


Article

Promoting Students' Mental Health through Design and Implementation of Multi-Activity Pods in Educational Institutions Using the WELL Building Standard

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Abstract: The findings of several research studies conducted with university students that aimed to investigate the quantitative relationship between psychological distress, sleep difficulties, and homesickness have shown a significant interrelation among those factors. All the previous studies demonstrated benefits of napping, meditation, relaxation, and sharing feelings and experiences on students' mental well-being, which could enrich the brain's educational capacity, a matter that is relevant to a student's learning level. This study aimed to encourage on-campus students to alleviate their feelings and relax. This process will help students to recharge their energy, in addition to increasing their alertness and focusing abilities, especially since the COVID-19 pandemic has intensified global stresses. In this study, the authors used a systematic review and literature analysis to understand the relationship between mental stresses and student performance. We then used an evidence-based research opinion poll and presented our work at different academic exhibitions for feedback as an approach for developing an experimental conceptual multi-activity unit that can be used across university campuses. The "Reviving Pod" was specifically designed for different activities: napping, meditation, and virtual communication. The designed approach utilizes state-of-the-art technologies (embedded sensors, smart ergonomic seats, contactless technologies, self-cleaning materials, IoT, virtual meetings platforms, mobile applications, etc.). A Reviving Pod can be located variably within a university campus. According to the poll results, we proposed a recreational zone design to accommodate the pods, as well as a diversity of activities that can encourage students to relieve their stresses and reinforce their health, consequently increasing their academic performance and supporting their well-being using the WELL Building Standard to promote better mental health, which is vital for students' success.

Keywords: napping pod; students' mental health; educational institutions; human-centered design; IoT; interior architecture; parametric design; WELL Building Standard; CAD/CAM; Rhino/Grasshopper



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1. Introduction

Over the last decade, many countries have paid great attention to university students' well-being and mental health [1]. Students in universities have always been subjected to a great deal of stress. Internal and external pressures from the world to succeed, financial issues, future concerns, social challenges, assignments, and exams in multiple subjects requiring planning and focus, often with conflicting priorities, are just a few of the stresses that a student can face [2]. It was confirmed that students are suffering from an increase in diverse mental health issues [3]. In recent decades, many papers have discussed the issue of university students' mental health and the importance of napping. Poor sleep is considered an obstacle to student success; therefore, institutions of higher education are focusing on healthy sleeping habits, which have become a top priority for colleges and universities. Organizations can receive several sleep interventions, such as cognitive-behavioral therapy

methods, mindfulness, meditation, sleep education, and environmental initiatives, among others [4]. Studies have also found that students who have access to green landscapes and regular physical activities reap considerable health benefits, lower stress levels, and more attentional focus than students who do not [5].

Finally, designing a Reviving Pod and the surrounding recreational zone could help university students to relieve their stresses and maintain their health and well-being.

1.1. Literature Review

Recent research has noted that academic stressors refer to any educational pressures (for example, environmental, social, or personal demands) that cause a student's behavior to change [6]. Studying and examinations, competitions, and learning a large amount of information in a short period can all result in varying degrees of stress [7].

For youth experiencing mental and emotional discomfort, college health services are frequently the initial point of contact. When stress leads to functional disability, it becomes a set of symptoms that must be addressed to avoid negative short- and long-term results and maintain one's academic level.

There are many chronic mental illnesses that manifest in one's teenage years, and, while college and university are times of enormous opportunity and sensitivity, college healthcare clinicians are charged with the mission of introducing mental healthcare to students who are hesitant to seek care from mental health professionals due to their attitudes toward mental illness. Consequently, establishing the ability to deliver compassionate, encouraging, and efficient mental healthcare is crucial for healthy, productive students [8].

Brooks and Lack, in 2006, discovered that napping for 10 min improved participants' attentiveness immediately after waking up and that the alertness lasted for 2.5 h [9]. Lovata and Lack, in 2006, suggested that napping can also help with short-term memory [10]. Karni, in 2008, discovered that having a nap in the afternoon boosts brain activity [11]. Milner, Fogel, and Cote, in 2006, showed that naps can improve alertness, mood, creativity, and productivity during the day [12].

According to Scott in 2008, sleep keeps people healthy, cognitively bright, and better equipped to cope with stress [13].

Napping, as stated by the National Sleep Foundation in 2009, can help people to relax and restore their energy [14]. Frederic, Benjamin, Reza, Maria, Bruno, Marion, and Valentin, in 2014, stated that short naps are a more productive way to improve mental and physical abilities compared to caffeine, which can disrupt sleep [15].

Short naps, relaxation, communication, and revealing stress have been proven to improve cognitive skills, enhance well-being, have a positive impact on mental health, and help boost academic performance for university students.

Students' distress and relaxation have been measured by many universities through assessments, scales, and surveys (such as University of Manchester and University of Bedfordshire in the UK and University of Sydney, University of Queensland, University of Western Sydney, and University of New South Wales in Australia). These studies acknowledged that stress, anxiety, and mental health are serious concerns that students face daily and also highlighted the need to provide napping facilities on their campuses to support students' mental health [16].

A large study conducted in the United States found that students with better grades are more likely to engage in physical exercise on a regular basis [17].

Seitz, Reese, Strack, Frantz, and West (2014) demonstrated that presence of green spaces around a campus was linked to lower rates of chronic absenteeism [18]. MacNaughton et al., in 2017, stated that a higher standard of indoor air quality reflects to better health [19], and Weeberb J. Requia and Matthew D. Adams, in 2022, confirmed that access to green spaces enhanced students' academic performance, as confirmed by Wu et al. [20].

Moreover, Jo Barton and Mike Roberson, in 2017, highlighted that green areas within a campus reduced mental fatigue and aggression [21]. Moreover, Schulman and Peters, in

2008, provided improvement treatment for attention deficit disorder through exposure to green areas [22].

According to the WELL Building Standard, mental health can be improved by influencing an individual's cognitive and emotional well-being through design tactics, a matter that educational institutions may supply by providing direct access to nature, such as sunshine, green walls, and natural materials [23].

Considering all of the above, to help students overcome stresses and anxiety at university, we considered providing multi-activity pods on campus for napping and relaxing. These pods are intended to be placed in a recreational zone where students can release their stresses and enjoy a friendly and healthy environment.

Consequently, we conducted research and a survey on the different napping pods available on the market. The majority of pods offer a reading lamp, a recliner, and Internet connectivity at the most fundamental level. While some are considerably higher in quality than others, they all provide one with a quiet space to rest and sleep. Energy pods are often made for taking naps at work or for just having a nap [24] without considering all the other features needed by students [25].

Finally, we proposed a novel Reviving Pod based on interviews, focus groups, and systematic review research in order to fulfill the need among students for a private space (for napping, communication, relaxation, etc., as shown in Figures 1–3) on campus to help promote better mental health while considering the safety of the users [26]. These Reviving Pods are multifunctional units designed to relieve students' stress and anxiety, as well as for students suffering from mental disorders or those who need to be alone to relax, contact a family member, or widely express their emotions within a private area, as shown in Figure 4.

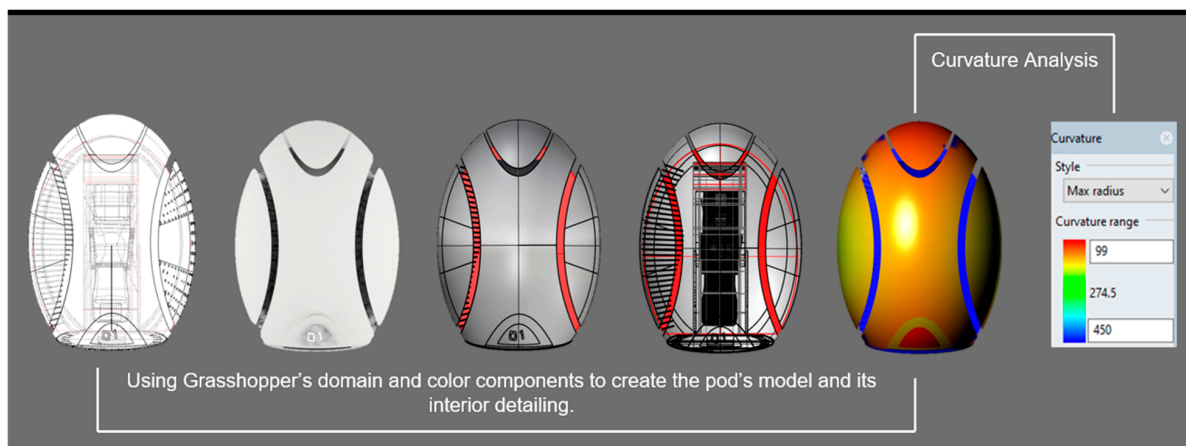


Figure 1. The “Reviving Pod” modeling design with technical, rendered, shaded, and X-ray view curvature analysis rendered in the Rhino program (computational modeling by the authors).

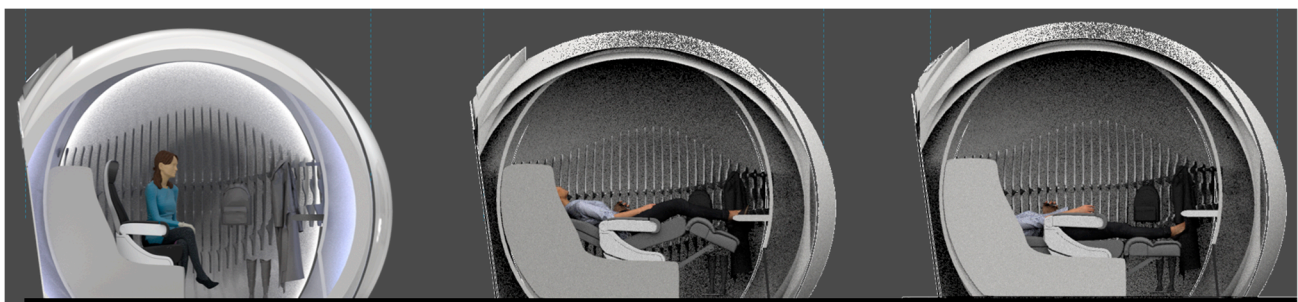


Figure 2. Elevation and sections illustrating the different seat positions: Seated Upright Position, Zero Gravity Position, and Napping Position in the “Reviving Pod” (design by the authors).

