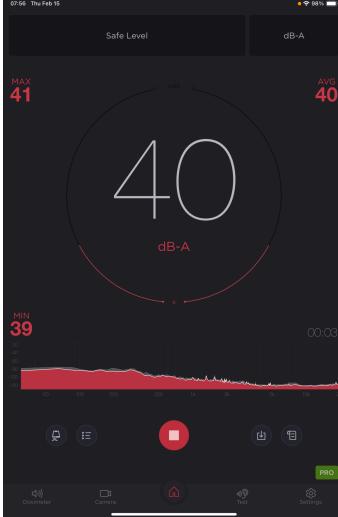
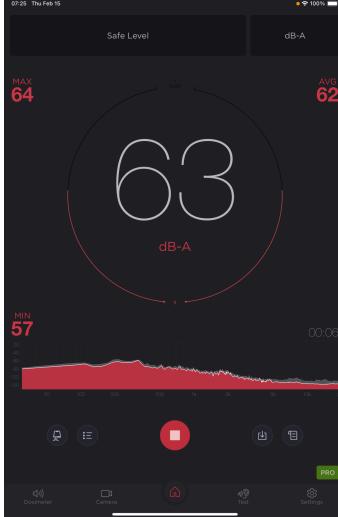
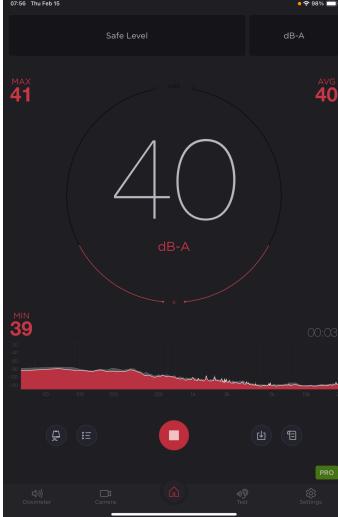
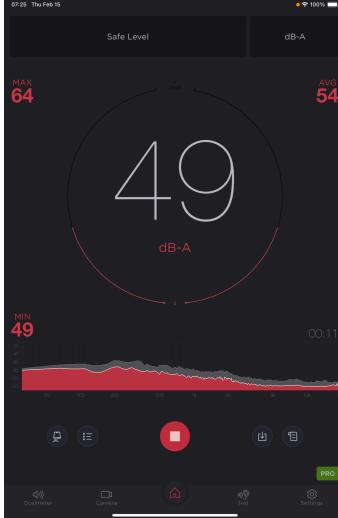
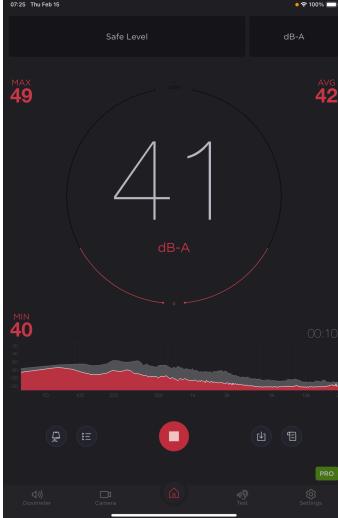
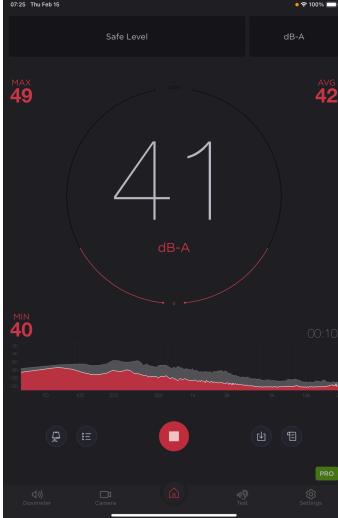
	Plants	Diameter≈40, Height=98	
Study Room	Chair (×6)	43×53×80	
	Square Table (×2)	90×90×77	

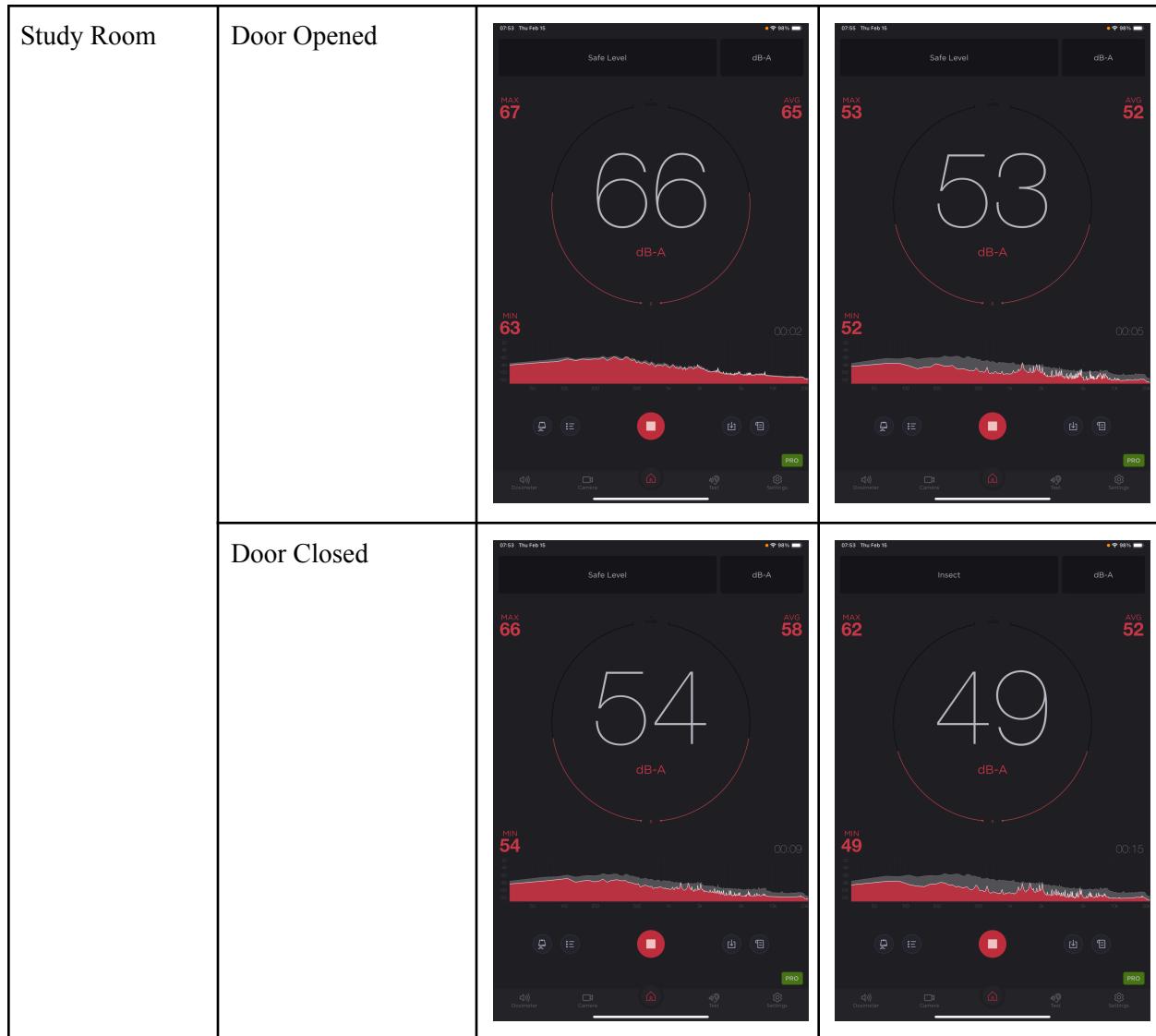
Appendix E: Noise Level in the Wellness Room and the Study Room

We used a loud-speaker to play white noise outside the rooms and measured the noise level (device: iPad mini 6, software: dB Meter) for four conditions listed below. To control the variable, no one was there because it was 7 am, and the device was fixed in place, with a fixed distance from the source of sound.

