Empowered by Design

Student Projects for the Charlie and Harriet Shaffer Cognitive Empowerment Program (2018-2023)

Cognitive Empowerment Program

EMORY UNIVERSITY

Georgia Tech | College of Design

SimTigrate Design Lab

Index

Introduction

Georgia Tech joined forces with Emory University's Brain Health Center to launch an innovative research and therapeutic program for people living with mild cognitive impairment (MCI) with a significant gift from The James M. Cox Foundation and Cox Enterprises, Inc. This program is called the Charlie and Harriet Shaffer Cognitive Empowerment Program.

Starting in 2018, during the early stages of planning, the SimTigrate Design Lab at Georgia Tech began facilitating collaborative projects between people living with MCI and Georgia Tech students to develop solutions to improve the quality of life of people living with MCI. These collaborations resulted in many truly innovative projects, a small sample of which we highlight here. The goal of this report is to share the valuable lessons we have learned working with this population to support future efforts.

CEP x SimTigrate

A History of Collaboration

From the very beginning, people with MCI and their families embraced the opportunity to work with the student teams to share their lived experiences and aspirations for how they can maintain a good quality of life despite MCI. In the Spring semester of 2018, Professor Herb Velazquez had student teams from his industrial design studio course focus on exploring the needs of people living independently with MCI, to help understand the kind of programming that would be beneficial. These wonderful people came to the GT campus to speak to the classes and invited students into their homes for data collection, observing how their spaces work for them.

A patient and family advisory board (PFAB) was convened to ensure that people with MCI and their care partners would co-design the therapeutic programming and the space where it would be housed. Working with the PFAB we adopted a vision for the Charlie and Harriett Shaffer Cognitive Empowerment Program as a living laboratory for revolutionizing the experience of people facing cognitive changes by creating an evidence-based empowerment model that can be nationally and internationally replicated.

Program Structure

The program is structured around four cores: Therapeutic, Technology, Built Environment and Innovation Accelerator.

The four cores reflect the CEP's mission: empowering people facing cognitive changes by co-creating a sustainable learning community that promotes joy, purpose, brain health, and wellness through innovation and personalized lifestyle programs, technologies, and physical environments.

The Innovation Accelerator core, led by the SimTigrate Design Lab, facilitates academic, clinical, industry, and student research that explores ways to help people living with mild cognitive impairment and their care partners improve quality of life and the lived experiences of people with cognitive impairments.

The Charlie and Harriett Shaffer Cognitive Empowerment Program opened its doors to the first two cohorts of members in January 2020. We engaged members and care partners in research through participation in weekly Think Tank sessions where they had the opportunity to meet with researchers directly. The program switched to being delivered virtually from April 2020 through May 2021, but student teams continued to work on projects for the CEP, meeting with members remotely to get their input and feedback.

The Innovation Accelerator aimed to educate students on MCI, provide guidance on how to respectfully interact with members, and support recruitment into research activities. The overriding principle of these projects has been to use participatory research methods and when possible, incorporate co-design. The solutions that are explored and the process of collaborative design itself are intended to promote member empowerment.

The Alzheimer's Association estimates that between 12 to 18% of people over 60 years old are living with Mild Cognitive Impairment. It is a neurological condition characterized by slight but noticeable changes in cognitive abilities such as memory, language, attention, and executive functioning. These changes in cognition are more than what's considered to be normal for aging. People with MCI often face difficulties with Instrumental Activities of Daily Living such as planning, decision-making and task sequencing capabilities. Primarily due to the reduced capacity for cognitive load in people with MCI, researchers have observed difficulties in visual-spatial abilities, psychomotor skills, and safety.

MCI also presents obstacles in maintaining social interactions due to impairments in memory, communication, and decision-making. While MCI can sometimes be a precursor to more serious cognitive decline like Alzheimer's disease or other forms of dementia, only one third of people with MCI will progress to these conditions within five years.

Project Themes

86 projects were completed across 10 various GT courses, all focusing on a broad range of issues.

This report only covers the projects completed by Georgia Tech students; the CEP also supported 13 seed grant projects and numerous internal research projects which are not included in this document.

We have selected 8 themes to highlight in this report: Lighting, Sleep, Cooking, Wayfinding, Social Engagement, Keeping Track of Objects, Management and Reminders, and Vitality. These topics were frequently explored by students because of their importance in daily life, and task complexity that often poses challenges for those with MCI. A full list of all the projects by class is provided in Appendix A followed by a full list of all the projects by topic.

Through these projects, we were able to identify best practices for creating innovative solutions for those aging with MCI. Students were directed to focus on innovations that can greatly increase individual autonomy, reduce dependence on care partners, and contribute positively to their quality of life. For example, being able to cook a meal independently also brings members a sense of satisfaction, which often goes a long way toward improving their mental health.

Key Design Themes

Keep it simple

Use intuitive interfaces

Integrate solutions into daily life

Support personalization

Build in flexibility for changing needs

Provide right information to the right person

Respect the user, focus on destigmatization

Maintain privacy and autonomy

Don't forget about joy!

Disciplines

Architecture

Industrial Design

Biomedical Engineering

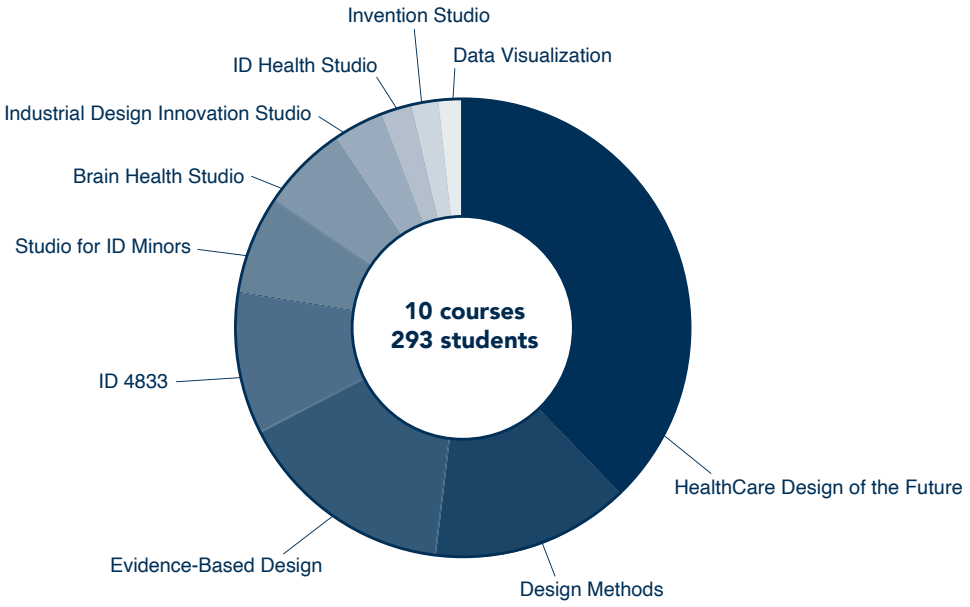
Industrial & Systems Engineering

Human Computer Interaction

Psychology

Computer Science

86 Total Projects



Lighting

In addition to the visual quality of light, there are important nonvisual effects of light.

Light is the primary factor in regulating our circadian rhythm. People with MCI may not spend much time outdoors and therefore do not receive enough natural light. Bright light therapy can provide direct exposure to the proper quality of light, helping to reduce sleep and mood disorders which are common in those with MCI. Proper color temperature light is also correlated with enhancing cognitive performance. Blue-toned light is appropriate in the morning with white light throughout the day to activate alertness and attention.

Student research explored how lighting can also be used as a tool around the home. Proper task lighting aids focus and concentration during task completion and eliminates distracting shadows. This is helpful to those with slower cognitive performance as well as aging eyes that require more light.

Referencing such research, Georgia Tech students created design solutions that implement intentional lighting into the lives of those with MCI.

Common project focuses were bright light therapy devices, in-home lighting systems that connect to apps, intentional task lighting, and lights for comfort and relaxation.

“Luminaire” (Figure 1) found a creative way to integrate bright light therapy technology into a home decor object. This product is a mirror-like surface that can be installed in the most convenient location for each user. It has customized features to match the home design, setting it apart from other medical or therapeutic device aesthetics. The light turns on automatically at programmed times to provide the user with lighting therapy at the appropriate times of day.

“Chef System” (Figure 2) focused on improving lighting to support independence in the kitchen. The team found that ambient lighting casts shadows that make it difficult to see and distract from task performance in the kitchen, where focus and attention to detail is required. This team designed a task lighting system that is connected to an app that illuminates different areas of the kitchen based on the steps taken while cooking.