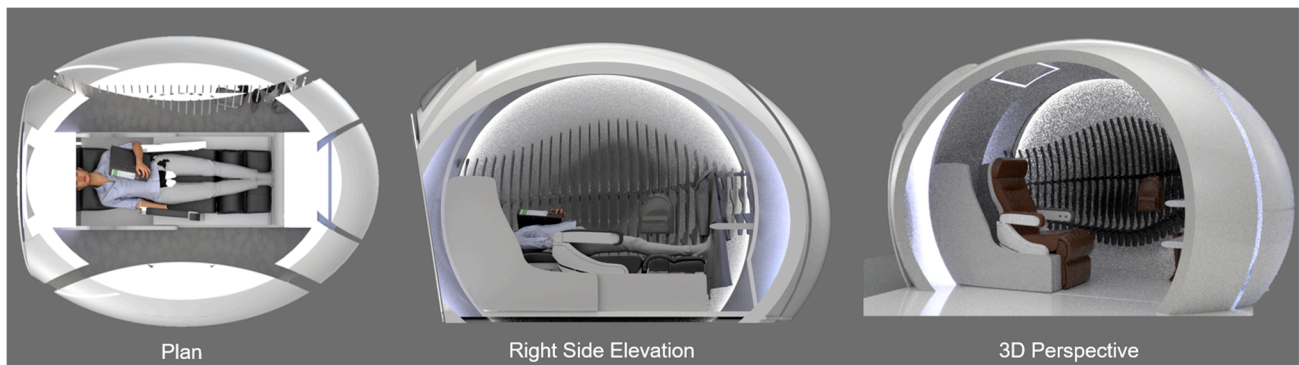


Figure 3. The “Reviving Pod” is presented in plan side elevation, and 3D perspective views, illustrating the pod’s interior design, including the recliner seat, parametric wall unit, smart projection screen, LED light, and adjustable working surface (design by the authors).

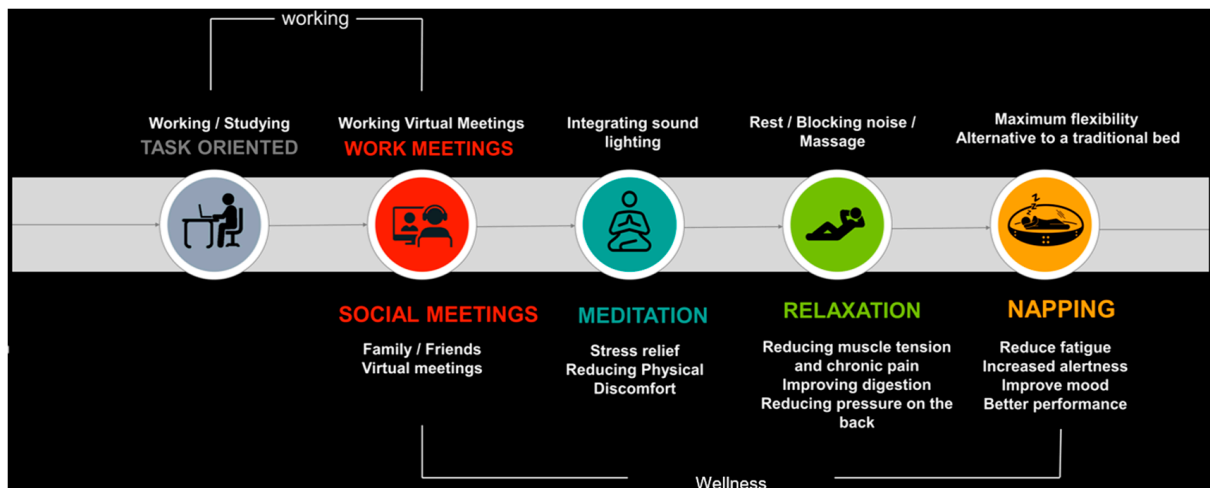


Figure 4. Diagram illustrating the different activities that students can conduct within the “Reviving Pod” according to their needs, including napping, communication, and relaxation (designed by the authors).

The pod is designed to be implemented in a recreational zone accommodating a running track, green walls, waterfalls, etc., as discussed in more depth later in this paper, and is considered a human-centered design following the WELL Building Standard created by our team according to the students’ poll responses in order to help students become more healthy and productive.

1.2. Problem Statement

- College and university students may face stress, anxiety, mental health problems, sleep disorders, or economic issues.
- The researchers’ opinion poll revealed various issues to resolve.
- University students may not find a private space on campus (such as a sleeping pod for taking a personal call, napping, or relieving their stresses to fulfill all their needs).
- The drawbacks of the majority of prefabricated sleeping pods on the market are their lack of smart features or workstations, insufficient space for holding student belongings or conducting quick virtual meetings with family or friends, and lack of choices for meditation, relaxation, or other activities.
- On some university campuses, recreational zones are lacking where students conduct physical activities (such as walking/running tracks that can be used during the year regardless of the weather).

- Not having direct access to nature was also found to have a negative impact on the students' academic success.
- Psychological stress and sleep issues for university students may be caused directly or indirectly by homesickness, attachment to one's home, or dislike of the university [27].
- Wei et al. (2007) noted that homesickness is considered one of the core acculturative stressors affecting people through cross-cultural transitions.
- According to Duru and Poyrazli (2007), acculturative stress is the mental and physical discomfort that results from interacting with a new culture [28].

1.3. Study Objectives

This study has several goals, as follows:

- Enabling students to relieve their stresses, nap for short periods, meditate, communicate, and reduce their fatigue, in addition to helping recharge their energy and increase their alertness, focusing abilities, and happiness;
- Offering an essential private area to accommodate virtual or social meetings with friends and family members, as well as creating a suitable environment for meditation as a method for reducing stress and physical discomfort during work hours. In addition, we sought to provide a quiet place for task-oriented activities, such as reading and virtual meetings;
- Developing an experimental conceptual smart unit "Reviving Pod" using CAD/CAM to be used on a university campus and to propose various parametric design layouts and configurations for the pod with different design possibilities for the surrounding zone depending on the space capacity and needs;
- Implementing the Reviving Pod within the recreational zone on campus to satisfy students' needs and apply the WELL Building Standard to promote students' mental health and relieve their stresses.

WELL v2 was created to reinforce the scientific basis for efficient health interventions through built environments and organizational practices [29].

1.4. Importance of Study

The importance of this study is its significance in improving students' lives, mental well-being, and academic performance, encouraging students to relieve their feelings and relax and enjoy a healthy motivational environment and helping students to recharge their energy and increase their alertness, focusing abilities, and happiness.

2. Materials and Methods

The research process used a descriptive–analytical methodology. Real data were gathered from students using an opinion poll. These data were then used to develop the proposed pod recreational zone design, following the WELL Building Standard, to create an efficient, friendly place on campus. This research had five sequential explanatory design phases, as shown in Figure 5.

2.1. Research by Design Methodology

2.1.1. Phase one (Systematic Review and Focus Groups)

The authors used a systematic review, literature analysis, and focus groups to understand the relationship between mental stresses and student performance and how to help overcome the corresponding problems. We designed an online focus group and created questions to investigate gaps and establish the data analysis process. The information was gathered in the form of field notes and organized by question and category using a spreadsheet, with a column to keep track of different responses. The goal of the analysis was to identify a theme that was related to the study's purpose. Following collection of data, the field notes were thoroughly examined and analyzed. Last, we described what was observed in the final report.

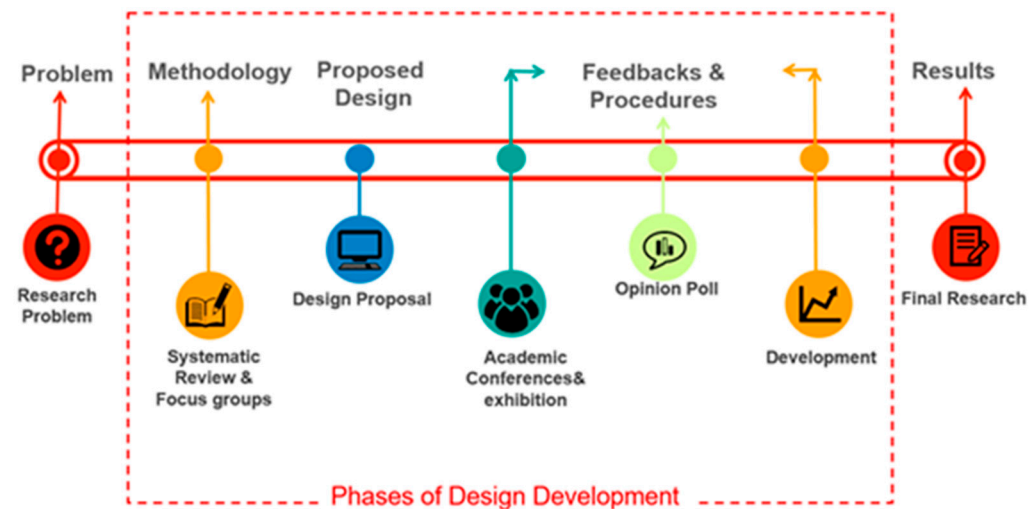


Figure 5. Sequential phases for the design development (diagram by the authors).

2.1.2. Phase Two (Design Proposal)

This study employed a multi-activity unit (Reviving Pod) and explored new forms and activities for Pod design using Grasshopper generative algorithms for design, simulations, visualization, and analysis. These algorithms were integrated with the Rhino 3D software using V-Ray for rendering.

2.1.3. Phase Three (Academic Conferences and Exhibition)

We presented the “Reviving Pod” proposal online at the Research and Innovation Day organized by Fanshawe College, Canada, 2021. After feedback, the proposed pod was developed and implemented in a recreational zone designed and displayed at Dar Al Uloom University on 6 February 2022. Feedback was considered for the proposed final design.

2.1.4. Phase Four (Opinion Poll)

We included the opinion poll that was distributed to university students at DAU. The results of the opinion poll data analysis indicated the positive impact of having a multi-activity pod and a recreational zone within the university campus and its effectiveness in helping students overcome their stresses and anxiety. We used an opinion poll tool consisting of 13 questions directed at the beneficiaries of the college students regarding the Reviving Pod and recreational zone to determine the opinions and needs of the users.

2.1.5. Phase Five (Development)

After receiving feedback from the academic exhibition participants and student opinion poll, the design was further developed according to the students’ needs using the WELL Building Standard to help students overcome their stresses, feel happier, maintain their health and well-being, and improve their academic performance.

Consequently, the experiment, process, and results were fully documented. Last, we finalized the proposed design to be placed within the university campus. The results of this work provide a contribution toward solving students’ stress and anxiety.

3. Results

3.1. General Pod Description

A Reviving Pod is a contemporary-looking, smart, futuristic, and multifunctional unit that is proposed to be installed at universities campuses. Such units can be placed in the library, hallways, outdoor areas, or anywhere else on campus depending on space availability and needs. This pod can be accessible to students, faculty, and staff by schedul-

ing a session through the designed application, online, by phone, or through the campus information desk.