The measurement in Table 13 shows that the noise reduction ability of the walls of the rooms is 12 - 14 dB.

Table 13. Existing Sound Reduction System

		White Noise	Not Playing
Wellness Room	Door Opened	 	 
	Door Closed	 	 



Appendix F: Light Intensity in the Rooms

Table 14 shows the detailed lighting condition measured in lux for each room. (Measuring device: iPad Mini 6, Software: Light Meter)

Table 14. Lighting Conditions in the Rooms

	Minimum (lux)	Average (lux)	Maximum (lux)
Wellness Room - Lights on	153	287	327
Wellness Room - Lights off	164	271	333
Study Room - Lights on	210	264	318
Study Room - Lights off	180	241	346

Screenshots from the app and pictures of the environment are shown in Table 15.

Table 15. Evidence of the lighting

	Wellness - Lights on	Wellness - Lights off	Study - Lights on	Study - Lights off
Lighting condition				
Picture of the condition				

Appendix G: Escalator and Stairs to the 28th floor

Figure 24 shows the escalator and stairs connecting the 27th floor and the 28th floor.



Figure 24. Escalators and stairs to the 28th floor

Appendix H: WiFi Speed and Signal Strength in the Rooms

Figure 25 exhibits the results of the WiFi speed tested using “SpeedTest by Ookla” in the study room.

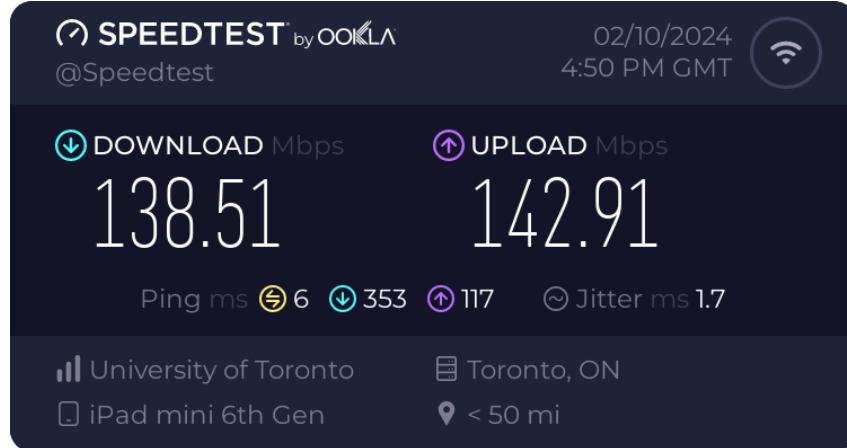


Figure 25. Wifi Speed in the Study Room [32]

Figure 26 shows the WiFi signal strength in the rooms. The signal strength for the 2.4 GHz band and 5 GHz band are -52dBm and -60dBm, respectively. (Measuring device: Xiaomi 10, software: WiFiAnalyzer, measured on Feb 15, 2024).

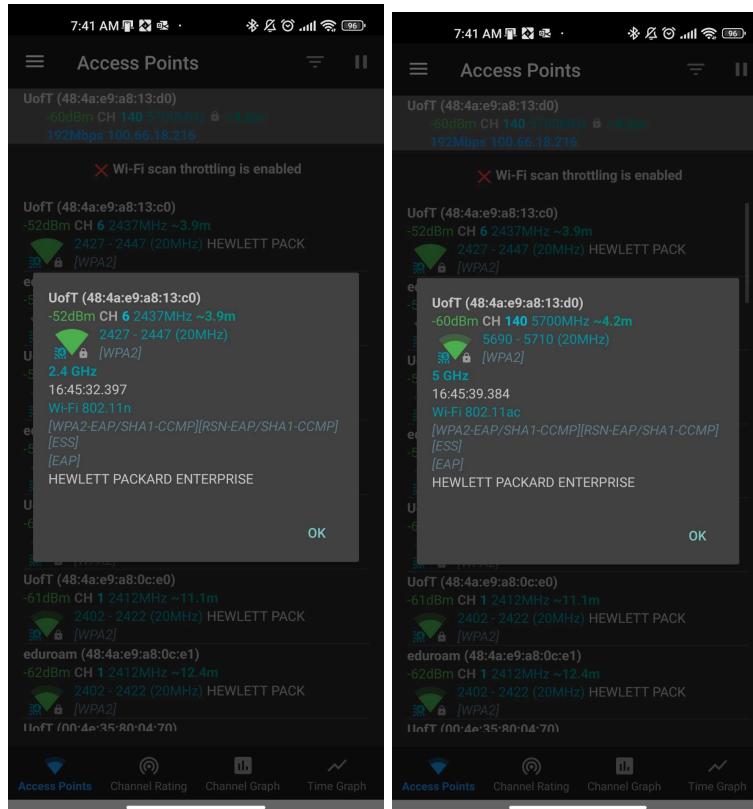


Figure 26. Screenshot of the WiFi signal strength

Appendix I: Black Box method

After studying the inputs and outputs of our design using the black box method, shown in Figure 27, we have been able to derive primary and secondary functions.



Figure 27. Black Box Method

The design should efficiently handle the intake and release of mass, including storage. It must regulate energy usage (light, sound) and provide guidance on wellness resources and room utilization.

Appendix J: Prioritizing Objectives using Pairwise Comparison

The objectives listed in our objective table were prioritized from top to bottom, determined through the pairwise comparison method by ultimately identifying the most significant factors that should be considered when generating solutions. The pairwise comparison is shown in Table 16.

Table 16. Pairwise Comparison Method for Objectives

—	Mentally stimulating in its ambience	Conducive to wellness and relaxation	Comfortable for users	Community-oriented	Easily alterable	Distractio n-free	Score
Mentally stimulating in its ambience	—	1	1	1	1	1	5
Conducive to wellness and relaxation	0	—	1	1	1	1	4
Physically Comfortable for users	0	0	—	1	1	0	2
Community-oriented	0	0	0	—	1	0	1
Easily alterable	0	0	0	0	—	0	0
Distractio n-free	0	0	1	1	1	—	3

Appendix K: Overview of Natural Lighting Patterns

To mimic lighting in the morning, utilize bright, blue-enriched lighting and switch to warmer, dimmer lighting in the evening [17]. Additionally, natural environments often involve variations of light transmittance along the vertical gradient, whereby the light intensity gradually increases as the altitude increases. This is expected due to tree and plant coverage that effectively block out sunlight such as a forest canopy in a forest. Also, clouds or rain are factors to consider that influence light intensity as altitude increases.