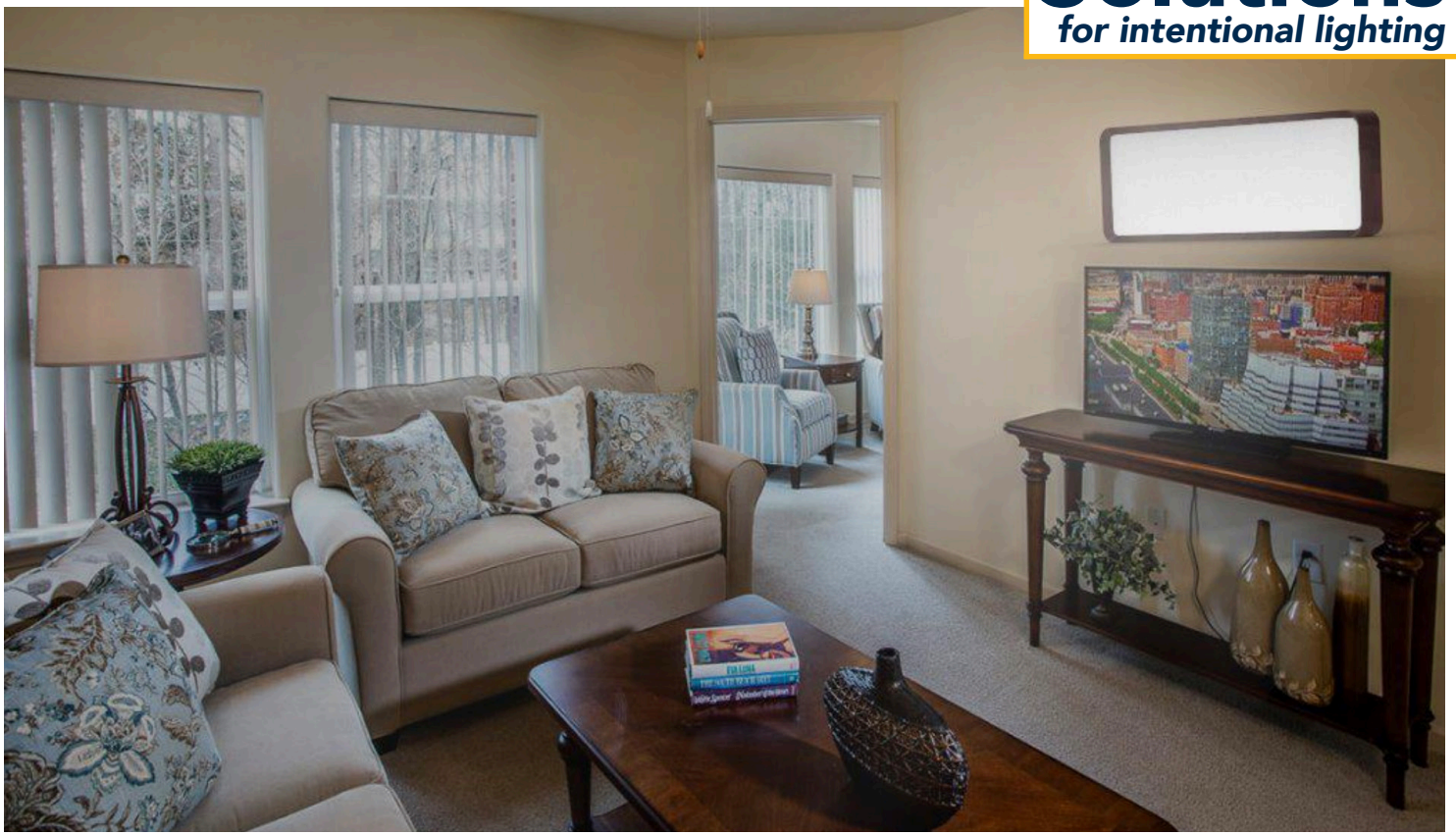


Figure 1: Luminaire’s integrated bright light therapy design with customized finishes

The “Nature Console” (Figure 3) used light to support mood during hospitalization. The concept incorporates lights to reduce stress and increase relaxation for people with MCI during an inpatient stay. Through remote-controllable system settings, the hospital room would transform into different ambient environments. Features included morning and evening lighting color options and system projections, such as clouds or stars.

Figure 2: Chef System’s guided task lighting for the kitchen

Figure 3: The Nature Console’s immersive hopital lighting and sound experience

Sleep

Sleep is essential to good health and has a significant impact on mood, arousal, alertness, and attention throughout the day.

Sleep disruption can be attributed to factors such as high stress, anxiety, and frequent nighttime trips to the bathroom that older individuals with MCI tend to experience. Inadequate sleep can disrupt an already compromised memory consolidation, as well as other cognitive functions that are regenerated during deep sleep. Environmental factors such as lighting and noise also have a big impact on sleep quality. Bright light exposure in the morning helps establish wakefulness while lower levels of red/amber color light are appropriate in the evening to support sleep by promoting melatonin production. Additionally, students investigated studies revealing that those who listened to white noise while falling asleep had better overall sleep scores and decreased levels of the stress hormone, cortisol. New studies even show that certain audio features have been found to enhance memory formation. These positive lighting and noise features have been integrated into student designs to increase the quality of sleep health for those with MCI.

Solutions
for improved sleep

Georgia Tech students explored a large variety of factors that would aid sleep for those with MCI.

Common themes were improving sleep through calming bedside lights, specific music or white noise features, and apps that track sleep data.

One student group focused on resolving poor sleep that individuals with MCI experience in stressful hospital settings through their project, “Dozz” (Figure 4). They designed a tablet interface to be used at hospital bedsides that offers four different white noise types with tailored volume selection, duration settings, and gradual sound introduction to provide patients with a better sleep-wake cycle and an overall positive healthcare experience.

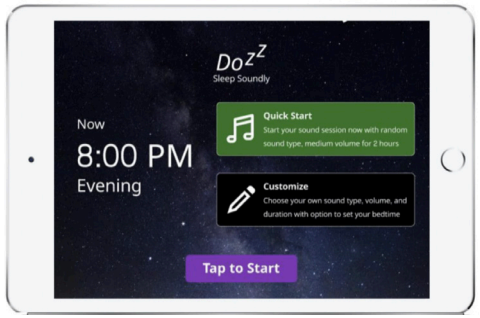


Figure 4: Dozz’s strategic interface design with dark background, time awareness, intuitive icons, large font, and task reminders

Figure 5: Sun and Moon bedside light with sleep aiding abilities

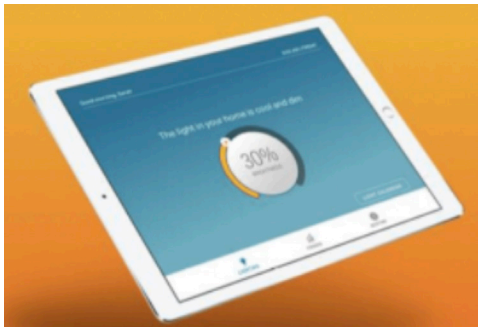


Figure 6: Luma app interface featuring light temperature data

Another project, “Sun and Moon” (Figure 5), is an assistive bedside light that promotes a more calming sleep environment. The light changes color temperature to aid circadian rhythms. It also connects to an app that poses a series of questions regarding sleep quality in relation to the light environment. Additionally, it helps users keep a schedule of daily activities that encourage happy and active lives.

“Luma” (Figure 6) focused on sleep tracking through an app interface. The device and connecting app automatically sets the optimal light temperature for nighttime to aid sleep and melatonin production. It also adjusts the light intensity in the users’ home, tracks their daily light temperature exposure goals, and sets a bedtime schedule. The system leverages the entire home environment to create better sleep for the user.

Cooking

In exploring kitchen environments and cooking activities, several challenges significantly impair individuals' ability to cook safely and efficiently.

Due to cognitive limitations, people with MCI often encounter memory challenges that lead to forgotten recipe steps or missing ingredients. The necessity for multitasking exacerbates issues with attention and concentration, increasing the risk of kitchen accidents such as leaving the stove on or sustaining minor injuries. These incidents not only cause physical harm but also induce stress, discomfort, and a lack of confidence in the kitchen. Impairments in executive function complicate the planning and preparation of nutritious meals and require older adults to need assistance. Visual-spatial challenges hinder navigation around the kitchen and the accurate measurement of ingredients. Additionally, declines in psychomotor skills slow physical actions such as chopping and stirring, heightening the risk of cuts or burns. Addressing these difficulties through thoughtful modifications to the kitchen environment can significantly improve safety and autonomy, allowing individuals to engage more confidently in cooking activities. This not only positively contributes to their quality of life, but also brings a sense of satisfaction from maintaining culinary independence.

Solutions
for confident cooking

Due to the larger design scope pertaining to the kitchen environment, student teams approached solutions through the lenses of safety, the built environment, and cooking as a progressive process.