According to various studies, relaxation techniques are effective for reducing anxiety, distress, and depression [30]. The effectiveness of mindfulness meditation as a stress reduction method has also been proven [31]. Moreover, it can be helpful for students to speak to someone during moments of stress and express their worries and fears [32]. Students can use the pod for working, holding short virtual meetings with family or friends, meditating to reduce physical discomfort, relaxing and reducing muscle tension and chronic pain, or receiving a massage. Others, however, use the pod for napping to reduce fatigue and improve their mood and increase alertness and performance, as shown in Figures 6–8.

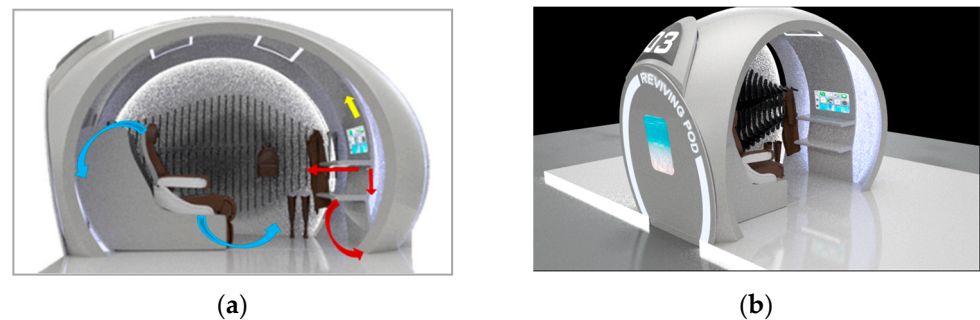


Figure 6. (a) Perspective view designed by the authors illustrating the adaptable transformable adjustable interior units for different multi-functional uses (the interior design elements); (b) perspective view illustrating the pod's interior and exterior design, emphasizing the wayfinding elements, pod number, LED lights, and external smart digital touch screen (the exterior design elements). Arrows' illustration showing different furniture adaptability.

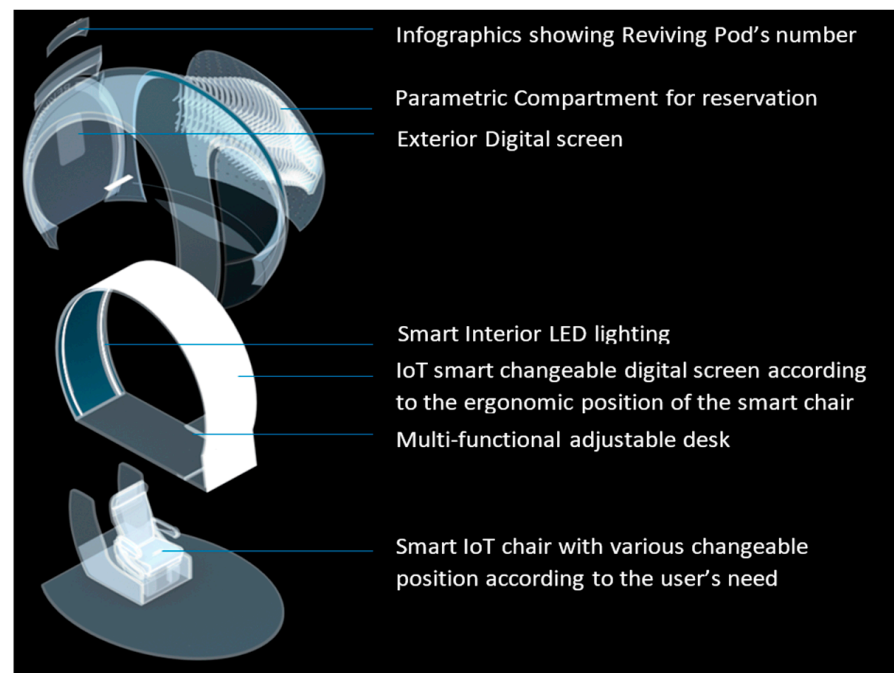


Figure 7. Exploded isometric illustrating the pod's form, components, and interior design elements (designed by the authors).

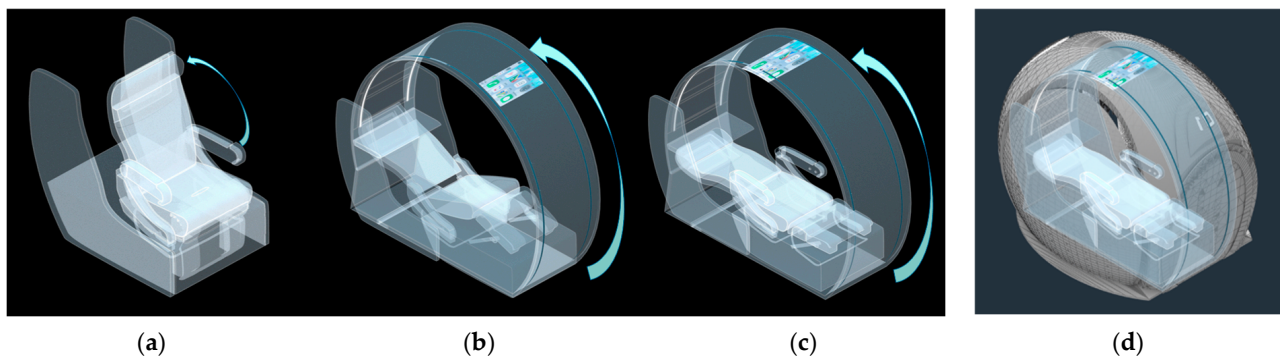


Figure 8. Isometric views illustrating the interactivity between the recliner seat and the projected screen to maintain a suitable field of vision by changing the angle of inclination of the smart seat: (a) Working/meeting position, (b) Relaxation/meditation position, (c) Napping position, and (d) Pod's closed form showing the interior view (design by the authors). In terms of fabrication, technical breakthroughs in manufacturing techniques have enabled innovative structures to be created using extremely accurate automated machines. Digital fabrication technologies have enabled customizable configurations, simpler construction techniques, and time savings, all of which play an important role in architecture and interior design through the intersection between form, material, and technique. The integration of smart materials in the interior design of the pod, especially during the pandemic, adds to the potential impact of the innovative materials, coating, and smart advanced technology that can help to prevent transmission of the virus in the built environment [33].

3.2. Unit Interior Description

The pod provides a workstation and a personal belongings zone for each occupant. The personal belongings zone contains shelves and places for the user's coat, bag, and personal belongings. We created a parametric wall unit using computer technology to act as a sound diffuser and for its aesthetic and visually pleasing qualities. The Reviving Pod includes a working surface and a smart adjustable recliner seat that is ergonomically designed and uses sensors and other technology to gather information on how students sleep, as shown in (Figures 9–11). The pod also transfers sleep information to the student's smartphone, where it can track how well the student sleeps and provide feedback on how to achieve adequate sleep.

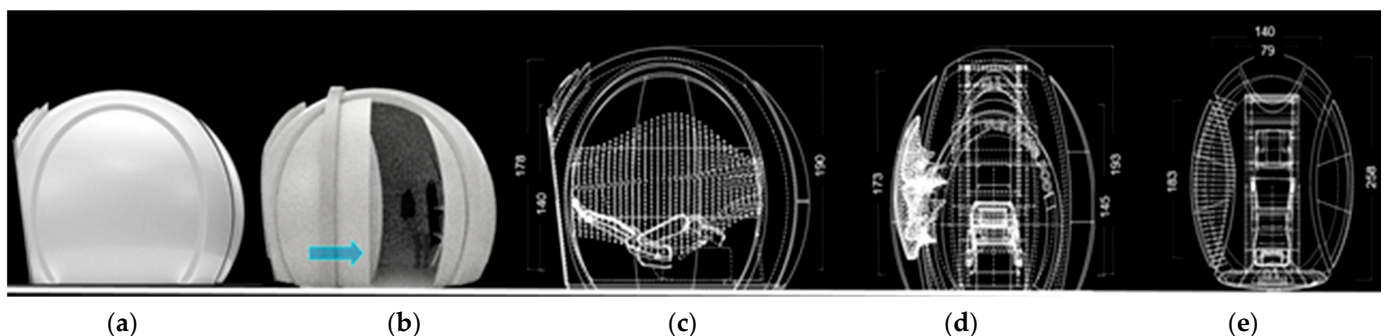


Figure 9. (a) Rendered side views illustrating the pod's form; (b) the door mechanism as shown by arrow illustration; (c) cross-section; (d) elevation; (e) plan with dimensions in centimeters (designed by the authors).

A smart and intuitive cross-platform application allows students to manage and control the pod's interior environment. The sensor's properties are used for face and voice recognition, along with machine learning technologies. The pod provides Wi-Fi, a computer, and a smart-projected screen for virtual meetings with different adjustable positions, as shown in Figure 12, as well as a touch screen that offers exterior information.

This design accommodates multiple types of students as chatting face-to-face is preferable for some students, while others feel more comfortable with text messages. The pod has a smart air system for controlling the temperature and ventilation, smart dimmer LED lights, and power outlets. Thermal comfort differs greatly between people and countries depending on factors such as activity level, clothing, temperature, and humidity.

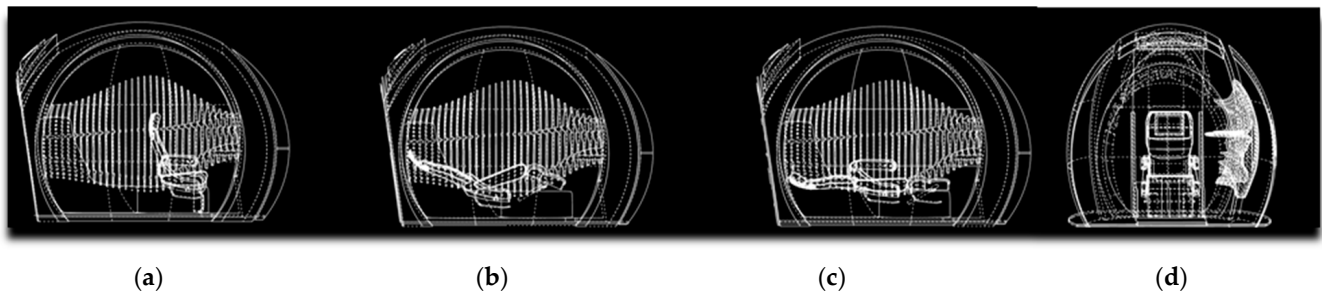


Figure 10. Technical drawings illustrating the parametric wall unit and different positions for the adjustable smart seat: (a), working/meeting position, (b) relaxation/meditation position (c), napping position, and (d) front view (designed by the authors).