Appendix L: Research regarding amount of wellness resources required

The team defines a wellness resource as any object or item in the wellness room that aims to improve the well-being of students. The wellbeing can be from any of the eight following wellness “dimensions”, which the group’s further research has found.

- Emotional - Regarding one’s ability to manage their feelings and emotions
- Financial - Aspects of well-being related to management and knowledge of personal finance
- Physical - Physical Aspects of the body
- Occupational - Satisfaction of one’s future career or job
- Environmental - Encompasses both one’s regard for the environment and the environment’s effect on their physical and mental health
- Intellectual - Mental activities that are thought-provoking and contributes to the development of the brain
- Spiritual - Regardless of belief in deities, the aspects of searching for life’s purpose and meaning
- Social - Regarding social interactions and personal relationship [23]

In Client Meeting #2, Lucy Chandler stated a suitable amount of wellness resources present in the wellness room is at least 10 wellness resources (Appendix M).

Of these dimensions, the wellness room can provide at least verbal or intangible (e.g. brochure providing them information) support for all of them. If one is to enter the wellness room, they are likely to seek one kind of support from these categories. There is no set industry standard, but students should be able to access at least one resource from each one of these categories.

10 resources can be a goal that the wellness room aims to achieve.

Appendix M: Client Meeting #2 Notes

Parts of the Conceptual Design Specifications document cites the second client meeting. Proof towards the validity of the client meeting notes is shown in Figure 28 and 29 by images of team member Aileen's engineering notebook.