One student group studied the kitchen space and all the cognitive functions involved in preparing a meal. They then approached their design solution from the perspective of the built environment. Upon analyzing accessible kitchen features and speaking with industry experts, they proposed design strategies that enhanced efficiency with the kitchen layout (Figure 8), ensured there were enough visual cues (Figure 7) to help people with MCI function independently, and evaluated the kitchens' capacity to integrate future smart technology. The proposals had an emphasis on safety through design.

One industrial design student team innovated a multipurpose workstation, "Curio" (Figure 9), that could function as a standalone unit for one person or could be assembled in a modular fashion for a training kitchen (see Figure 9). The

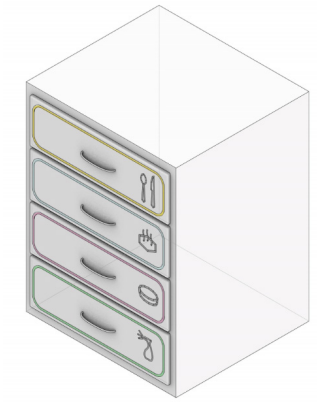
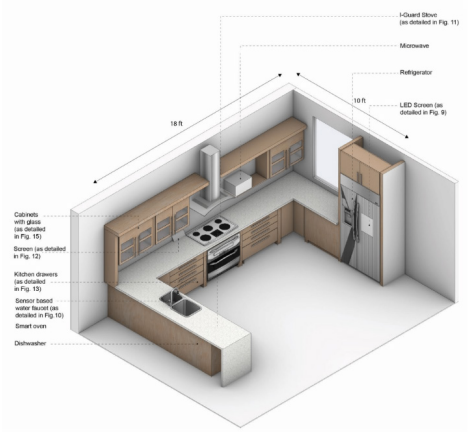


Figure 7: Engraved Kitchen Drawers



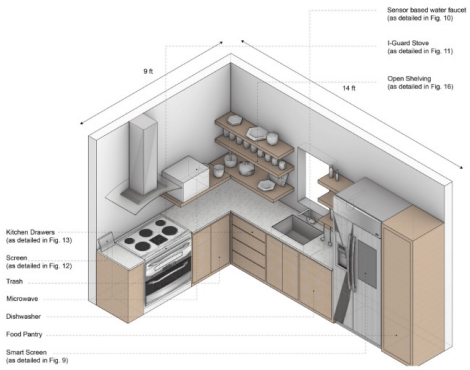


Figure 8: L-shaped and U-shaped kitchens

Figure 9: Curio features and working prototype

cooking station featured integrated cabinets, drawers, a stove, pantry, and a washing-section. There was also a space for a tablet computer with a minimalistic application to guide members through the cooking process. The student team created a working prototype, which was positively received among members at the CEP who had a chance to use it.

The kitchen is an ideal environment to provide members with a sense of empowerment and independence.

A mix of architecture and industrial design students came up with a meal-prep package, “Food for Thought” (Figure 10), that delves into technology in food management. The team acknowledged the sense of satisfaction that comes from having successfully cooked a meal, further establishing that the kitchen is an ideal environment to provide members with a sense of empowerment and independence.

They identified three different tiers of needs for members based on the severity of their diagnosis and noticed that there are already products with varying levels of work needed to cook a meal. Their proposed system would involve a nutritionist who could customize the packages on a weekly basis depending on the user’s needs and preferences. The result is a product that provides a balanced diet alongside cognitive stimulation.

In another approach towards smart technology and assistants,

Figure 10: Food for Thought food package tiers

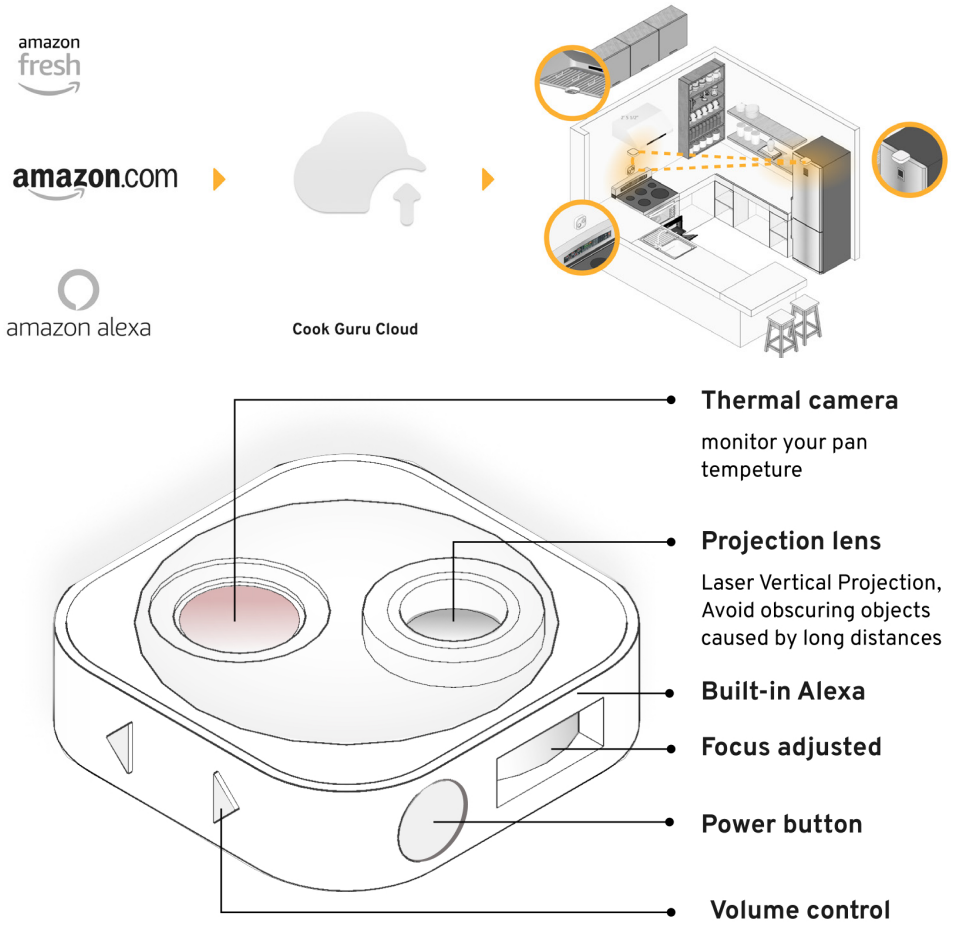


Figure 11: Cook Guru home system

one student group formulated a prototype for a voice-activated assistant for the kitchen. Their “Cook Guru” (Figure 11) featured an interactive projector that could show the members their recipes, notes, and other information. The device also had integrated heat sensors to monitor cooking temperatures, a voice-activated assistant, and other lifestyle features. These devices could be installed anywhere in the kitchen, and even be used in conjunction with multiple devices (should the user need more aid). These products aimed to help people with MCI age-in-place and cook independently.

Wayfinding

Navigating the world around us is more than a convenience—it's essential for maintaining an active, independent life.

Wayfinding underscores the necessity of designing environments that aid in navigation without being overwhelming or overstimulating for those facing cognitive challenges. Studies conducted by Georgia Tech students reveal that memory lapses, along with impaired language, spatial comprehension, reasoning, and judgment, complicate the ability to move through both familiar and unfamiliar spaces. Their findings recommend environments that feature direct visual pathways with minimal turns, clear landmarks, and distinctive layouts. Moreover, preferences emerged for environments that are well-lit and incorporate natural elements, with clear signage and variations in color, lighting, and space to help differentiate areas. The feedback from care partners highlights a significant demand for intuitive design in aids and applications, ensuring effective communication and better navigation support. These navigation elements improve daily experiences for individuals with cognitive challenges and set the stage for groundbreaking solutions that embrace simplicity and clarity in design.

Solutions
for intuitive wayfinding

Georgia Tech students envisioned wayfinding to be more accessible and inclusive.

Prior to opening, a team of students examined the CEP layout and the likely schedules of the members to create a network of unidirectional pathways branching from a 'hub' to simplify wayfinding. They developed a color-coded signage system to help individuals recognize their location and find the simplest path to their destination (Figure 12). By minimizing the amount of information presented, the system effectively simplifies wayfinding for individuals with cognitive impairments. The team proposed that these signs be suspended from the ceiling or placed in other distinctive, yet non-intrusive, locations to ensure visibility without overwhelming the surroundings.

One student team delved into the architectural dimension of wayfinding by engaging in discussions with specialists to gain a comprehensive understanding of wayfinding in relation to cognitive health. This effort resulted in a compilation of design recommendations for upcoming projects and a thorough evaluation checklist for current or renovation-bound projects. They applied this concept by assessing the Cognitive Empowerment Program with their checklist (Figure 14), offering design enhancements to better accommodate individuals with MCI within the facility.