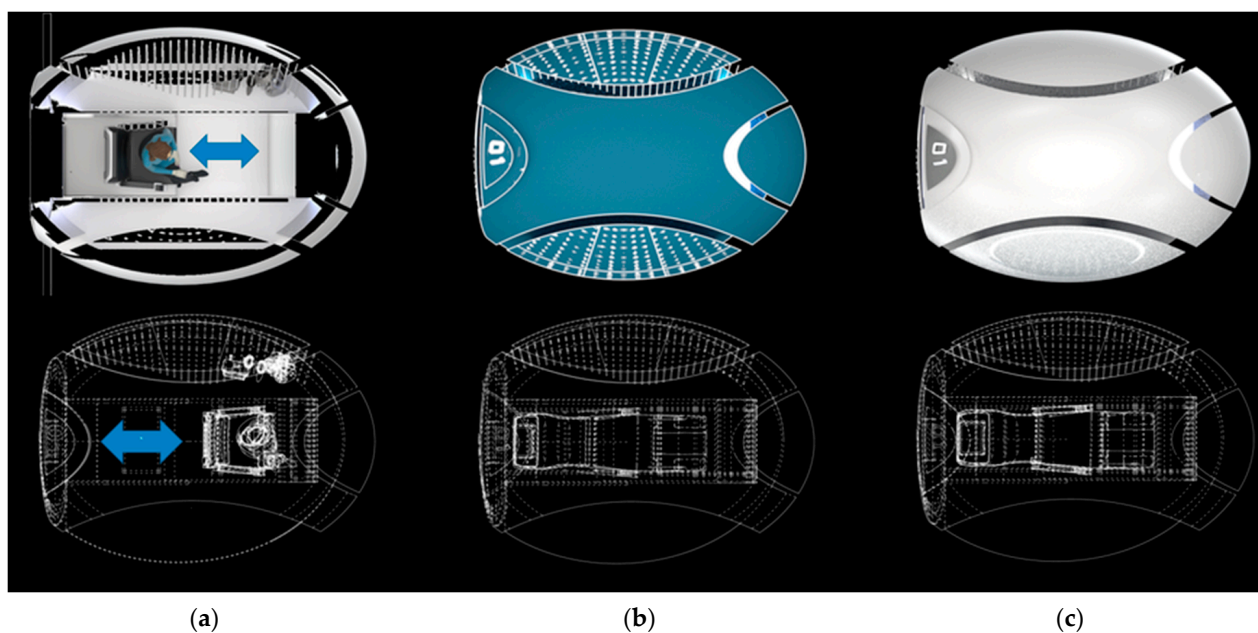


Figure 11. Different rendered and technical views of the “Reviving Pod”: (a) working/meeting position and plan, (b) relaxation/meditation position and plan, and (c) napping position (designed by the authors).

The pod can be placed in student lounges, libraries, and other common places as needed.

A 2014 study conducted by the International WELL Building Institute (IWBI) worked on thermal comfort factors, such as air temperature, air velocity, and radiant temperature; air emissivity of space; heat transfer coefficients; and metabolic rates and recommended that these factors should be taken into consideration [29]. The authors then used a smart adjustable cooling and heating system to achieve the required thermal comfort and individual thermal preferences inside the Reviving Pod, as well as providing CNC cut plywood material and parametric walls to reach a minimum level of acoustic separation in order to effectively isolate sound and enhance voice privacy. Application of acoustic materials that block or absorb sound can improve focus and lessen reverberations [34].



Figure 12. Diagram indicating COVID-19 precautions in the pod’s design, illustrating the personal belongings zone, adjustable smart seat, LED outlets, and various smart technologies used within the Reviving Pod, as designed by the authors.

3.3. Design Consideration for Infection Control

In this study, we aimed to minimize transmission of viruses through contaminated materials as people can pass on viruses by directly contacting or touching surfaces or objects. Use of virtual meetings, contactless technologies to open doors, physical signs for maintaining social distance, smart self-cleaning materials, and antimicrobial finishes are all examples of such measures.

Temperature detection (using an RGB thermal camera to scan human body temperature) and disinfection spraying system to sanitize the entire space using embedded sensors can help keep everyone safe and prevent spread of viruses. To prevent viral transmission, more precautions were needed in terms of the pod’s features and materials used to help make the pod more efficient [35], as shown in Figure 13.

3.4. Form, Material, and Fabrication

The top view of the pod looks like an oval with an egg-like form to save energy. The prefabricated pod is light-weight, enabling it to be easily transported and shipped.

The frame of the form is structured from aluminum layered with fiberglass using the vacuum infusion process (VIP), which is a technique for injecting resin into laminate through vacuum pressure [36,37]. We proposed different possible configurations for the pod, as shown in Figures 13 and 14, as well as various designs for the partitions and waiting areas. The design and layout depend on the available space and number of pods needed in the space. The parametric design was implemented in the design utilizing CAM and CAD technologies, as shown in Figures 15–17 [38].

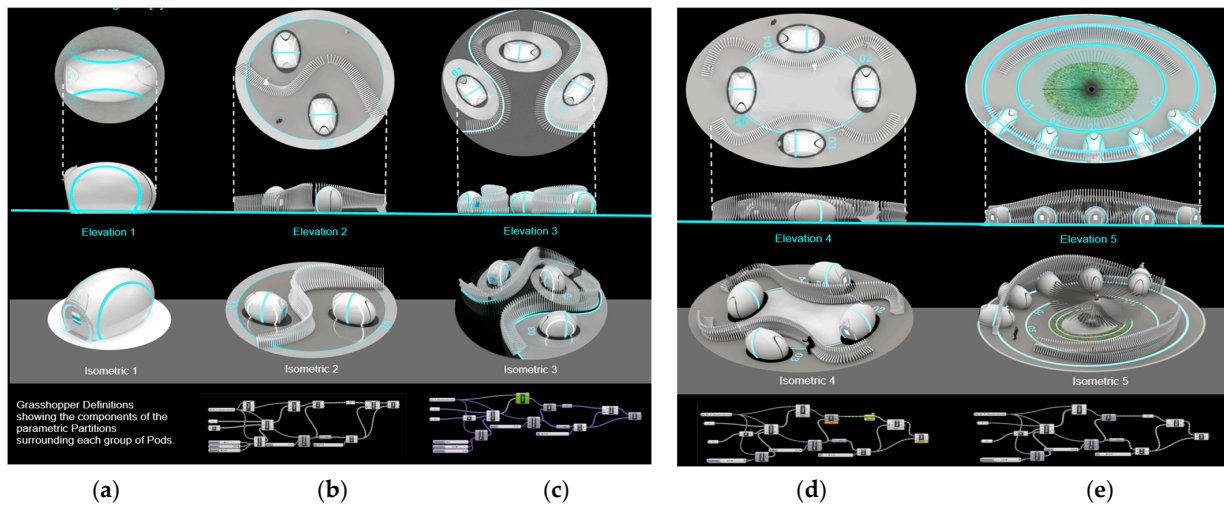


Figure 13. Top views, elevations, and isometrics illustrating different configurations and layouts for the proposed pods: (a) single-Reviving-Pod layout; (b) two-pod layout; (c) three-pod layout illustrating parametric seats and partitions/Grasshopper definitions for each parametric unit; (d) four-pod layout; (e) five-pod layout showing the wayfinding, landscape design, parametric seats, partitions, and shade (designed by the authors).

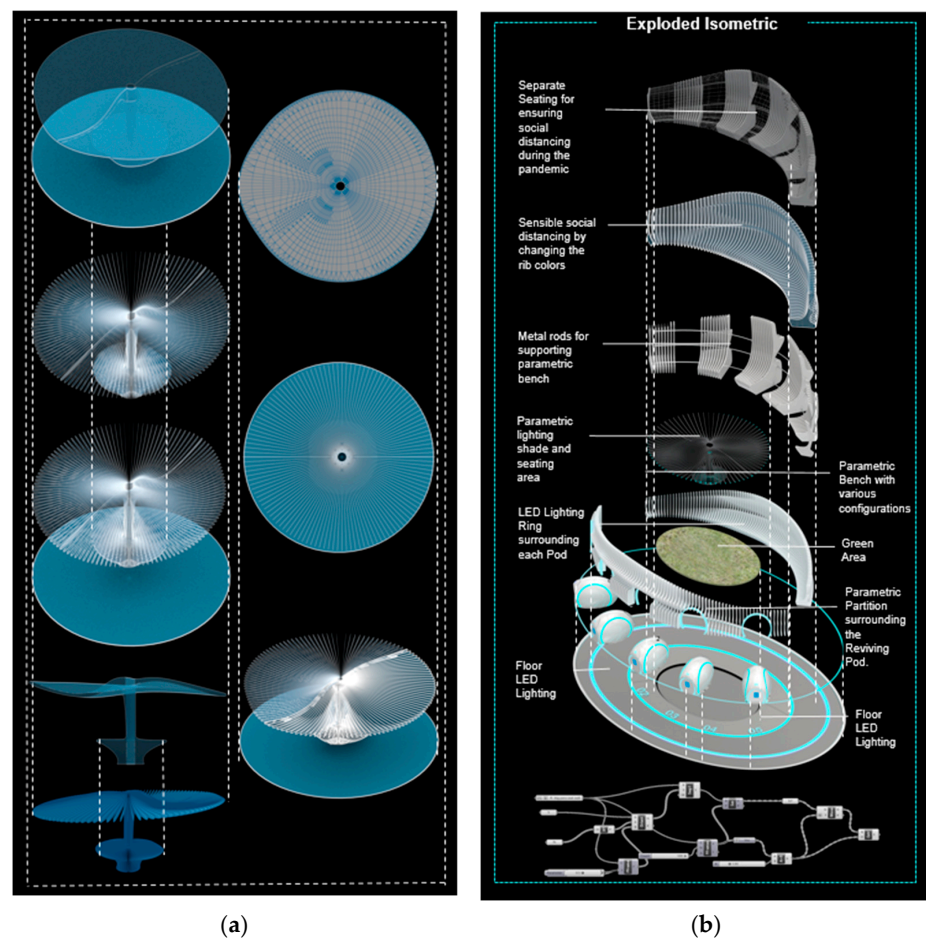


Figure 14. (a) Exploded isometric view showing the proposed layout for five Reviving Pods with parametric shade and surrounded by parametric partitions/Grasshopper definitions for the parametric unit; (b) isometric views, elevation, and top views illustrating the parametric shade and seat (designed by the authors).