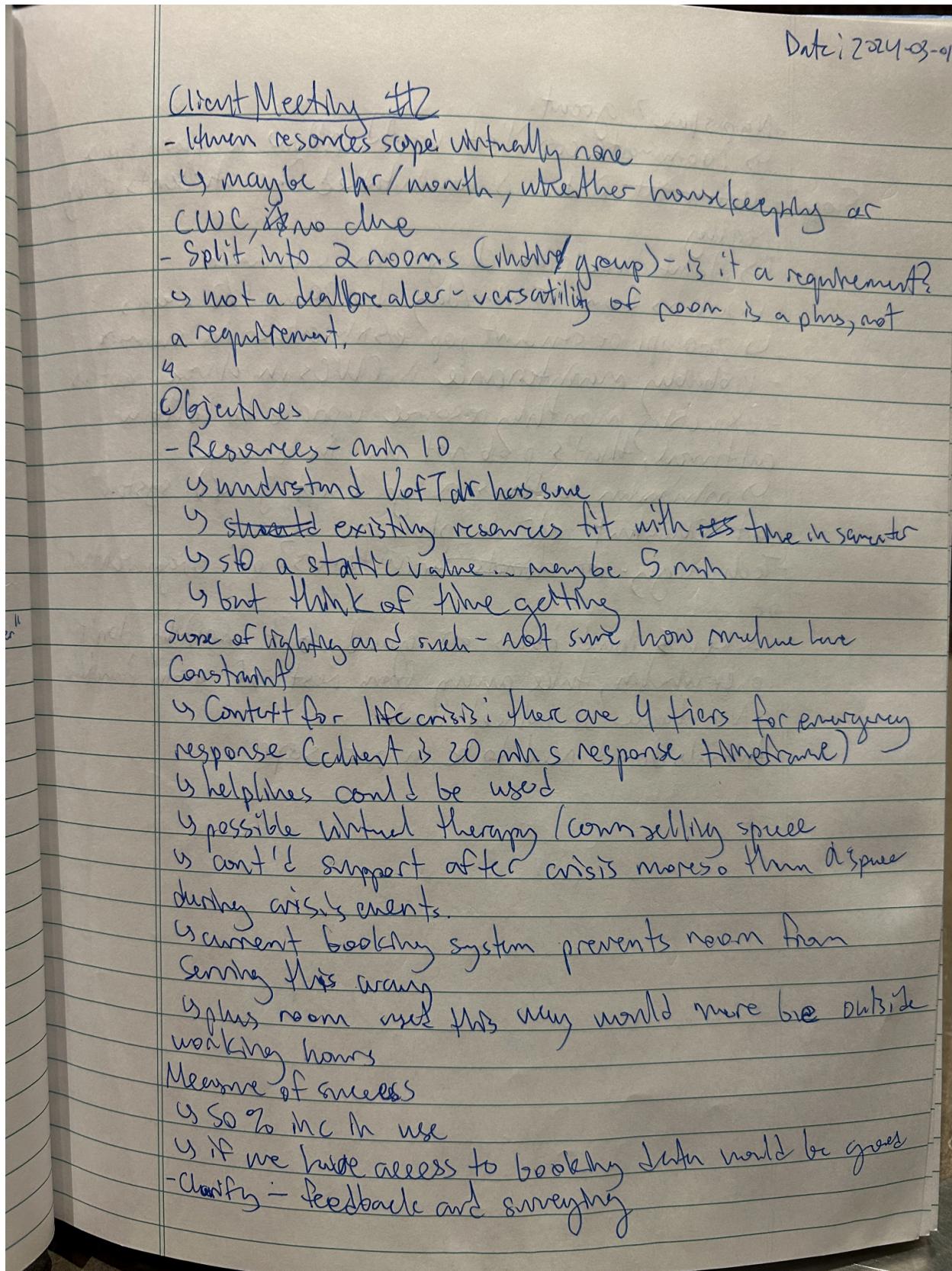


Figure 28. Client Meeting 2 Engineering notebook

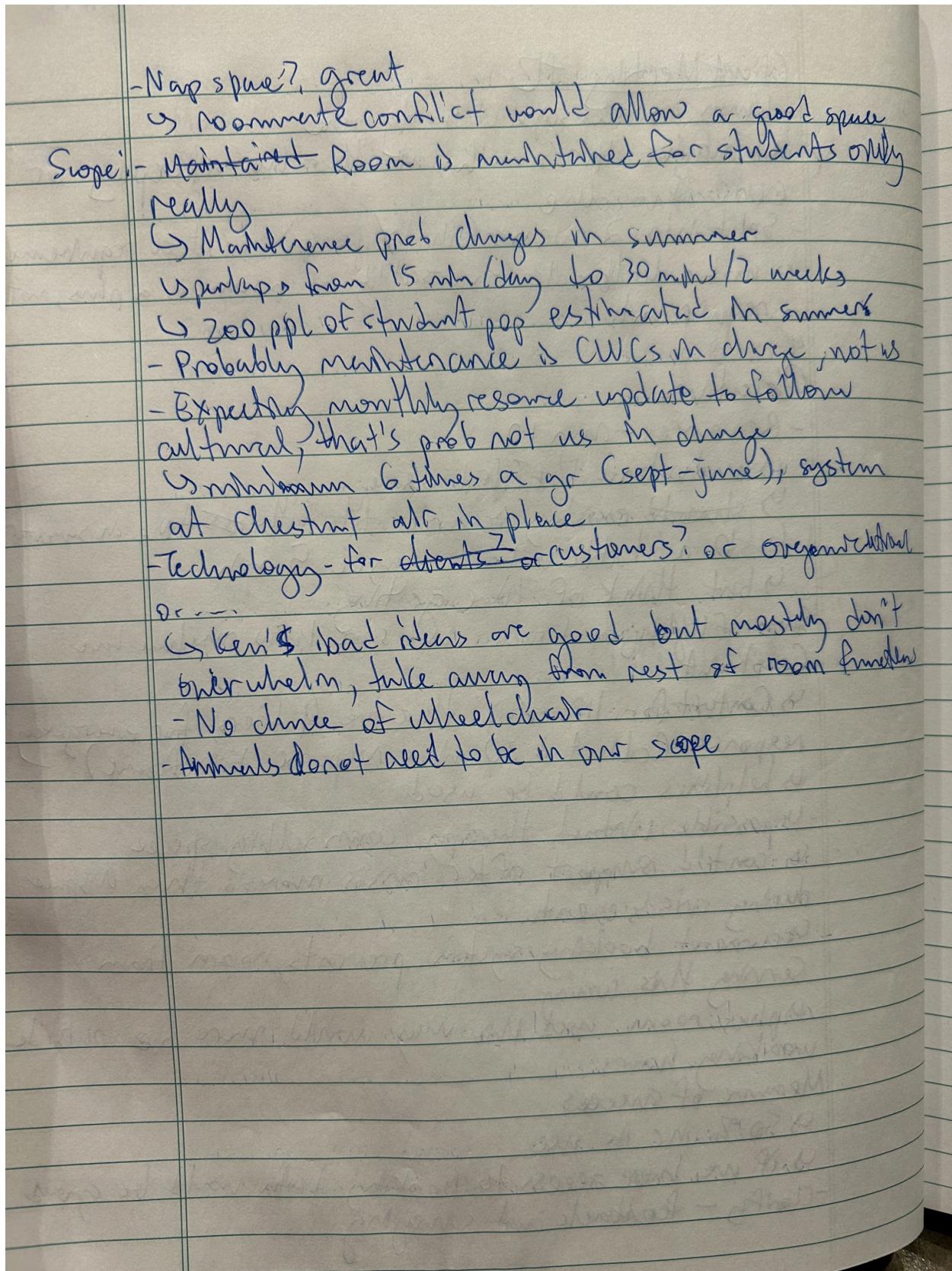


Figure 29. Client Meeting 2 Engineering notebook

Appendix N: Ontario Building Code

The sections of the Ontario Building Code cited are shown in Table 17.

Table 17. Ontario Building Code

Section of Ontario Building Code	Excerpt	Rationale for Constraint
9.5.11(1)	<p>Table 9.5.11.1.</p> <p>Minimum door Sizes</p> <p>Forming Part of Sentence 9.5.11.1.(1)</p> <p>5. Rooms located off hallways that are permitted to be 710 mm wide</p> <p>Minimum Width, mm: 610 Minimum Height, mm: 1980</p>	Places constraint on any kind of door or entrances that can be implemented in the wellness room.
9.20.6	<p>“1) The thickness of loadbearing interior walls shall be determined on the basis of the maximum lateral support spacing as provided in Sentences 9.20.10.1.(2) and (3).</p> <p>(2) The thickness of interior non-loadbearing walls shall be,</p> <p>(a) determined on the basis of the maximum lateral support spacing as provided in Sentences 9.20.10.1.(2) and (3), and</p> <p>(b) in any case, not less than 65 mm.”</p>	<p>Merging the wellness room and study room into a single room or implementing paths to enter leave between them is very possible.</p> <p>Thus, any modifications to the interior wall between the two rooms must conform to this constraint.</p>
9.7.2.3	<p>Except as required in Article 9.9.10.1. and Sentence (3), the minimum window glass area for rooms in buildings of residential occupancy or rooms that are used for sleeping shall conform to Table 9.7.2.3.</p> <p>Table 9.7.2.3. glass Areas for Rooms of residential Occupancy</p> <p>Forming Part of Sentence 9.7.2.3.(1)</p> <p>4. Living rooms and dining rooms: 10% of</p>	Windows are likely subject to modifications due to the need for feasible lighting. The window between the wellness room and study room should also be subject to removal as it's the lack of privacy is a functional gap.

	area served	
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Appendix O: Idea Generation, Creativity Method #1, Free Brainstorming/Research

The following section describes free brainstorming, one of four idea generation methods used during the idea generation process outlined in 6.1. Each member is free to record any idea they wish as long as it meets the function that the idea correspondingly satisfies (more about meeting functions in Appendix P). These ideas can be any that team members have in mind or have found using research, and were used to generate ideas already existing in the industry.

Allow Entrance and Exit	Separate Room: Install a door (typical with doorknob) between the study space and wellness room that can only be accessed through a Wellness Coordinator's Key	Brainstorming
-------------------------	---	---------------

Figure 30. An example of an idea generated by brainstorming. This idea involved no research and hence did not need justifications

Control Light and Sound	Incorporate speakers that provide natural soundscapes such as flowing water, rustling leaves, and birdsongs	Brainstorming, Research: https://www.pnas.org/doi/10.1073/pnas.2013097118
-------------------------	---	---

Figure 31. An example of research being conducted to arrive at an idea using free brainstorming. This idea utilized a research paper from the University of Michigan to arrive at the types of natural sounds that can induce wellness

Appendix P: Idea Generation, Creativity Method #2, ChatGPT

The following section describes ChatGPT, the second of four idea generation methods used during the idea generation process. For ChatGPT, team members fed at least three different, consecutive prompts to an online chat bot for solutions to improving a wellness room. Members are free to record or reject any ideas returned by the bot.



You

I am currently trying to re-design a wellness room that is underutilized. Specifically, its lighting is dim and does not have any features that pertain to wellness. Can you give some specific suggestions on how to improve the lighting?



ChatGPT

Certainly! Improving the lighting in a wellness room can significantly enhance its ambiance and functionality. Here are some specific suggestions to consider:

1. **Natural Light Integration:** If possible, maximize natural light by adding larger windows, skylights, or light tubes. Natural light has numerous benefits for wellness, including boosting mood and increasing productivity.
2. **Full-Spectrum Lighting:** Install full-spectrum lighting fixtures that mimic natural sunlight. These lights provide a balanced spectrum of color that can positively impact mood and energy levels.
3. **Dimmable Lights:** Incorporate dimmable lighting options to allow users to adjust the brightness according to their preferences and activities. Dimming the lights can create a calming atmosphere for relaxation or meditation sessions.
4. **Task Lighting:** Include task lighting such as adjustable desk lamps or reading lights in areas where specific activities like reading, journaling, or crafts may take place. Task lighting helps reduce eye strain and provides focused illumination.
5. **Color Temperature Control:** Opt for lighting fixtures with adjustable color temperatures. Cooler temperatures (5000-6500K) are energizing and promote concentration, while warmer temperatures (2700-3000K) create a cozy and relaxing ambiance.

Figure 32. A sample prompt seeking for solutions to solve problems regarding the wellness room's lighting



You

Well in addition to problems with the lighting, my wellness is lacking features that insulate sound for it do be a place for reflection and relaxation. Are there any solutions out there that solves this problem?