Designed to aid individuals in navigating their local areas, "WayHome", an application that could be integrated into a smartwatch (Figure 13), was developed by another student group. The primary goal was to bolster the confidence of members in their environment, ensuring they have the means to return to a secure location or their homes at the press of a button. This application also facilitates connection with the care partner's mobile device, enabling the monitoring of the individual's location and providing a way for the partner to initiate contact if necessary. To further simplify use and enhance focus on the environment during extended walks, the group suggested the option of an athletic wristband as an alternative to the smartwatch, aimed at minimizing distractions and conserving battery life.

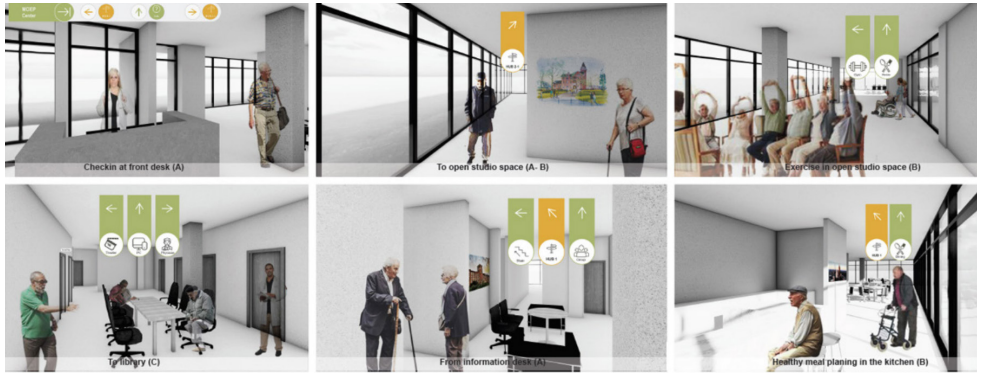
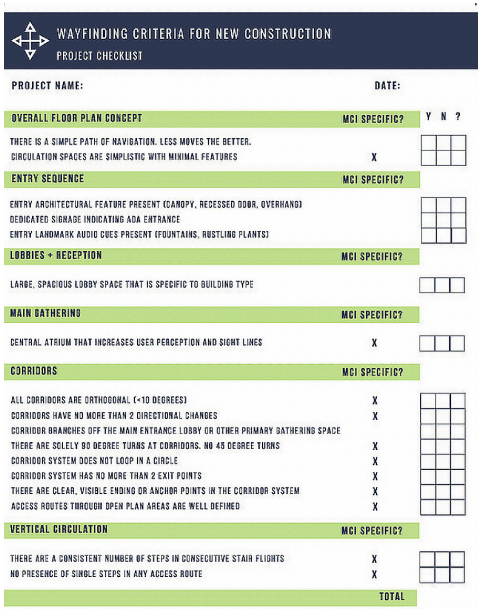


Figure 12: Signage system with directions

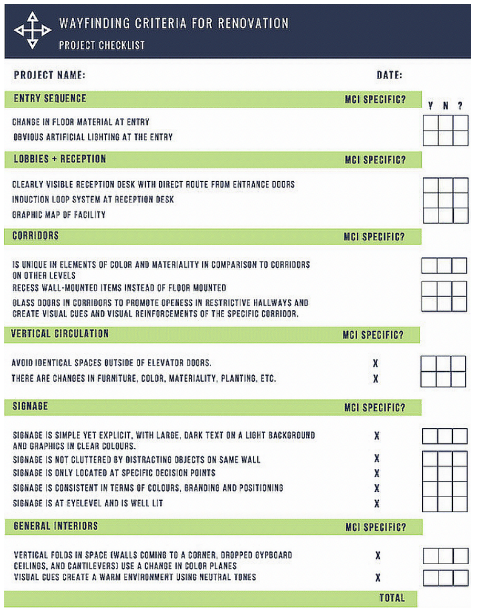
Figure 13: WayHome app and smartwatch



WAYFINDING CRITERIA FOR NEW CONSTRUCTION
PROJECT CHECKLIST

PROJECT NAME: DATE:

		Y	N	?
OVERALL FLOOR PLAN CONCEPT	**MCI SPECIFIC?**			
THERE IS A SIMPLE PATH OF NAVIGATION. LESS MOVES THE BETTER.				
CIRCULATION SPACES ARE SIMPLISTIC WITH MINIMAL FEATURES	X			
ENTRY SEQUENCE	**MCI SPECIFIC?**			
ENTRY ARCHITECTURAL FEATURE PRESENT (CANOPY, RECESSED DOOR, OVERHANG)				
DEDICATED SIGNAGE INDICATING ADA ENTRANCE				
ENTRY LANDMARK AUDIO CUES PRESENT (FOUNTAINS, RUSTLING PLANTS)				
LOBBIES + RECEPTION	**MCI SPECIFIC?**			
LARGE, SPACIOUS LOBBY SPACE THAT IS SPECIFIC TO BUILDING TYPE				
MAIN GATHERING	**MCI SPECIFIC?**			
CENTRAL ATRIUM THAT INCREASES USER PERCEPTION AND SIGHT LINES	X			
CORRIDORS	**MCI SPECIFIC?**			
ALL CORRIDORS ARE ORTHOGONAL (<10 DEGREES)	X			
CORRIDORS HAVE NO MORE THAN 2 DIRECTIONAL CHANGES	X			
CORRIDOR BRANCHES OFF THE MAIN ENTRANCE LOBBY OR OTHER PRIMARY GATHERING SPACE				
THERE ARE SOLELY 90 DEGREE TURNS AT CORRIDORS. NO 45 DEGREE TURNS	X			
CORRIDOR SYSTEM DOES NOT LOOP IN A CIRCLE	X			
CORRIDOR SYSTEM HAS NO MORE THAN 2 EXIT POINTS	X			
THERE ARE CLEAR, VISIBLE ENDING OR ANCHOR POINTS IN THE CORRIDOR SYSTEM	X			
ACCESS ROUTES THROUGH OPEN PLAN AREAS ARE WELL DEFINED	X			
VERTICAL CIRCULATION	**MCI SPECIFIC?**			
THERE ARE A CONSISTENT NUMBER OF STEPS IN CONSECUTIVE STAIR FLIGHTS	X			
NO PRESENCE OF SINGLE STEPS IN ANY ACCESS ROUTE	X			
	TOTAL			



WAYFINDING CRITERIA FOR RENOVATION
PROJECT CHECKLIST

PROJECT NAME: DATE:

		Y	N	?
ENTRY SEQUENCE	**MCI SPECIFIC?**			
CHANGE IN FLOOR MATERIAL AT ENTRY				
OBVIOUS ARTIFICIAL LIGHTING AT THE ENTRY				
LOBBIES + RECEPTION	**MCI SPECIFIC?**			
CLEARLY VISIBLE RECEPTION DESK WITH DIRECT ROUTE FROM ENTRANCE DOORS				
INDUCTION LOOP SYSTEM AT RECEPTION DESK				
GRAPHIC MAP OF FACILITY				
CORRIDORS	**MCI SPECIFIC?**			
IS UNIQUE IN ELEMENTS OF COLOR AND MATERIALITY IN COMPARISON TO CORRIDORS ON OTHER LEVELS				
RECESS WALL-MOUNTED ITEMS INSTEAD OF FLOOR MOUNTED				
GLASS DOORS IN CORRIDORS TO PROMOTE OPENESS IN RESTRICTIVE HALLWAYS AND CREATE VISUAL CUES AND VISUAL REINFORCEMENTS OF THE SPECIFIC CORRIDOR.				
VERTICAL CIRCULATION	**MCI SPECIFIC?**			
AVOID IDENTICAL SPACES OUTSIDE OF ELEVATOR DOORS.	X			
THERE ARE CHANGES IN FURNITURE, COLOR, MATERIALITY, PLANTING, ETC.	X			
SIGNAGE	**MCI SPECIFIC?**			
SIGNAGE IS SIMPLE YET EXPLICIT, WITH LARGE, DARK TEXT ON A LIGHT BACKGROUND AND GRAPHICS IN CLEAR COLOURS.	X			
SIGNAGE IS NOT CLUTTERED BY DISTRACTING OBJECTS ON SAME WALL	X			
SIGNAGE IS ONLY LOCATED AT SPECIFIC DECISION POINTS	X			
SIGNAGE IS CONSISTENT IN TERMS OF COLOURS, BRANDING AND POSITIONING	X			
SIGNAGE IS AT EYELEVEL AND IS WELL LIT	X			
GENERAL INTERIORS	**MCI SPECIFIC?**			
VERTICAL FOLDS IN SPACE (WALLS COMING TO A CORNER, DROPPED GYPSCARD CEILINGS, AND CANTILEVERS) USE A CHANGE IN COLOR PLANES	X			
VISUAL CUES CREATE A WARM ENVIRONMENT USING NEUTRAL TONES	X			
	TOTAL			

Figure 14: Wayfinding criteria checklist

Social Engagement

Maintaining social connections is pivotal for enhancing emotional well-being and slowing cognitive decline.