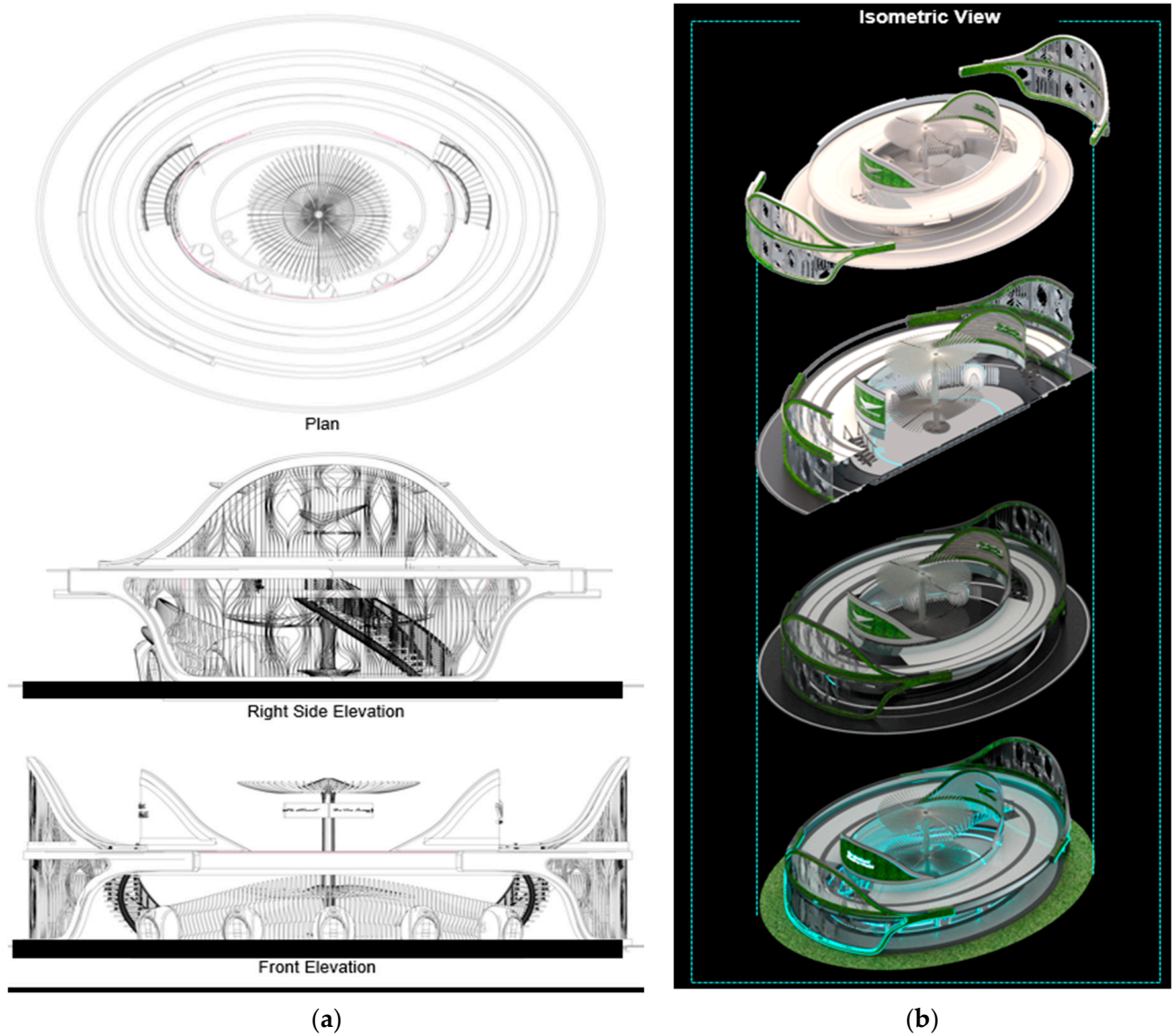


Figure 15. (a) Plan showing the right side and front elevation for the double floor walking track; (b) different isometric views (designed by the authors).

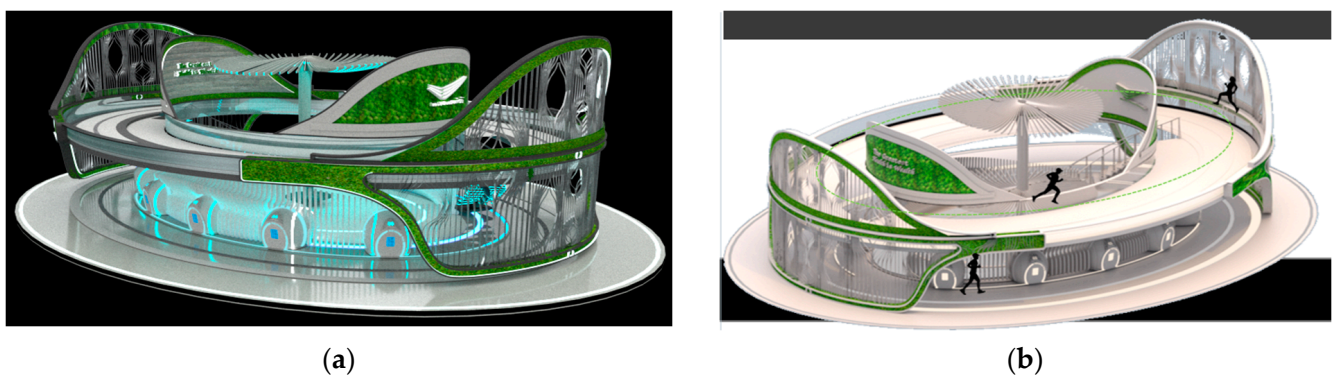


Figure 16. (a) 3D perspective; (b) 3D perspective showing the double floor walking track (designed by the authors).

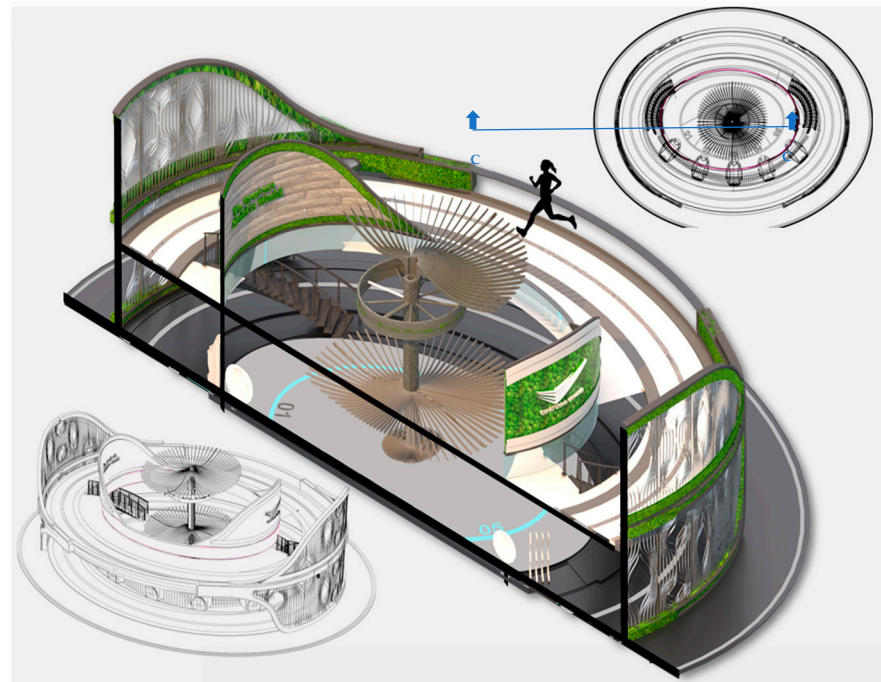


Figure 17. 3D section showing the double floor walking track, with the plan and 3D perspective (designed by the authors).

3.5. Recreational Zone Description

To help relieve students' stress and anxiety, we proposed a recreational zone design on campus to provide a healthy environmental space for students to recharge their energy and release their stresses.

The proposed design is a double-story oval-shaped zone with two opposing curved staircases positioned on both sides.

Using stairs can help improve physical health, encouraging good habits and motivating students to participate in a sustainable lifestyle while discouraging sedentary behavior [39].

The wayfinding design incorporates signs, symbols, colors, and LED lights to efficiently lead students around. These features are vital in designing spaces as they provide visual signals and pod numbers to help students make their way to the reserved pod. The waiting area and partitions were also customized based on the fluid design concept.

The proposed partitions and seats (waiting area) are made from CNC cut plywood and were designed by sectioning the form. Sectioning was generated for fabrication using Rhino software and controlled by Grasshopper. Employing a parametric design can also help improve the acoustics in the space.

The downstairs area is an open space with a central double-height focal point containing a circular seating area and smart kinetic shade.

Additionally, parametric curved green walls were designed as a sound-reduction solution to reduce the amount of noise in the space in order to improve student health and well-being by raising acoustic comfort levels. Here, five Reviving Pods are implemented within the parametric walls [40].

LED lights are also used within the project to improve productivity and provide optimal visual acuity as needed [41]. The upper level is mainly a walking and running track for university students. The walking track flooring system was used to support sustainable power generation for energy efficiency within the zone by utilizing piezoelectric cells.

Piezoelectric technology generates energy from external force impulses or vibrations in the floor, harvesting energy from footsteps by converting kinetic energy into electrical energy to support green technologies. Double curved walls are located on both the inner

and outer track walls to be used as green walls, with water fountains on both sides as access to nature was found to have important health benefits, including stress reduction and greater attentional focus [42].

3.6. Applying WELL Building Standard to the Recreational Zone Design

We proposed a human-centered design with a light-weight structure, as shown in Figure 16, to solve college/university students' struggles and help them recharge their energy and relieve their stresses on campus while achieving environmental sustainability with a commitment to good health and well-being, affordable and clean energy, and quality education [43]. We included some of the main features of the WELL Building Standard in the proposed recreational zone design to address issues that impact the health, comfort, and knowledge of students and promote and reinforce health by providing fresh air, water features, and green spaces for physical activity and social connection, as shown in Figure 18.

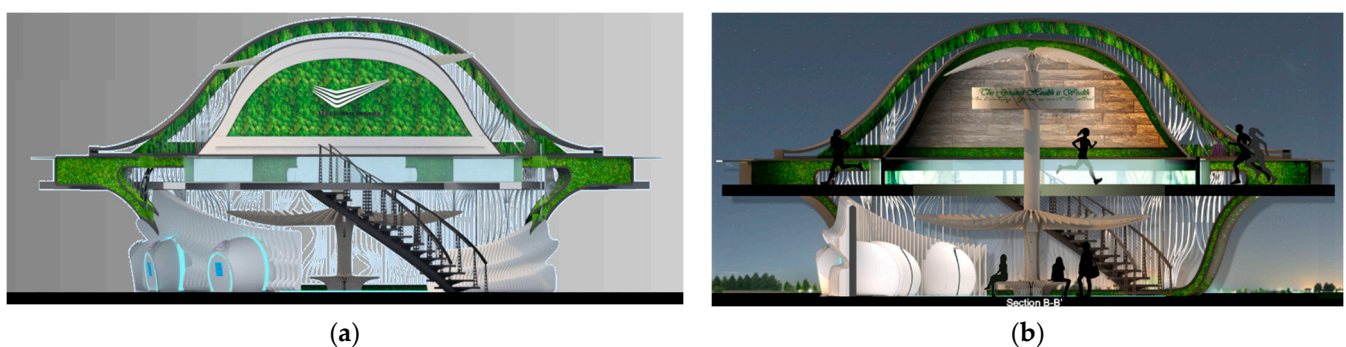


Figure 18. (a) Right side elevation; (b) right side section (designed by the authors).