ChatGPT

Absolutely! Sound insulation is essential for creating a serene and tranquil environment conducive to relaxation and reflection in a wellness room. Here are some solutions to consider for improving sound insulation:

1. **Acoustic Panels:** Install acoustic panels on walls and ceilings to absorb and reduce sound reflections within the room. These panels come in various shapes, sizes, and materials, including fabric-covered foam, wood, or recycled materials, allowing for customization to match the room's aesthetics.
2. **Soundproof Curtains:** Hang heavy, sound-absorbing curtains over windows and doors to block outside noise and minimize sound transmission. Look for curtains made with dense materials like velvet or wool, or consider adding a soundproofing liner to existing curtains for enhanced insulation.
3. **Wall Coverings:** Use sound-absorbing wall coverings, such as cork or fabric wall panels, to dampen sound reverberations and improve acoustics. These coverings not only provide insulation but also add texture and visual interest to the room.
4. **Rugs and Carpets:** Place thick rugs or carpets on the floor to reduce footstep noise and absorb sound vibrations. Opt for rugs with dense pile or padding underneath for better sound insulation.
5. **Sealing Gaps and Cracks:** Seal any gaps and cracks in walls, windows, doors, and floors to prevent sound leaks and enhance overall soundproofing. Use weather stripping, caulking, or door sweeps.

Figure 33. A sample prompt seeking for solutions to improve the ways at which the sound insulation could be improved



You

Do you have any ideas pertaining specifically addressing seasonal affective disorder? How about light that can mimick nature?



ChatGPT

Certainly! Addressing Seasonal Affective Disorder (SAD) often involves incorporating lighting solutions that mimic natural daylight. Here are some specific ideas tailored to addressing SAD with nature-mimicking lighting:

1. **Natural Light Emulation Bulbs:** Invest in LED bulbs designed to replicate the spectrum of natural sunlight. These bulbs emit a full spectrum of light, including blue wavelengths, which can help regulate circadian rhythms and improve mood. Look for bulbs labeled as "daylight" or "natural light" with a color temperature of around 5000-6500 Kelvin.
2. **Sunrise Alarm Clocks:** Consider using sunrise alarm clocks or dawn simulators in the wellness room. These devices gradually increase light intensity over a set period, simulating a natural sunrise and helping to regulate sleep-wake cycles. Waking up to gradually increasing light can be especially beneficial for individuals with SAD.
3. **Light Therapy Boxes:** Light therapy boxes emit bright, full-spectrum light that mimics natural sunlight. Users typically sit in front of the box for a set period each day, which can help alleviate symptoms of SAD by providing exposure to intense light similar to outdoor sunlight. Look for light boxes with a minimum of 10,000 lux intensity and filters to block harmful UV rays.
4. **Dynamic Lighting Systems:** Install dynamic lighting systems that can adjust color temperature and brightness throughout the day to mimic the natural changes in sunlight. These systems can be programmed to provide cooler, energizing light in the morning and warmer, relaxing light in the evening, helping to regulate circadian rhythms and improve mood.

Figure 34. Continuing from Figure O2, a more elaborate prompt is fed to the chat bot to generate more specific and potentially more innovative ideas

Appendix Q: Idea Generation, Creativity Method #3, Lateral Thinking

The following section describes Lateral Thinking, the third of four idea generation methods used during the idea generation process. Here, team members are to take one idea from the existing pool, and question why that idea is currently commonly used. If possible, the idea is replaced with another component, or certain parts of the idea will be dropped to form a new idea. This is to deviate away from common industrial solutions for wellness rooms.

A slide that enables the user to enter and exit the room	Lateral thinking
Entering and leaving the room after crossing an obstacle	Lateral thinking

Figure 35. Instead of the door that the wellness room currently uses, this team member challenged them to be dropped and have unconventional means to serve the functionality of allowing entrance and exit

Implementing a window that can amplify the natural light passing through from outside	Brainstorming
Block all the external light and sound, then generate artificial ones in a controlled manner	Lateral thinking

Warrick Tsui 8:47 PM Today

Lateral Thinking Challenge: Instead of allowing natural light, is it possible to replicate the same thing without utilizing the windows?

Figure 36. The idea “Allow Natural Sunlight” being challenged using lateral thinking. Instead of external light, this team member instead proposed using all artificial light

Appendix R: Idea Generation, Creativity Method #4, Biomimicry

The following section describes Biomimicry, the last of four idea generation methods used during the idea generation process. Here, team members are to ask the question, “how does nature solve the problem present in the Wellness Room?”. They then brainstorm ideas inspired from ways that living things solve similar problems, or things found in nature that resemble an existing solution.

<p>Provide pods or personal spaces in the room similar to cocoons that can be used for meditation, napping, and relaxation</p>	<p>Biomimicry: Modelling after Caterpillar Cocoons</p>
--	--

Figure 37. An idea inspired by caterpillar cocoons, attempting to address the lack of features being conducive to wellness in the current wellness room

<p>Filtering light from the window modeled after a forest canopy</p>	<p>Biomimicry: Nature's way to both providing and blocking sunlight</p>
--	---

Figure 38. An idea inspired by forest canopies, attempting to address the lack of sufficient lighting in the wellness room

Appendix S: Idea Generation, Members recording their ideas

The idea generation process started with members individually generating ideas for components of the wellness room. This document was completed in two nights in each member's free time on a shared Google Doc (full document available here: [Idea Generation](#)). Each member was required to generate at least 10 ideas using the creativity method of their choice (covered from Appendix O-Q)

Idea	Method Used
Idea	Method Used

Figure 39. The primary and secondary functions of the project are first listed

Idea	Method Used
Separate Room: Install a door (typical with doorknob) between the study space and wellness room that can only be accessed through a Wellness Coordinator's Key	Brainstorming
Monodirectional Window: Install tinted windows in the common use room, where occupants can view the corridor and the rest of the study space on the 28th floor, but others can't look in.	Brainstorming
AI Door Locking: a smart entrance system that allows residents to enter and exit the wellness room seamlessly using facial recognition, voice commands, or a mobile app	Chat gpt
Automatic door (accessibility)	Brainstorming

Figure 40. Sample section from the Idea Generation document, showing several ideas generated regarding the physical enclosure of the room

Retrieve Information on Sources	Have a corner with iPads/Tablets installed (fixed), where the only features accessible are wellness resources	Brainstorming
	Shelf of books (self help and fiction)	Brainstorming
	Provide print outs like the "worry jar" activity	Research
	Provide a researched guide with instructions to breathing exercises	Brainstorming
	Provide a projector that plays live streams of animals in nature	Brainstorming
	Have a phone available at all times that can reach all 4 tiers of Wellness Coordinators through text messages and voice calls	Random Stimulation
	Implement a device that has access to internet	Lateral thinking

Figure 41. Sample section from the Idea Generation document. Showing several ideas generated regarding the way wellness information is conveyed