Navigating social interactions with MCI presents significant challenges due to impairments in memory, communication, and decision-making. Research shows that MCI often disrupts important relationships, exacerbating isolation and depression. Thus, enhancing social connectivity is vital for supporting independence and improving life satisfaction by increasing cognitive stimulation, emotional stability, and maintaining community connections. Effective social engagement strategies highlighted by the students include integrating supportive technologies and interventions into daily routines. Providing emotional support and reducing feelings of loneliness are also essential. Furthermore, educating families and communities about MCI helps preserve and strengthen relationships.

Personalization of these tools allows for self-expression, boosting confidence in social settings. This holistic approach aims not only to improve the quality of life for those with MCI, but also lays the groundwork for innovative social engagement solutions. Student research and designs promise a more connected future for individuals managing MCI.

Solutions
for maintaining social engagement

Solutions to improving social engagement have taken a variety of forms ranging from the design of electronic devices, booklets that guide discussions, applications that structure interactions, and the design of built environments.

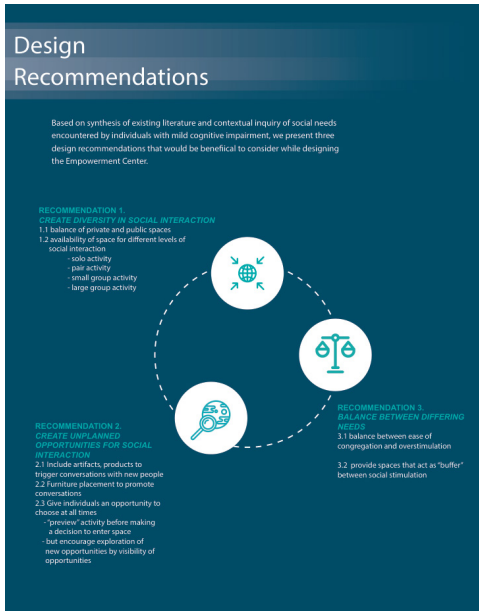


Figure 15: Set of design recommendations to enhance social engagement for members of CEP

Figure 16: An assessment of the cafeteria in terms of social engagement, with closing comments

One student team developed design recommendations (Figure 15) to support increased social interaction at the CEP based on evidence-based design. Their project included specific goals and an assessment of how well different spaces met those goals (Figure 16).

Others focused on addressing the anxiety and uncertainty that people feel following a diagnosis of MCI. The core idea is that after the diagnosis, the "100 Days" kit (Figure 17) is handed to the couple to provide them with a guide to progress along their new journey together. It serves as a tool to aid communication, interaction, and routine, and facilitates interconnectedness between the pair. The kit also includes more information about MCI, as well as activities that the couple could do together to enhance their quality of life.

Another project, "TalkAssist" focused on helping people with MCI maintain connection with their long-distance friends and family through technology. The students developed the user interface design (Figure 18) for a tablet that would serve as a phone for the members. They created a prototype to satisfy each of the members needs individually, utilizing simple and intuitive interface features. "TalkAssist" also includes sets of flashcards for the target population that facilitate meaningful interactions between members and people from any age group or audience, extending communication beyond just the internal CEP community.

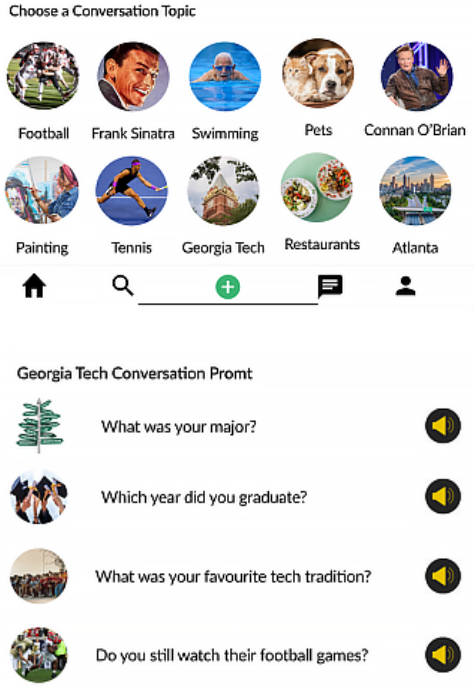


Figure 18: TalkAssist UI sequence aimed to aid in meaningful interaction among members

Figure 17: The "100 Days" kit contains educational and supportive materials for the person with MCI, the care partner and for the member.

Keeping Track of Objects

People with MCI may have difficulties remembering where they placed everyday items, causing dependency, frustation, and a lack of confidence in their day-to-day lives.

Conversations with members revealed insight into the complexity of designing solutions that address needs without stigmatizing the user. Lower order needs involved addressing lapses in memory, decision making, and complex/ multi-step task sequencing. The higher order needs of avoiding stigma require careful consideration of the emotional experiences of proposed solutions, which is necessary to assess their usefulness and practicality. Interviews and observations of members solidified that ego and esteem are a higher priority to the MCI population than the lower order needs of keeping track of objects. However, both needs could be met through inconspicuous, integrated designs that keep track of objects while reducing stigmatization surrounding memory issues.

Solutions
to keep track of objects

Student designs typically take one or both primary approaches: storage solutions or location tracking systems.

The first category focuses on keeping an active inventory of items. This design direction encourages proactive storage and organization to prevent the user from losing track of their frequently used items. The second category facilitates the tracking of lost or difficult to locate objects. These designs aim to help those with MCI track down essential items with the use of simple and intuitive devices. These devices could be used to locate everyday items such as a wallet, keys, or any other item that may be frequently misplaced.

One student solution is a system called “Psynosure”, which includes an LCD (illuminated display) embedded in a picture frame, a personal item tray, and a medicine organizer (Figure 19). The illuminated display acts as an information hub and gives reminders which can only be accessed via facial recognition through the integrated camera, keeping the reminders invisible to visitors. This camera is activated while the user is taking

Figure 19: Psynosure, information hub and trays

the medication so that the care partner can confirm that the proper medication was taken. The tray uses a pressure sensor and RFID tag reader to recognize the paired items and has lights that can point the user in the right direction to find lost items if they are not left on the tray.

Another solution, “ColorBlock”, uses a cubby system which gives the user a visual inventory of their items (Figure 20). It draws the user’s attention with the use of visual aids such as splayed out sections, prompting the user to place their item in its designated cubby as soon as they walk through their door.

Another design, “Aura”, takes the form of a multimodal product ecosystem. The system utilizes WiFi connection and a correlating app to control the devices. The visual aesthetics of the three products are cohesive, allowing the system to seemlessly match any home decor. The individual components include a weather device with a display screen for reminders (Figure 21), a portable bluetooth chip which can be attached to frequently used items (Figure 22), and a tray that pairs with the chip to help with locating such items (Figure 23).

Figure 21: Aura, weather display device

Figure 22: Aura, portable alert device

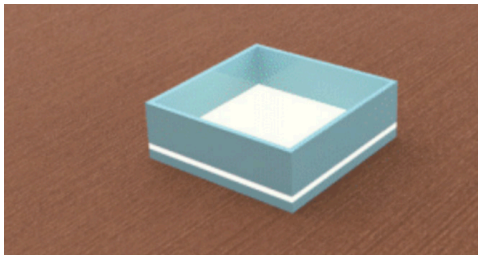


Figure 23: Aura, weight sensing “landing pad”

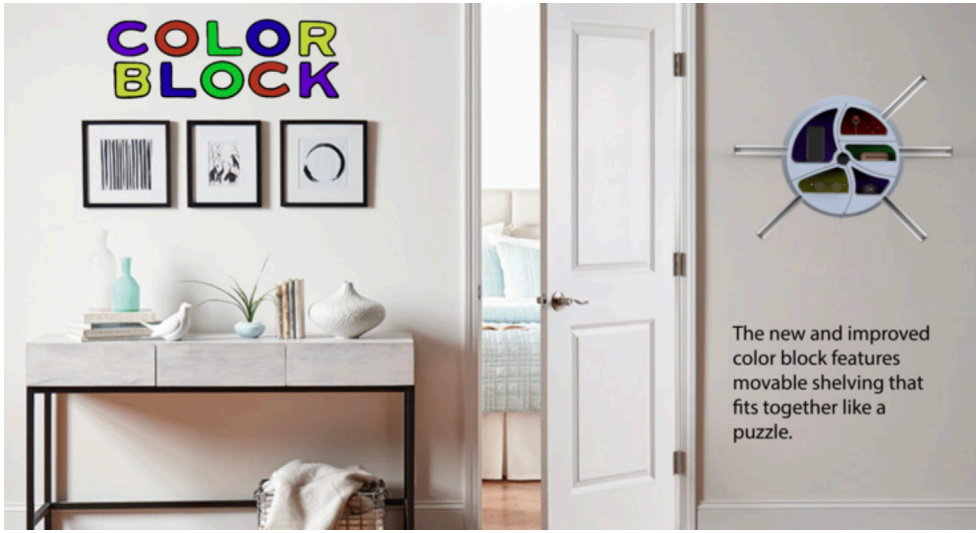


Figure 20: ColorBlock cubby system.