The aim of the designed space is to create a built environment that improves university students' fitness, mood, sleep patterns, and performance, as shown in Table 1. Ultimately, the WELL Building Standard supports creation of an atmosphere that is beneficial for learning. Green areas and the pods are factors that can help promote students' mental health. However, such measures accomplish these goals in different ways as the results depend on students' mental well-being and needs and how they are able to relieve their stresses, as shown in the conducted survey.

Table 1. This table shows the WELL Building Standard features applied to the recreational zone and Reviving Pod.


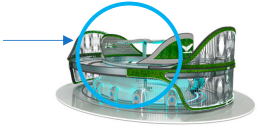

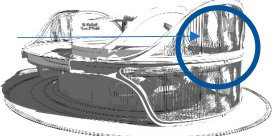

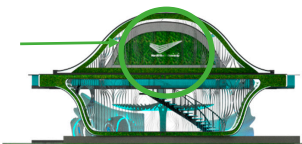

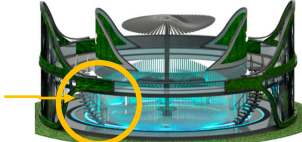



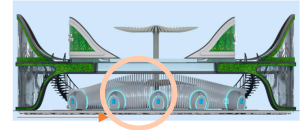

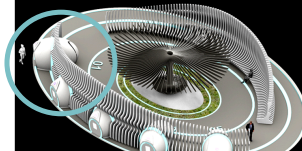
WELL Building Standard		
1	<p>Air</p> 	<p>The importance of clean air to our health cannot be overstated. This can be achieved by improving air quality in buildings using ventilation systems and choosing the right building materials and installation of appropriate materials with deployment of effective methods to regularly disinfect specified locations [44]. This standard is evident in the aluminum frame of the Reviving Pod's structure layered with fiberglass using the vacuum infusion process (VIP), as well as application of smart self-cleaning materials and antimicrobial finishes for infection control.</p> 
2	<p>Water</p> 	<p>The WBS for water supports safe and clean water by using suitable filtration procedures and conducting frequent testing to ensure that occupants of the building receive water of the highest quality for a variety of purposes [45]. It is important to stay hydrated by drinking a great deal of water, especially in hotter weather and when exercising. The taste of tap water can be improved to encourage greater water consumption and lessen the need for bottled water. The following conditions must be met in order to promote water consumption: There must be at least one dispenser within 30 m (100 feet) of all regularly used floor space (at least one per floor). We fulfilled this standard by adding four water dispensers for every floor to be used within the recreational zone.</p> 

Table 1. Cont.

WELL Building Standard		
3	<p>Nourishment</p>  <p>Attempting to integrate design methods and policies within buildings that increase access to healthy food options empowers people to make better dietary decisions and leads to improved health and well-being. We fulfilled this standard by designing double-curved walls on both the inner and outer track walls to be used as green walls within the recreational zone.</p>	
4	<p>Light</p>  <p>Lighting parameters should seek to minimize disruption to the body's circadian system, increasing productivity, improving sleeping quality, and providing adequate visual acuity where required. This feature recommends shielding designs and dimmable glass for successfully managing disruptive glare emanating from windows. This element generally requires use of automatic monitoring systems to ensure that window shades are efficiently used to control direct sunlight and limit artificial light output when sunlight meets the designated light levels, representing a plan for both energy efficiency and enhanced user experience [46]. LED lights are effectively used in wayfinding elements throughout the recreational zone to lead students around through visual signals and pod numbers alongside smart interactive LED lights within the Reviving Pods.</p>	
5	<p>Fitness</p>  <p>Projects should identify physical-activity-promoting policies and strategies that can be applied in the built environment to increase physical activity and reduce commonly related ailments, thereby assisting in the fight against diabetes, obesity, and chronic diseases. We designed stairs and an indoor walking track in the proposed recreational zone for improving physical health and encouraging good habits for students on campus.</p>	
6	<p>Comfort</p>  <p>Guidelines should be established to create productive and pleasant indoor environments. We achieved this measure by designing multi-activity pods on campus for napping and relaxing within a recreational zone where students can release their stresses and enjoy a friendly and healthy environment.</p>	
7	<p>Mind</p>  <p>Because the mind is so essential to an individual's overall health and well-being, creating an environment that promotes a healthy mental state can have significant psychological and physical benefits. The WELL Building Standard identifies policies that can be implemented to improve mood, sleep, stress levels, and psychosocial status, thereby promoting and enabling overall occupant health and well-being. We proposed use of "Reviving Pods" for meditating to promote relaxation and reduce physical discomfort, muscle tension, and chronic pain. Users can also receive a massage, while others use it for napping or to reduce fatigue. Such pods could also be added within the recreational zone to help promote students' mental health.</p>	

4. Discussion

The proposed pod design offers a single space for numerous activities and enables more effective use of available space. Some students find it difficult to express themselves in front of others and would rather do so in a setting that is more private. According to numerous studies, controlling students' stress can improve their academic performance. Other factors that can help to control stress include maintaining attention, obtaining enough rest, exercising frequently, and using time management strategies. In order to better understand the needs of students and contribute to development of a design that will help in relieving their stresses, which is proven to have an impact on the learning process, we conducted a quantitative survey to assess students' opinions on the proposed developments and features added to the conventional pod design. The pod can be placed in student lounges, libraries, and other common places as needed.

This section includes the following: a presentation and discussion of the results related to the opinion poll filled out by students of Dar Al Uloom University and data analysis of the responses to explore how students on campus can be made to feel more comfortable and avoid stresses and anxiety during the day.

We carried out several procedures to receive approval for the questionnaire to be sent via email to Dar Al Uloom University students. The electronic questionnaire was created and prepared to collect feedback and responses as an experimental strategy for mental health promotion among university students. The questions were categorized under two main parts: (1) what could help destress students and maintain their mental health; (2) the degree to which the pod's design satisfied and fulfilled students' needs.

The responses provided by the students were then analyzed by a web application for measuring students' responses and the level of satisfaction towards the proposed design. The frequency of responses to each question in each section was as follows. The total sample size was $N = 100$, and 63 students responded to the questionnaire.

We distributed the electronic survey consisting of 13 questions among university students to determine their opinions about the proposed design of the Reviving Pod and recreational zone, and 63 responded, as shown in Table A1. The sample consisted of 63 beneficiaries of students.

Table A2 demonstrates that the university students were satisfied by the suggested design of the recreational zone, which was demonstrated by their opinions in the independent survey and by studying the voting results of the beneficiaries' answers to the proposed recreational zone design.

The authors realized that there was broad satisfaction with the provided survey questions, to which 63 recipients answered. The Reviving Pod and recreational zone design were unanimously approved based on recipients' ideas and desires in accordance with the time requirements and their needs.

The pie chart below shows this result graphically (Tables A1 and A2).

4.1. Opinion Poll Results

The sample consisted of 63 beneficiaries who were university students (100%).

As shown in Table A1, 87.3% of the beneficiaries' responses emphasized that they faced stress or anxiety during their exam weeks or finals, and 44.4% emphasized the importance of sleep to release their stress; 14.3% emphasized the importance of talking to someone to release their stress; 4.3% emphasized the importance of meditation; and 22.2% emphasized the importance of listening to music to relieve their stresses, although only 7.9% preferred playing sports, and 6.3% liked watching television to relieve stress. A total of 85.7% of respondents confirmed that they needed a private space to make a call or have a rest on campus, and 85.7% responded that they think the available services in the proposed Reviving Pod design are suitable for them. In addition, 88.9% of respondents confirmed that the interior design of the Reviving Pod is user friendly and will help them to become relaxed.

In addition, a total of 25.4% of students expressed their belief in the importance of providing comfortable benches for sitting and relaxing to relieve stress. They also confirmed that adding a Reviving Pod within the recreational zone would be a positive addition to the university campus and would make them release their stress (93.7%); 67.2% reported that playing easy sports on campus would help them maintain a healthy body and alleviate stress. Some of the views also highlighted that access to green spaces (WELL Building Standard) can help decrease anxiety and improve feelings of wellness (95.2%).

4.2. Limitations of the Work

Sleeping pods are becoming increasingly popular in universities across different countries as students seek ways to obtain enough rest while remaining focused on their studies. However, there are some potential limitations to using sleeping pods that should be considered. Some universities, for example, may lack the necessary infrastructure to support such devices, and sleeping pods can be costly, so budgetary concerns should also be addressed.

5. Conclusions

- The “Reviving Pod” is an experimental human-centered design unit. This device is considered a design solution, created to provide a private place for students on campus to take a nap, relax, meditate, or communicate virtually. The pod provides an ergonomic adjustable reclining seat, a built-in computer, smart screens, a smart air system, LEDs, contactless technologies, a disinfection spraying system, voice and face recognition, and mobile application features. The pod can be set in different proposed configurations and layouts and also offers smart parametric shades, partitions, and seats that can be controlled by the IoT. In the design of this unit, we also considered various COVID-19 precautions, such as detecting the user’s temperature, utilizing smart self-cleaning materials, and installing kinetic parametric seats for maintaining social distance.
- The results of data analysis indicated effectiveness of the interior design environment in promoting student mental health and well-being.
- Computational modeling helped students to visualize the proposed design and its performance.
- Designing a recreational zone based on the WELL Building Standard promotes a healthy lifestyle for college students on campus.
- Providing a zone that accommodates a diversity of activities can encourage students to reinforce their health through physical activity, consequently increasing their academic performance and supporting their well-being, according to the students’ poll results.
- We suggest using more affordable sustainable materials in future activities to reduce expenses.
- We also recommend implementing different fabrication techniques that are easier and more affordable and encourage further developments on this pod with more economic solutions and lower costs.
- When building new campuses, universities could add infrastructure to implement pods in different locations (library, lounge, etc.).
- Future research could design capsules that are set together vertically to save space.
- The possibility of locating pods in outdoor areas requires further environmental sustainability studies, such as using solar panels and green energy with cooling and heating facilities.
- We advise considering use of 3D printing for fabrication of the pod.
- Further studies could be developed to analyze the number of pods required, the space requirements, and the overall economics.