Appendix T: Idea Generation, Morphological Chart

Ideas are transferred into a morphological chart by their function on a spreadsheet (full document here: [+ Morph Chart](#)).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	X
	Means	Means	Means	Means	Means	Means	Means	Means	Means	Means	Means	Means	Means	Means	Means	Means	
2	Separate Room: Install a door (typical with doorknob) between the study space and wellness room that can only be accessed through a Wellness Coordinator's Key	Monodirectional Window: Install tinted windows in the common use room, where occupants can view the corridor and the rest of the study space on the 25th floor, but others can't look in.	ALDoor Locking: a smart entrance system that allows residents to enter and exit the wellness room seamlessly using facial recognition, voice commands, or a mobile app	Automatic door (accessibility)	The part of the room soundproof and for event space is separated from the communal space by a wall that can slide to increase the capacity of the event space	Half of the allocated space is a soundproof room, the other half is an open lounge without walls or reservation need	The room has a lot of space for people to move furniture around (like bean bags and beanbag chairs)	No entry allowed between rooms, except curtains or blinds that can be opened to view the other room.	Open space that can be accessed by everyone . Participants will have headphones so that their conversation can remain private . A curtain may be placed for physical privacy	A slide that enables the user to enter and exit the room	Entering and leaving the room after crossing an obstacle	Hollow tree trunk entrance shape with a wooden panel as a door covering	A revolving door that limits air flow and facilitates traffic into and out of the room				
	Allow Entrance and Exit into the Wellness Room																
3	Provide adjustable human (something) lighting that can only be controlled by Wellness Coordinators. Lighting can be adjusted based on "season"	Have the ability to control and reduce external sound levels (without using technology), for example, Wellness Coordinators can adjust sound waves on walls	Numerous lamps and small lights along the ceiling, instead of one big ceiling light	Jukebox that plays a selection of relaxing calm music	Lights that can change lighting to one color or one of many predetermined palettes based on user's choice, since there are many color studies on which colors are more relaxing	Provide noise-cancelling headphones	Provide headphones connected to youtube/spotify or to a catalogue of copyright-free music in provided playlists, and also podcasts, nature sounds, and natural sleep sounds like rain or birdsong	Control light and sound using an at that analyzes your mood and adjusts these setting so that you feel well	Placing a device on the user like sunglasses and headphones connected to a software that will manage light and sound reception	Provide curtains which blocks 99% sun lights, offering people to sleep or meditation	Make the whole ceiling screen, showing different video sources while providing light	Block all the external light and sound, then generate artificial ones in a controlled manner	Filtrating light from the window, modeled after a forest canopy	Indoor fountain waterfalls for natural sound and humidity control	Incorporate speakers that provide natural soundscapes such as flowing water, rustling leaves, and birdsongs		
	...																

Figure 42. The layout of the morphological chart, where ideas are organized the same way as the idea generation document. The “cell” number that each idea occupied allowed full solution generation to be more convenient

Appendix U: Idea Generation, Full Solution Generation

After completing the morphological chart, each member formed at least 12 complete full solutions by choosing one or more idea components for each function (from the morphological chart), then combining them. These full solutions are again, recorded onto a Google Doc (full document here:

[Idea Generation - Full Solutions](#)), which allows for team members to draw inspirations from another during the process.

Before recording each solution, each team member must provide a general theme or justification of their solution. This is to prevent the possibility of solutions that consist of “randomly” selecting elements from the morphological chart.

In addition, the Combination Code column contains a list of all the idea components that each solution features, using their location in the morphological chart spreadsheet, ordered alphabetically. Solutions with the same combination code could be easily identified to be duplicates.

Solutions eliminated before the voting phase is reached due to duplicates or feasibility are highlighted red, moved to the end of the tables, and the reasonings are provided under the Voting Results column.

Ethan's Solutions:

Combination Code	Justification / Associated Theme	Solution
N2, N3, P3, D4, C5, K6, D7, K7	Users feel more immersed in a natural environment rather than a technological one The purpose is to provide an ‘escape’ from technology and humanity into nature	<ul style="list-style-type: none"> • Hollow tree trunk entrance shape with a wooden panel as a door covering • Filtering light from the window modeled after a forest canopy • Incorporate speakers that provide natural soundscapes such as flowing water, rustling leaves, and birdsongs • Provide print outs like the “worry jar” activity • Have different cabinets storing non-digital wellness resources (i.e. books) that can be accessed by anyone • Provide a projector that plays live streams of animals in nature • Provide a hammock to lie in • Provide pods or personal spaces in the room similar to cocoons that can be used for meditation, napping, and relaxation

Figure 43. Sample full solution from team member Ethan. The theme of this solution was to make the user feel as if they were in a natural setting

Ken's Solutions:

Combination Code	Justification / Associated Theme	Solution	
B2 B3 D3 F4 G4 D5 B6 E6 G7 B8 D8 E8	<p>Community Oriented</p> <p>When no events, serves as two separate wellness rooms; when holding events, serves as a big wellness room</p> <p>Since facing community, the facilities should be stout</p> <p>Event holder can also store information on the website (D5)</p>	<ul style="list-style-type: none"> Separate Room: Install a door (typical with doorknob) between the study space and wellness room that can only be accessed through a Wellness Coordinator's Key Provide adjustable human centric lighting that can only be controlled by Wellness Coordinators. Lighting can be adjusted based on "season" Numerous lamps and small lights around room, instead of one big ceiling light Implement a device that has access to internet Vocal assistant that can add events that are dictated by the wellness coordinator Create a website or printed resource that consolidates or easily provides the various mental health resources that UofT offers 	

Figure 44. Sample full solution from team member Ken. The theme of this solution was to be suitable to host community events in addition to upholding the basic functions of a wellness room

Appendix V: Idea Selection, Multi-Voting Process

Figure 45 illustrates the multi-voting process the team employed. The goal was to reach, through several rounds of voting, a final count of 10 solutions. In each round, a number of votes equal to 15-25% of the total solutions was given to each member, and they voted on the document shown in Appendix U by highlighting a word in a column in the solution's row with a chosen colour undisclosed to other team members. The tally of the number of solutions with each number of votes is shown in the table to the right. The blue box highlights where all the accepted solutions come from.