Management & Reminders

Reminders play a pivotal role in planning and management, serving as specific prompts or notifications to highlight important events or tasks at designated times.

For people with MCI, the process of organizing and scheduling daily to monthly tasks can seem daunting. This can include ensuring doctor appointments and medication adherence, both of which are crucial to one's health.

Through their research, Georgia Tech student teams discovered a wide-range of solutions for individuals with MCI, encompassing apps, devices, and wearables. Apps were found to enhance cognitive functions through stimulating activities and reminders, while devices provided assistance with daily tasks, medication management, and safety monitoring. Wearables, such as smartwatches, offered continuous health tracking and real-time feedback, enabling proactive interventions. Mock-ups played a crucial role in visualizing potential solutions, allowing for user feedback and iteration before final solutions were developed. These findings highlight the potential of technology to enhance the quality of life and independence of individuals with MCI.

Design aspects consisted of integrated technology, assistive interactions, and intuitive interfaces that all provide simple management solutions.

A team of students from Georgia Tech created a physical device named the “Companion Robot” (Figure 24), which interfaces with their Guardian App. Together, they are designed to address the physical and mental needs around the home environment for older individuals living with MCI. Crafted as a companion, the robot supports daily routines by reminding users of medication schedules, delivering essential items such as food and medicine, and providing nighttime illumination for safety.

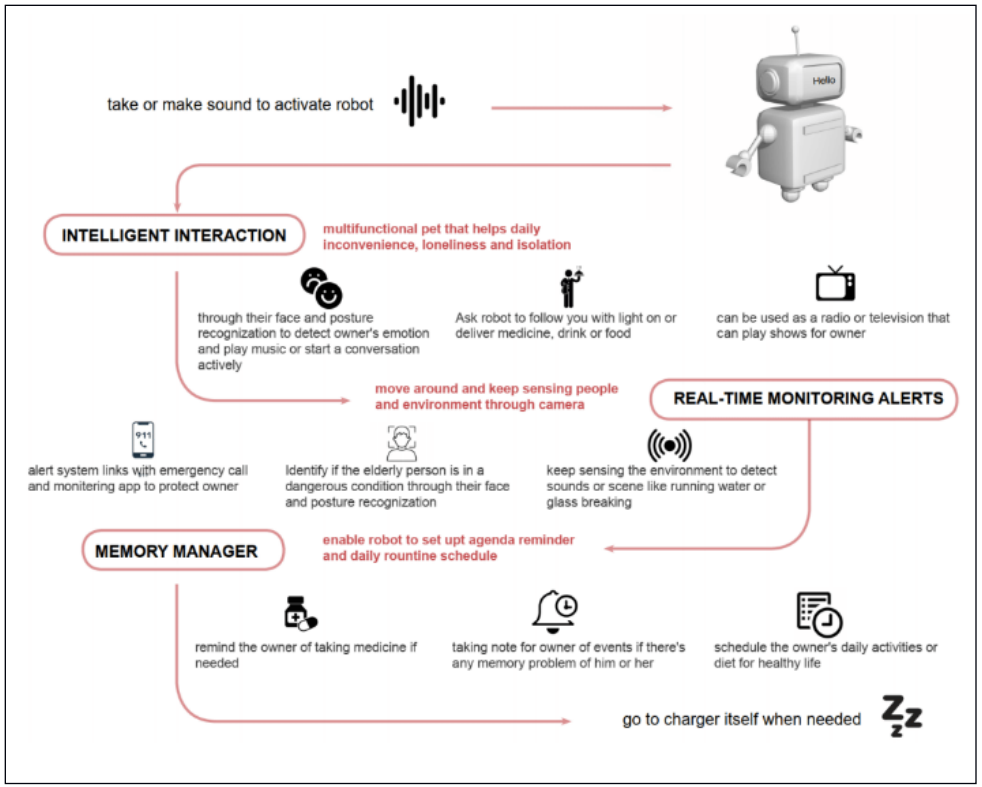


Figure 24: Companion Robot usage flow diagram

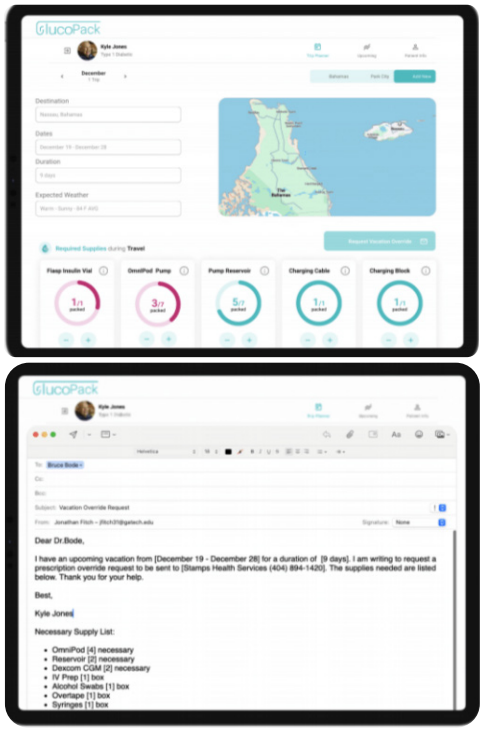


Figure 25: GlucoPack App Interface

Another team of Georgia Tech students resolved the struggle that older adults with Type 1 diabetes and MCI face packing and managing medication when traveling. Students developed the “GlucoPack Bag”, a comprehensive solution featuring an app and a physical bag, aimed at streamlining the packing experience for people managing diabetes. The app (Figure 25) creates a customized packing list based on the travel duration, destination, climate conditions, and medications. The design of the GlucoPack bag has integrated features for management and reminders (Figure 26). It caters to the varying requirements of diabetic travelers by offering adjustable storage space and provisions for preserving insulin vials at a consistent temperature, thereby guaranteeing their efficacy during the entirety of the trip.

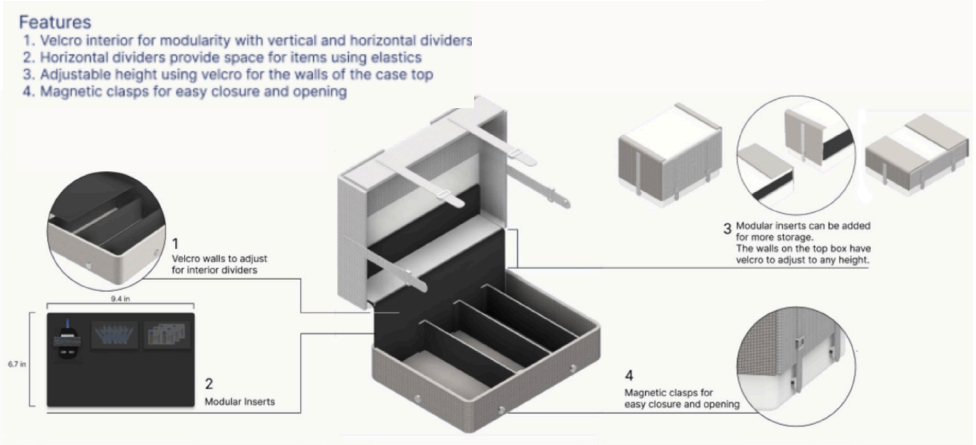


Figure 26: GlucoPack container features

Enhanced digital reminder applications take the stress out of planning and scheduling for those with MCI.

"Reminder Pro's" interface (Figure 27) features a simple home screen display, providing the date, time, product name, and access button, and is compatible with any digital device. Within the "Reminders" page, individuals with MCI will discover prompts for their daily tasks and scheduled events.

Users can input crucial reminders to aid in their cognitive functioning and routine management. These reminders are automatically linked to the "People Database" page if a familiar name is detected within the reminder, providing easier access to information about people they will soon interact with. This feature assists in recalling characteristics and relationships with important people in their lives and combats memory issues that may hinder these relationships.

Figure 27: Reminder Pro interface

Vitality

Empowering people living with MCI involves finding ways to help them understand and embrace new changes by continuing to perform hobbies and activities that bring them joy and meaning.