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Appendix A

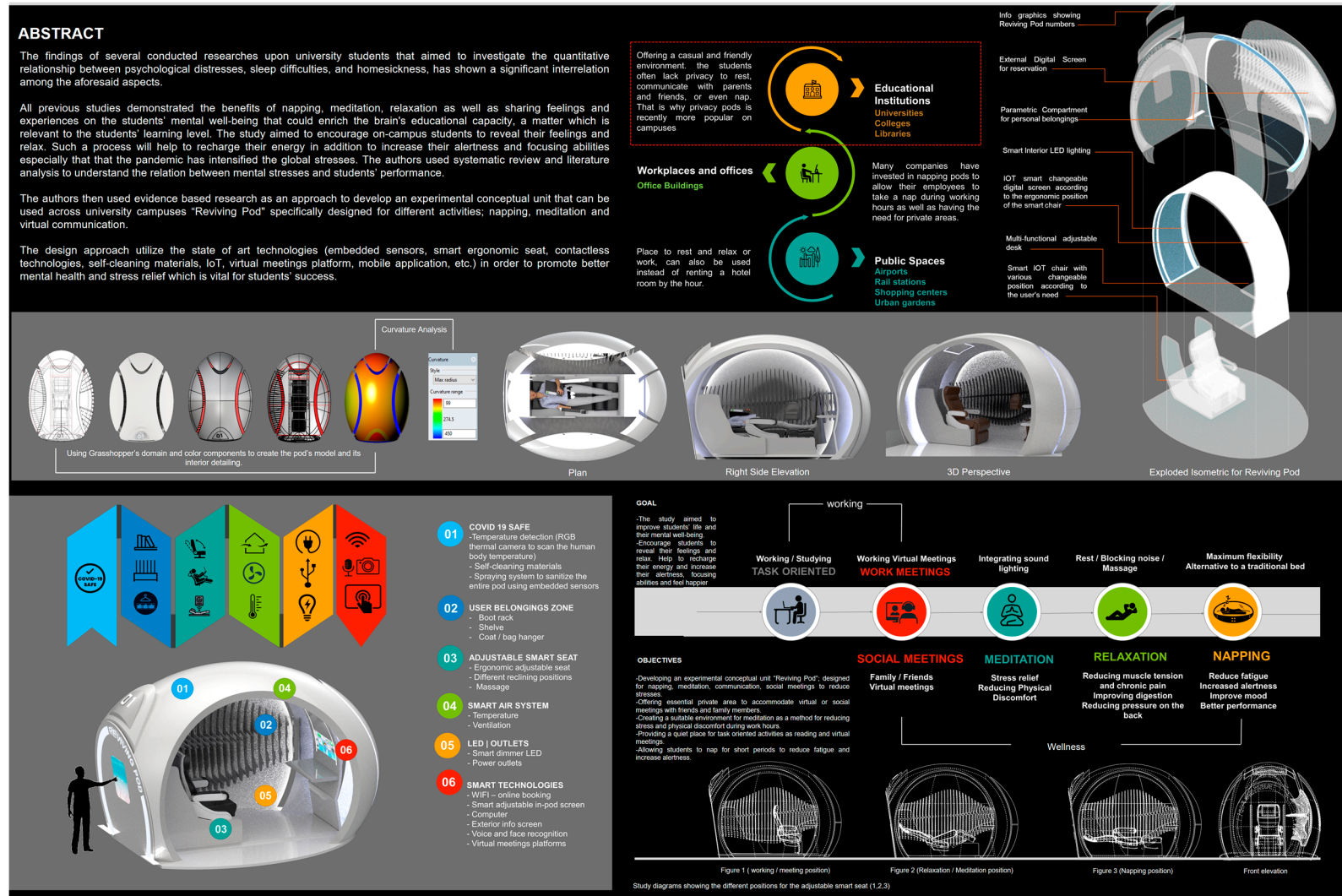


Figure A1. Samples of the posters (Poster1) displayed on 6 February 2022 on DAU campus in the CADD Female Exhibition.

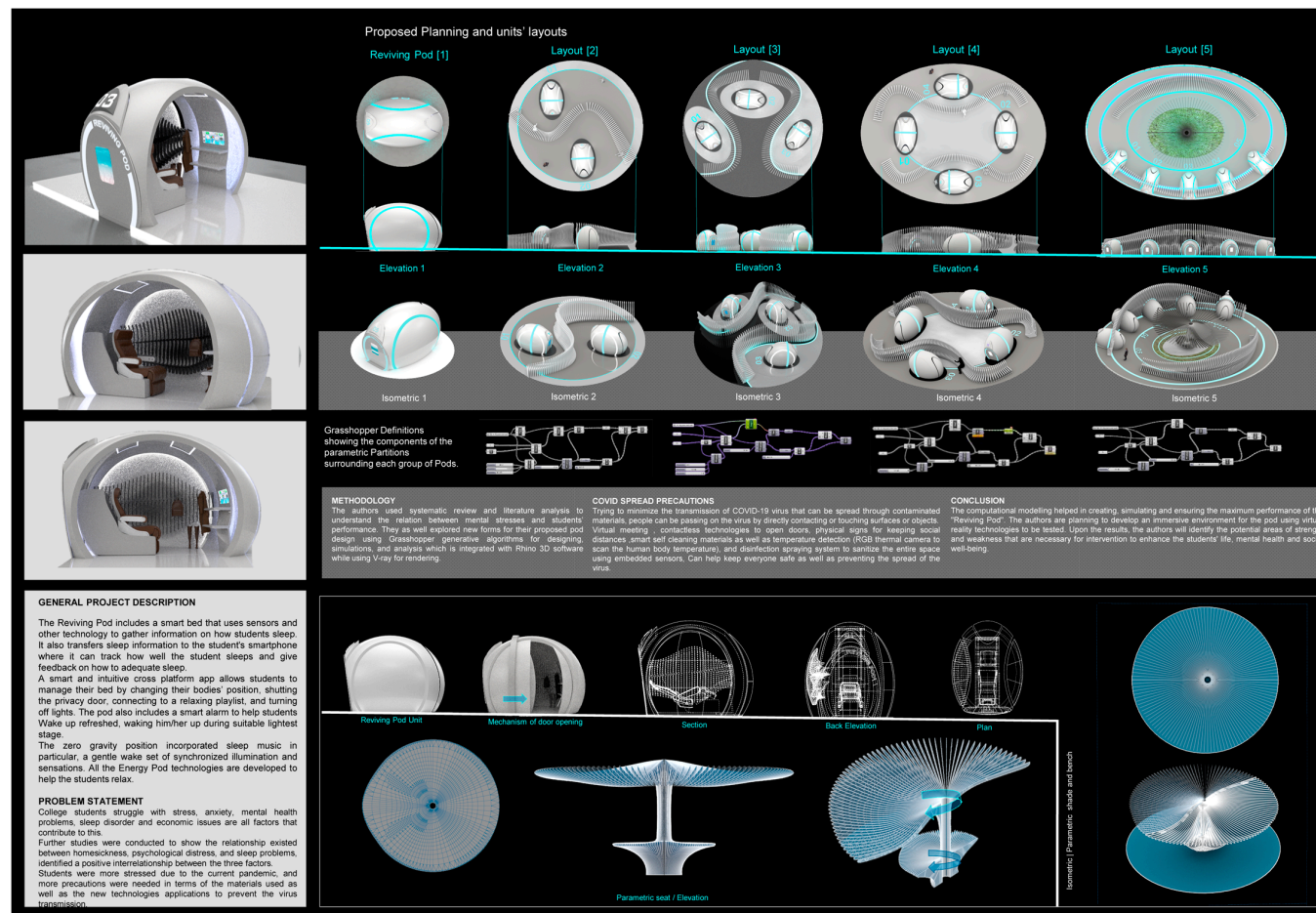


Figure A2. Samples of the posters (Poster2) displayed on 6th of February 2022 on DAU campus in the CADD Female Exhibition. “Benyapa Prueksanusak, Punawatchara Rujivipatand, Konlakorn Wongpatikaseree, 2019” “Stella Collins, 2019” “Mingyu Park, Young-Hoon Song, Jeongyeup Paek, 2016” “ Julia Dellitt, Simon and Schuster, 2015.” “Andreas Holzinger, Martina Ziefle, Carsten Röcker, 2014” “Psychologists, Steven P. Gilbert & Cameron C. Weaver, 2010” “Taub, John M.,Tanguay, Peter E.,Clarkson, Douglas, 2010” “Vela-Bueno MD, Julio Fernandez-Mendoza MS, Sara Olavarrieta-Bernardino MS, Alexandros N. Vgontzas MD, Edward O. Bixler PhD, Juan Jose de la Cruz-Troca MS, Alfredo Rodriguez-Muñoz MS & Jesús Oliván-Palacios MD, 2008.”.