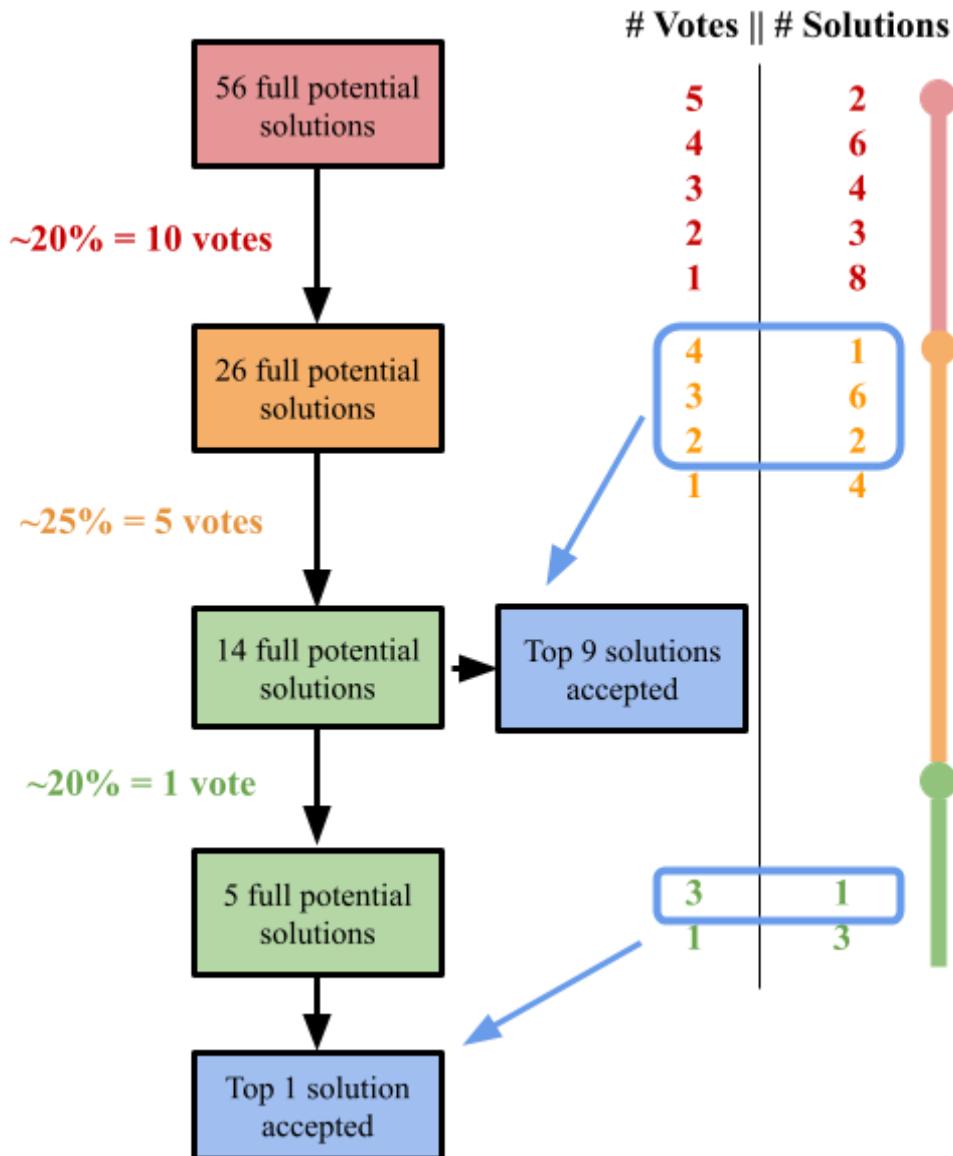


Figure 45. The multi-voting process illustrated

In the same format as the document in Appendix U, the top ten solutions were then collected into a document, and the top three were later highlighted green. A sample is shown below (full document available here: [Idea Generation - 10 Solutions](#))

Combination Code	Justification / Associated Theme	Solution
N2, N3, P3, D4, C5, K6, D7, K7	<p>Users feel more immersed in a natural environment rather than a technological one</p> <p>The purpose is to provide an 'escape' from technology and humanity into nature</p>	<ul style="list-style-type: none"> • Hollow tree trunk entrance shape with a wooden panel as a door covering • Filtering light from the window modeled after a forest canopy • Incorporate speakers that provide natural soundscapes such as flowing water, rustling leaves, and birdsongs • Provide print outs like the "worry jar" activity • Have different cabinets storing non-digital wellness resources (i.e. books) that can be accessed by anyone • Provide a projector that plays live streams of animals in nature • Provide a hammock to lie in • Provide pods or personal spaces in the room similar to cocoons that can be used for meditation, napping, and relaxation
B2, G2, D3, E3, E4, E5, G5, E6, G7	<p>Users are encouraged to socialize and interact with other individuals and professionals</p> <p>The purpose is to allow users to</p>	<ul style="list-style-type: none"> • Separate Room: Install a door (typical with doorknob) between the study space and wellness room that can only be accessed through a Wellness Coordinator's Key • The part of the room soundproof and for event space is separated from the communal space by a wall that can slide to increase the capacity of the event space • Numerous lamps and small lights around room, instead of one big ceiling light • bookshelves that play selected relaxing music

Figure 46. A snapshot of the consolidated document with the top ten solutions

Appendix W: Idea Selection, Graphical Decision Chart

The top ten solutions were ranked using a graphical decision chart. Each solution is assigned by team discussion a coordinate, which is a set of scores of 0-4 representing how well the solution fulfills the objective, as shown in Figure 47.

Design #	Conducive to wellness and relaxation	Mentally Stimulating	Distraction-free RMS	Criteria
1	2.5	3	3 4.924	
2	2	1.5	2 3.202	
3	3	1	4 5.099	
4	3.5	4	1 5.408	←
5	4	1.5	1 4.387	
6	2	3	2 4.123	
7	3	2	4 3.3852	
8	4	3.5	3 6.103	←
9	2	2	2 3.464	
10	3.5	2.5	4 5.874	←

Figure 47. Whiteboard showing the resulting coordinates of every datum from a team discussion

Figure 48 shows other angles of the graph, and the full graph with the numbered coordinates can be found at <https://www.desmos.com/3d/d8c150cab7> [33].

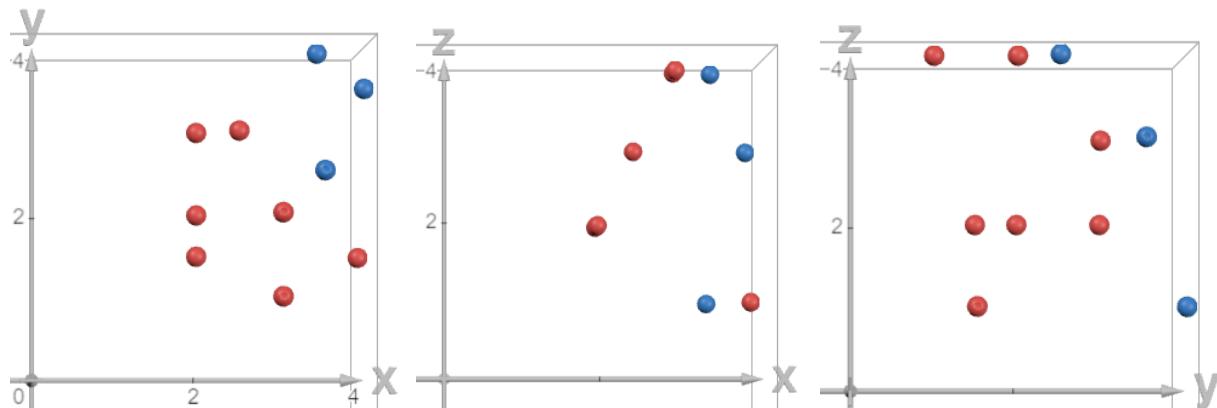


Figure 48. Other angles of the three-dimensional Graphical Decision Chart

Appendix X: Leisure Activities Offered by Designs

The following tables outline the leisure activities provided by Design 1 and Design 3. They are wellness resources in addition to the object already placed strategically around the room.

Table 18. Types of Wellness Resources Available for Design 1 (*Easylife Wellness*) on the Rotating Shelf And Book Display Shelf. This design focuses more on interactive wellness resources.

Solitary Games	Social Board Games
<ul style="list-style-type: none"> ● Kinetic Sand ● Stress balls ● Fidget spinners ● Puzzles ● Colouring books and crayons ● Word searches ● Magazines ● Fiction books ● Newspapers 	<ul style="list-style-type: none"> ● Playing cards ● Board games ● Chess

Table 19. Types of Wellness Resources Available for Design 3 (*DuoFusion Chambers*) on the Rotating Shelf And Book Display Shelf, which focus on meditation and students' individual reflection.

Leisure Activities
<ul style="list-style-type: none"> ● E-readers providing audio books ● Brochures providing QR codes and links to wellness websites ● Motivational Wellness Books ● Books teaching meditation

Appendix Y: The Pugh Method Chart Image and Justification

The Pugh Method Chart was performed on a whiteboard during a team meeting.