Challenges brought on by MCI do not diminish the ability to have an engaging life, as there are many avenues of interests an individual could explore to satisfy their need for fun and improve their state of well-being. Physical activities are effective in mitigating stress, depression, and loneliness often caused by MCI. Being physically active increases confidence and independence and creates a positive mood through the increased production of endorphins. Additionally, creative practices such as art, photography, and writing directly leads to increased expression of emotions, memory, well-being, social interaction, self-care, and motivation. Such self-expression can help circumvent the confusion and frustration that is often brought on by cognitive decline. This can bring feelings of purpose and connection with others. Any activity that can be done by individuals with MCI and their care partners together creates a bond that can bridge a gap of understanding and empathy. These research findings served as the motivation behind many Georgia Tech student projects that focused on bringing joy to those with MCI.

Projects that centered around vitality had themes of implementing enjoyment, community, and expression into design solutions.

Students designed an application to facilitate self-expression and enhance social engagement among individuals with MCI and care partners through therapeutic activity. “Post Art” (Figure 28), a program designed to allow CEP members to create postcards and share them with care partners, satisfies the need for a collaborative art application. The app uses prompts that focus on memories and storytelling, which was found to be the most comfortable and approachable means of communicating ideas for CEP members.

Another group of students created a colorful electronic xylophone that served as a fun and interactive activity for CEP members. The xylophone is programmable through a mobile app, in which the user can pick a variety of songs. “Xyla” (Figures 29-31) provides mild physical activity and a musical outlet for those with MCI.

Figure 28: Create Board of Post-Art application

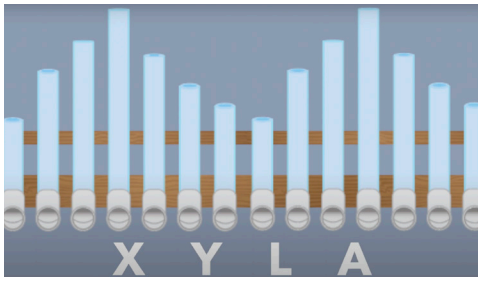


Figure 29: Xyla Logo

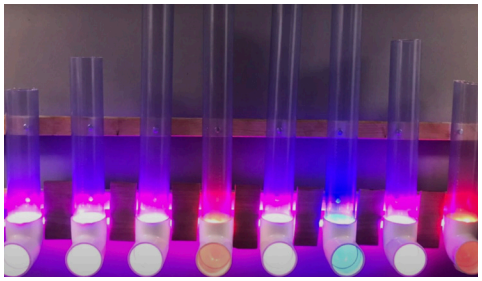


Figure 30: Xyla showcase of various colored lights

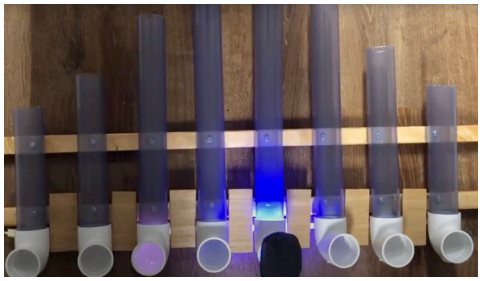


Figure 31: Screenshot of in-game action of the song ‘Amazing Grace’

Appendix A: *List of Projects by Class*

ID 3032 Brain Health Studio (Spring 2018)
Professor: Herb Velazquez

100 Days
Student Team: Valerie Koh, Abigail Tan, Belinda Zhang

ADAM
Student Team: Ariana Olalde, Daniel Charanis, Amy Virasak, Matt Schoonover

Aura
Student Team: Baylor Ward, May Iyer, Anna Taute, Kelsie Thomas

Psynosure
Student Team: Jenna Hollington, Anisha Matharu, Michael Armstrong, Cameron Chartier

ID 4071 Industrial Design Innovation Studio (Fall 2018)
Professor: Herb Velazquez

Curio
Student Team: Eugie Song, Abby Tan, Belinda Zhang, Stephen Wang, Angela Kim

Google Home Sous
Student Team: Dana Palacio, Leah Slepian, Jason Kim, May Iyer, Sung Hyun Jang

ARCH 6243 Evidence-Based Design (Spring 2019)
Professors: Craig Zimring, David Cowan

A Feasibility Study and Proposal for Using a Physically Interactive Video Game in the Mild Cognitive Impairment Empowerment Program
Student Team: Rachael LeRoux, Sarah Perlin, Amiri Savage

Correlation of Visual Spatial Memory with Built Environment: For patients with Mild Cognitive Impairment
Student Team: Jin Yu, Shilpa Mehta

How Meditation can Benefit MCI Fellows and Care Partners
Student Team: Jessica Van Duyne

Improving Personalization of MCI Interventions
Student Team: Renee Puvvada, Arshawn Mohseni

Increasing social interaction of individuals with MCI through evidence-based design of Emory Empowerment Center
Student Team: Susan Lee, Ethan (Jung Min) Cha, Tia Calhoun

Let There Be Light
Student Team: Annlea Anderson, Seong Hwan Park, Hailey Avis, Lynn Belhumeur, Meiyi Guo

The Role of Habits and Technology is IADLs
Student Team: Bianca Copello, Jin Noh

Wayfinding + MCI
Student Team: Collin Grill, Emily Khalid, Gwyneth Lando, Matthew Denig

ID 4833 Studio for ID Minors (Summer 2019)
Professor: Leila Aflatoony

Charles
Student Team: Jacob Selah Ware, Malone Gray Johnson, Sara Thomas Mathew

Differential Utensils
Student Team: Jacob Henry Cooper, Kyle Tolbert Mulholland, Nolan Lawrence Brown, Sydney Avalon Grell

Instructional Coffee Maker
Student Team: Unknown

Interactive Cutting Board
Student Team: Arleta Blake Underwood, Evan Thomas Parker, Madison Nicole Watts, Shireen Holly Hashemi

Lockermate: Wearable Assistant
Student Team: Bailey Griffin, Melissa Cosler, Brent Jackson, Nikole McLeish

Xyla
Student Team: Autumn Fields, Dustin Duy Nguyen, Haley Brooke Clark, Seo Jin Kim

ID 4833 Industrial Design Studio for Minors (Fall 2019)
Professor: Herb Velazquez

Design for Socialization
Student Team: Kristine Park, Mary Han, Susie Kim, Taft Kilpatrick, Tammy Vupham, Savannah Black

Appendix A

LEV
Student Team: Daniel Derochers, Gyeongtae Lyle Kim, Sungtae Kim, Jonathan Moon, Tommy Schmelzle

ID 6271 Healthcare Design of the Future (Fall 2019)
Professor: Craig Zimring, Leandro Tonetto, David Cowan

Digital Care Partner
Student Team: Jane Rodrigues, Vinita Kuhikar

Food for Thought
Student Team: Devanshi Kesaria, Chanjoo Kim, Bianca Shrestha, Daisy Yan

Making Care Easy
Student Team: Julie Harrison, Abby Kettle, Monica Magcalas

NaviCart
Student Team: Jonathan Hatley, Benton Humphreys, Maria Kopka

Recipe Process Tracking Organizer
Student Team: Caroline Kasmiskie, Hunter Perry, Erting Zhu

Reminder Pro
Student Team: Ishwar Ramnarine, Sharvari Tamhane, Rodrigo Tosaki

Responsive Driving Assistant
Student Team: Nourhan Alsayed, Evan Fowler, Sofia Safford, Justin Turner

Sleepcare
Student Team: Aditi Bharadwaj, Minji Kim, Rhea Laroya

The Signage "Hub" for MCI Fellows
Student Team: Yuhang Li, Jiahao Lyu, Mattew Mendez

Wayfinding Transportation Signage
Student Team: Carly Langsdorf, Tarek Sherif, Ryan Arrison

ID 4833 ID Minors Capstone (Summer 2020)
Professor: Leila Aflatoony

ArkStove
Student Team: Rachel Noh, Alivia Rukmana, Steve Sung, Karis Wang

CatWalk
Student Team: Raneem Rizvi, Nicole Woods, Aiza Shabbir, Ayesha Ahuja

Clockwise
Student Team: Aidan McGannon, Jaime Vera, Pedro Viera, Maripaz Rodriguez, Lily Sullivan

Eureka
Student Team: David Hounyo, Noah Longhi, Christian Manabat, Chuka Okolie, Nasif Wright

SmartGrow
Student Team: Gwen McGuire, Seoyong Park, O'Tejah McCreath Plummer, Thomas Thwaite

WayHome
Student Team: Asheton Arnold, Jennifer Kwak, Hope Kutsche, Owen Patterson, Dustin Minshew

ID 6271 Healthcare Design of the Future (Fall 2020)
Professor: Craig Zimring, Hermina Machry