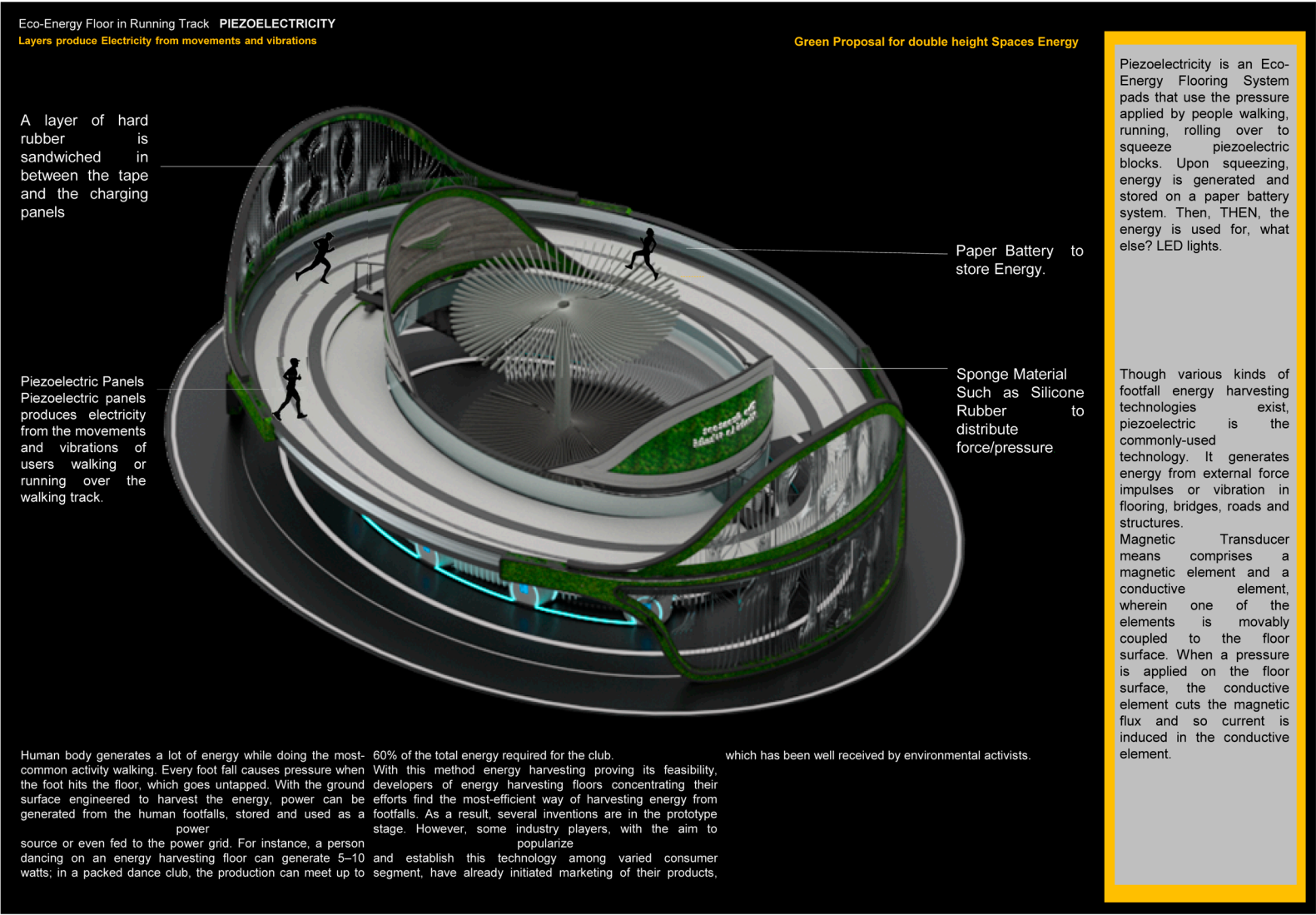


Figure A3. Samples of the posters (Poster3) displayed on 6 February 2022 on DAU campus in the CADD Female Exhibition.

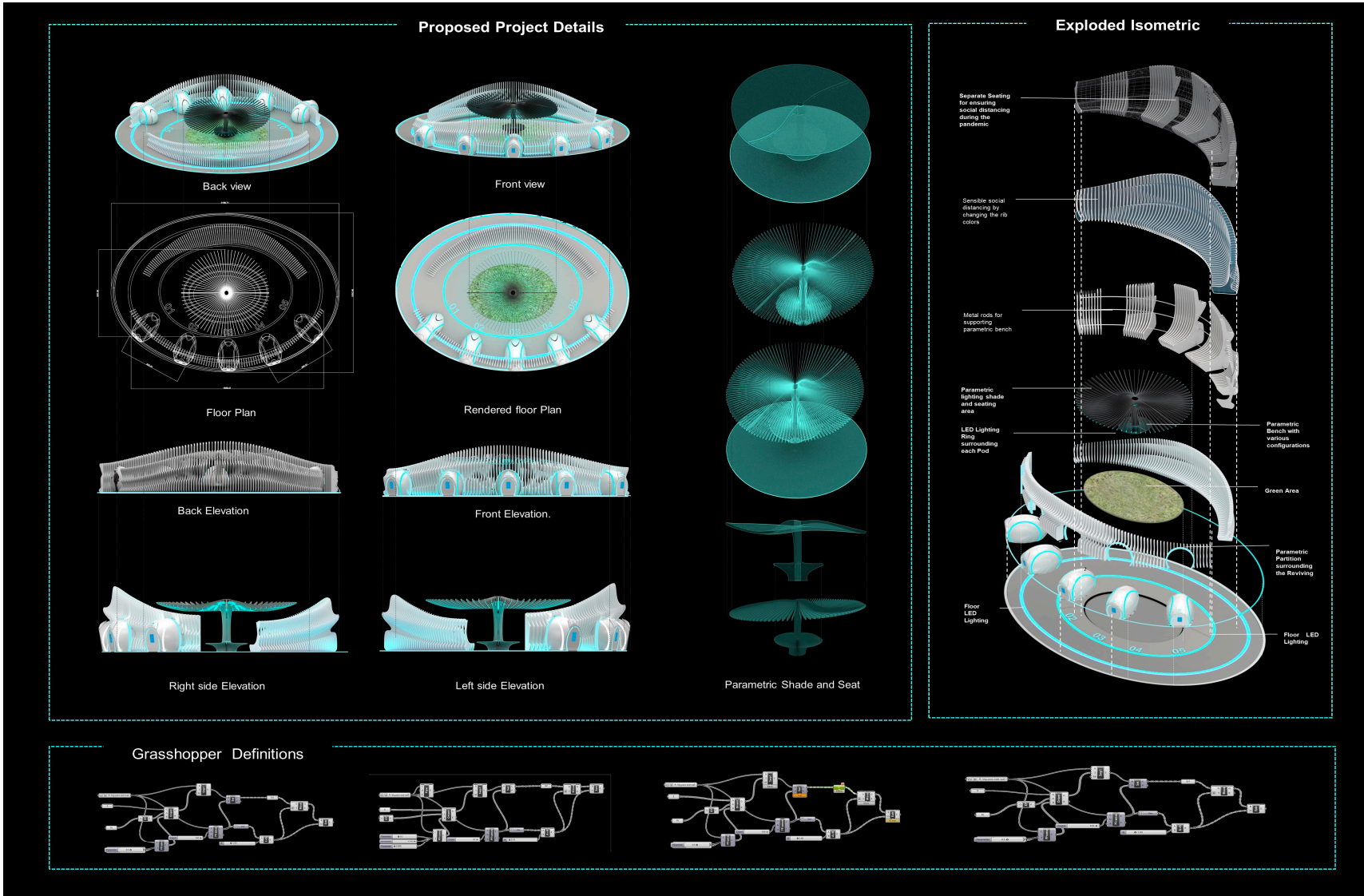


Figure A4. Samples of the posters (Poster1) displayed on 6 February 2022 on DAU campus in the CADD Female Exhibition.

Table A1. Responses of 63 students at Dar Al Uloom University (Section 1 of the survey: The “REVIVING POD”: Design), created by the authors.

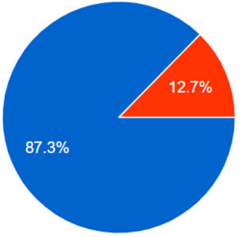
No.	Questions	Yes	No	Chart
1	Have you faced any kind of stresses or anxiety during your exam weeks or final submissions as a university student?	55	8	 <p>● Yes ● No</p>
2	What do you usually do to release your stresses?			 <p>● Sleeping ● Talking to someone ● Meditation ● Listening to music ● Playing sports ● Watching tv</p>
3	Have you ever felt like you needed a private space to make a call or have a rest on campus?	54	9	 <p>● Yes ● No</p>
4	If the there is an available Reviving Pod on campus, do you think that the available services in the proposed Reviving Pod design is suitable for you?	54	9	 <p>● Yes ● No ● If no, please add points</p>
5	Do you think that the interior design of the Reviving Pod is user friendly and will help you become relaxed?	56	7	 <p>● Yes ● No ● If not, Please explain.</p>

Table A2. Responses of 63 students at Dar Al Uloom University for (Section 2 of the survey: The “Re-creational Zone” with “REVIVING POD”), created by the authors.

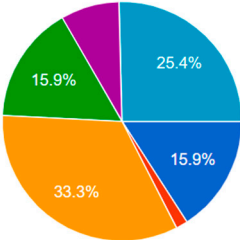
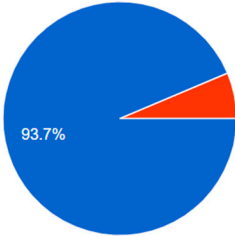
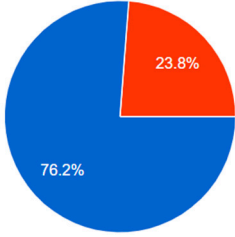
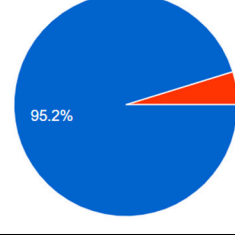
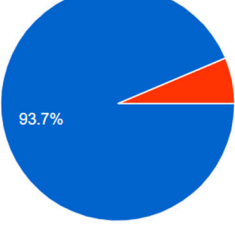
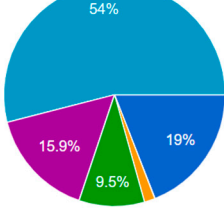
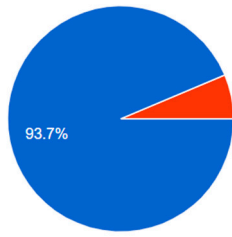
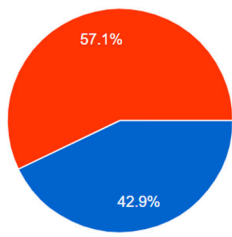
No.	Questions	Yes	No	Chart
1	What should universities provide for students to relieve their stresses?			 <ul style="list-style-type: none"> Nap Pods Private place for calling friends or family A place to work in private Green Areas Walking Tracks Comfortable benches for sitting and relaxing
2	Do you think that adding a “Reviving Pod” within the Re-creational zone will be a positive addition to the university campus and help you release your stress?	59	4	 <ul style="list-style-type: none"> Yes No
3	Do you think that playing easy sports on campus can help you maintain a healthy body and relieve your stresses?	48	15	 <ul style="list-style-type: none"> Yes No
4	Do you think that access to green spaces (WELL Building Standard) can help reduce your stresses and make you feel better?	60	3	 <ul style="list-style-type: none"> Yes No
5	Do you believe that a “Re-creational Zone” on university campus with green spaces and a walking track (WELL Building Standard) will help reduce your stresses and make you feel better?	59	4	 <ul style="list-style-type: none"> Yes No
6	Would you like to have such a design on your campus?			 <ul style="list-style-type: none"> 1(rarely) 2(Totally disagree) 3 (Disagree) 4 (Neutral) 5(Agree) 6 (Totally Agree)

Table A2. Cont.

No.	Questions	Yes	No	Chart
7	Do you think that “Recreational zone” with the “Reviving Pod” will enhance the university students’ academic level?	59	4	 <p>93.7%</p> <p>● yes ● No</p>
8	Would you like to add any extra functions in this zone?	36	27	 <p>57.1%</p> <p>42.9%</p> <p>● Yes ● No ● If not, please explain.</p>

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