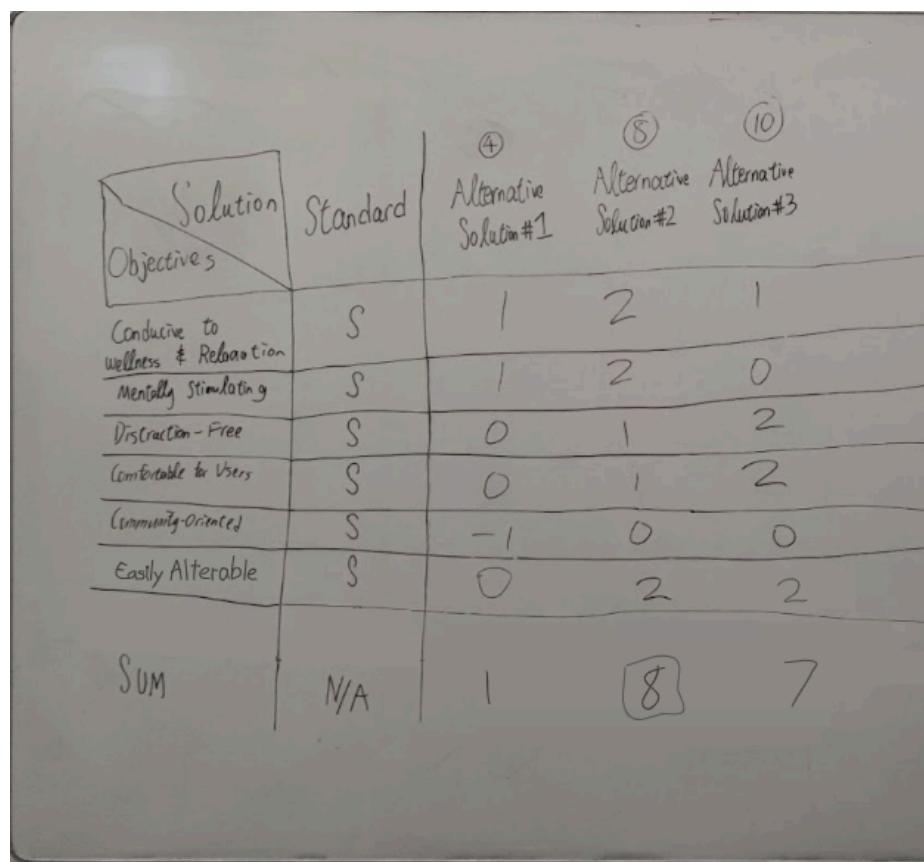


Figure 49. Image of Pugh Method Chart being performed

Table 20 outlines the team's justifications for each score on the chart.

Table 20. Pugh Chart Justification

Objective	Alternative Solution #1	Alternative Solution #2	Alternative Solution #3
Conducive to Wellness	Smart LED Lighting	Usage of actual plants	Incorporates Stone

& Relaxation	can help mimic natural lighting and colors	and biophilic items provide tranquility	tables and wooden shelves
Mentally Stimulating	More additional wellness resources, particular for physical wellness.	Provides wellness resources for various senses.	In terms of actual wellness resources, not many is added from the current wellness room
Distraction-free	An interactive approach to wellness will mean not every student will feel “distraction-free”.	Students will feel distraction free when they’re inside the egg pod chairs with sound insulation.	Strong sound-proofing provided by the panels can keep the entire room quiet. The rooms also do not have many overly interactive activities.
Comfortable for Users	No additional standout furniture or feature that makes it stand out from the current wellness room.	Use of hammock and egg pod chairs	Multiple options of different chairs provide options for comfort
Community Oriented	More active and “playful” approach for wellness is unconventional	No particular aspect that makes it stand out as an event space.	No particular aspect that makes it stand out as an event space
Easy Alterable	Rotating shelf and jukebox are difficult to move. The rest of the furniture are relatively modular.	Uses all modular furniture	Uses all modular furniture

Appendix Z: Calculation for Additional Space

The following is calculating the area of the study room. This is the additional usable space that can be utilized by expanding the room and completing a merger between the study and wellness room.

$$\begin{aligned}\text{Additional Area} &= (\text{Length of Study Room}) \times (\text{Length of Width Room}) \\ &= (3.2\text{m}) \times (2.85\text{m}) \\ &= 9.12 \text{ m}^2\end{aligned}$$

Attribution Table

**Engineering Strategies and Practice
APS112**

Attribution Table

Tutorial #:	125	Team #:	121
Assignment:	Conceptual Design Specification	Date:	23/3/2024

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 must 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 offense.

Section	Student Names					
	Aileen	Akshaya	Ethan	Warrick	Yongkang	Youssef
Cover Page					WD	
Executive Summary	ET FP	MR ET FP	ET FP		WD MR	FP
1.0 Introduction	WD	ET				FP
2.0 Problem Statement	ET	WD ET MR	ET	ET		

Section	Student Names					
	Aileen	Akshaya	Ethan	Warrick	Yongkang	Youssef
3.0 Service Environment	MR ET					
4.0 Stakeholders	MR					
5.1 Functions						
5.2 Objectives			ET MR	ET		
5.3 Constraints				ET FP		
6.1 Idea Generation	BI ET	BI	BI	BI WD ET MR FP	BI	BI,FP
6.2 Alternative Design Selection	WD OR5	ET		ET MR		FP
6.3 Description of Alternative Design	ET	ET	BI ET MR OR2 RS5 RS6 RS7 RS8 RS9	BI	OR1	BI WD ET MR OR3 OR4 RS7 RS8 RS9 FP
7.0 Proposed Conceptual Design	ET	WD MR ET RS3 RS4	ET	MR ET RS RS FP	ET	
8.0 Measure of Success	ET		WD ET MR RS1 RS2		ET FP RS10	FP

Section	Student Names					
	Aileen	Akshaya	Ethan	Warrick	Yongkang	Youssef
9.0 Conclusion	WD FP	ET		MR FP		FP
10.0 Reference List					ET MR	ET MR
Appendices	WD MR		ET FP	WD ET MR FP	ET	WD ET
All						

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 BI – Brainstormed ideas	FP – Final Proofread of COMPLETE DOCUMENT verifying for flow and consistency and correct formats OR – Other (give details below)
---	---

If you put RS (research) please add a number identifier such as RS1, RS2, etc. Give the research question / topic:

No. of Research RS#	Research question/topic
RS1:	Natural Lighting Patterns
RS2:	Industry Methods For Design Evaluation
RS3:	Effectiveness of Sensory stimulation
RS4:	Concept of Nature being a timeless source of tranquility
RS5:	Biophilic Design Principles
RS6:	Varying Shelf/Bookshelf Types
RS7:	S.A.D. lights
RS8:	Soundproofing methods

RS9	Electrochromic glass
RS10:	Measuring the lighting condition in Blender
RS11:	
RS12:	

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

- OR1: Design & render the 3D model of the windows
- OR2: Adapted internet photos to enhance visual display of components
- OR3: Did the floorplans of the three alternative designs
- OR4: Did part of the objectives table
- OR5: Made the Graphical Decision Chart and added detail to documents linked in Appendix

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 offense 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 offense, then you are considered an equal party in the offense and will be subject to academic sanctions.

Student #1 Name Ethan Lam

Student #2 Name Youssef BAYOUDH

Student #3 Name Aileen Sun

Student #4 Name

Warrick Tsui

Student #5 Name

**Akshaya
Velmurugan**

Student #6 Name

**Yongkang
Cheng**