Dozz
Student Team: Jay Xingjian Tao, Tanya Therathanakorn

Find the Way
Student Team: Byeonghyeon Cho, Melody Shellman

FineDine
Student Team: Rumka Gill, Katie Mueller, Danielle Temples

LightShade
Student Team: Raneem Rizvi, Michael Tang, Lauren Widjaja

LumiSafe
Student Team: Prerana Kamat, Sunny Kim

Remote Con-sole
Student Team: Emma Baubly, Eden (Heewon) Jeong

Support Starts with the Chair
Student Team: Ashley Baldwin, Paola Santiago

TalkAssist
Student Team: Aisha Abdullahi, Jessica Zhang,

Appendix A

Yeyang Gu
The Nature Console
Student Team: Tiffany Bouquet, Shalini Pandya

ID 4071 Invention Studio (Fall 2020)
Professor: Herb Velazquez

My CEP Social
Student Team: Bonnie Sun, Rebecca Sun, Mia Tomblin

Sun and Moon
Student Team: Jack Walz, Joseph Nixon

ARCH 4833|8833 Evidence-Based Design (Spring 2021)
Professor: Craig Zimring, Herminia Machry

Bright Light & MCI Symptom Research
Student Team: Tiffany Bouquet, Vitor Goncalves

Design of Shower zone for people living with MCI
Student Team: J Rodrigues, A Somasundaram

Evaluating Gardens for Effective Use
Student Team: Susanna Greiner, Amelia McLean

Home Environment for people living with MCI
Student Team: Dhruvi Zobaila

In-Home Bright Light Therapy Luminaire
Student Team: Grant Poteat, Kayt Dayton

Kitchen Designs for people with MCI
Student Team: Simran Bajaj, Monica Rizk, Sharvari Tamhane
Piedmont Park Design Proposal
Student Team: Leah Baldocchi, Greg Nye, Dylan Young

Positive Effects of Music on Sleep Quality
Student Team: Kanak Agarwal, Dustin Minshew, Tasha Snedaker

ID 3032 ID Health Studio (Spring 2021)
Professor: Wendell Wilson

Ambient Alerting
Student Team: Maggie Johnston, Scott Morgan, Rob Stout

Color Block
Student Team: Andrew Melissas, Andrew Scialabba, Morgan Drawdy

ID 4833 Special Topics: Collaborative Capstone Studio (Summer 2021)
Professor: Leila Aflatoony

In the Loop
Student Team: Hannah Nicole Fralick, Ashley Taylor Darling

Pill O'Clock
Student Team: Alyson Rose Riben, Jessie Liu, Matthew David Nuese, Maxx Ma

Caesera Bracelet
Student Team: Hannah P Takash, Surya Kaliki, Kelsey Chunju Watkins

Project 4
Student Team: Alexis Gutierrez, John Abraham Respert

ARCH 4803 Healthcare Design of the Future (Fall 2022)
Professor: Yousef Bushehri

All Aboard on Again in Place: The Light Rail Design for Aging in the Community
Student Team: Emily Mosbaugh, Elizabeth-Ann Turac, Paige Towler, Aleksandra Jelenkovic, Matthew Warrington

Bathroom Redesign
Student Team: Blaire Bosley, Mark Chan, Shaun Enwright, Grace Litter, Shreya Sachdeva

Chef System
Student Team: Annie Yining Chen, Sarah Grunert, Douglas Dillman, Alexandra Rachman, Ryan Stoddard

Multifunctional Meal Prep Station
Student Team: Smeya Shirly Deborah, Asia Falkner, Constance Norris Squirrell, Ann-Marie Sills, Jackie Zong

Promoting Self-efficiency and Independence in the Kitchen for People with MCI
Student Team: Zhiyong Kong, Hayoung Woo, Xinyue Zhang, Yue Zhu, Archi Shah, Priyanshi Manan Shah

Appendix A

Solutions to Reduce Cat-Related Falls of Aging Adults in the Home
Student Team: Katie Davis, Yulim Oh, Zhixuan Zhang, Francis LaRossa

ID 3320 Design Methods (Fall 2023)
Professor: Leandro Tonetto

Blanket
Student Team: Olivia Corp, Crystal Le, Sophia Toler, Stella Yancey

Dream Scents
Student Team: Ireoluwa Adaramola, Aditi Rao, Eva Duvaris, Adriano Bayz, James Bunting

Dreameasy
Student Team: Harry Ezenne, Aleksandra Jelenkovic, Connie Lee, Marika Misabishvili, Gabe Shafiq

Mindful Lantern
Student Team: Hamzah Alsalman, Ellie Finch, Megan Ramaswami, Sophia Wang, Vincent Zhu

Nyx
Student Team: Rohan Krishnan, Pedro Teitelbaum, Lucia Touma, Lisa DeLuryea

SnoozeTales
Student Team: Andrew, Amanda, Xinen Lyu, Xiaojum Xie, Peisen Zhao

Sunset
Student Team: Evan Deeny, Abby Ellison, Lena Konzelman, Micah Morris, Phoebe Shudt

Wind Down Routines
Student Team: Jace Walden, Madison DeBruin, Natalie Raya, Gerald Elam, Ryan Johnson

ARCH 6271 Healthcare Design of the Future (Fall 2023)
Professor: Yousef Busherhi

Age-Friendly Design Guideline & Assessment
Student Team: Claire Lin, Gayathri Dhurjati, Shuyan Xia

Aging with Diabetes
Student Team: Kenta Davis, Christina Feng, Jonathan Fitch

Fall Detection in the Elderly
Student Team: Aditya Jain, Nandini Dave, Surbhi Agrawal

Planting Ahead
Student Team: Chloe Van Nort, Kai Daurie, Cullen Whelan

Risks of Falls from Pets in the Aging Population
Student Team: Caitie Costello, Juliet Murphy, Mark Benedict Agunias

Robot Companions Mitigate Elderly Loneliness and Isolation Health
Student Team: Chunlan Wang, Cindy Jiang, Changda Ma

Solution to Provide Better Indoor Air Quality to Aging in Place
Student Team: Maryam Almaian, Juyoung Cho, Lynn el Khoury

Appendix B: *List of Projects by Topic*

Lighting

Alsalman, H., Finch, E., Ramaswami, M., Wang, S. & Zhu, V. (2023). *Mindful Lantern.* ID 3320 Design Methods.

Anderson, A., Hwan Park, S., Avis, H., Belhumeur, L. & Guo, M. (2019). *Let There Be Light.* ID 8900 Evidence-Based Design.

Bouquet, T. & Goncalves, V. (2021). *Bright Light & MCI Symptom Research.* ID 8803 Evidence-Based Design.

Bouquet, T. & Pandya, S. (2020). *The Nature Console.* ID 6271 Healthcare Design of the Future.

Kamat, P. & Kim, S. (2020). *LumiSafe.* ID 6271 Healthcare Design of the Future.

Langsdorf, C., Sherif, T. & Arrison, R. (2019). *Wayfinding Transportation Signage.* ID 6271 Healthcare Design of the Future.

Poteat, G. & Dayton, K. (2021). *In-Home Bright Light Therapy Luminaire.* ID 8803 Evidence-Based Design.

Rizvi, R., Tang, M. & Widjaja, L. (2020). *LightShade*. ID 6271 Healthcare Design of the Future.

Yining Chen, A., Grunert, S., Dillman, D., Rachman, A. & Stoddard, R. (2022). *Chef System*. ID 8803 Healthcare Design of the Future.

Sleep

Agarwal, K., Minshew, D. & Snedaker, T. (2021). *Positive Effects of Music on Sleep Quality.* ID 8803 Evidence-Based Design.

Bharadwaj, A., Kim, M. & Laroya, R. (2019). *Sleepcare*. ID 6271 Healthcare Design of the Future.

Walz, J. & Nixon, J. (2020). *Sun and Moon.* ID 4071 Innovation Studio.

Xingjian Tao, J. & Therathanakorn, T. (2020). *DozZ*. ID 6271 Healthcare Design of the Future.

Reminders

Davis, K., Feng, C. & Fitch, J. (2023). *Aging with Diabetes.* ID 6271 Healthcare Design of the Future.

Kong, Z., Woo, H., Zhang, X., Zhu, Y., Shah, A. & Shah, P. (2022). *Promoting Self-efficiency and Independence in the Kitchen for People with MCI.* ID 8803 Healthcare Design of the Future.

Ramnarine, I., Tamhane, S. & Tosaki, R. (2019). *Reminder Pro App.* ID 6271 Healthcare Design of the Future.

Wang, C., Jiang, C. & Ma, C. (2023). *Robot Companions Mitigate Elderly Loneliness and Isolation Health.* ARCH 6271 Healthcare Design of the Future.

Cooking

Bajaj, S., Rizk, M. & Tamhane, S. (2021). *Kitchen Designs for People with MCI.* ARCH 4833|8833 Evidence-Based Design.

Deborah, S.S., Falkner, A., Squirrell, C.N., Sills, A.M. & Zong, J. (2022). *Multifunctional Meal Prep Station.* ID 8803 Healthcare Design of the Future.

Derochers, D., Kim, G.L., Kim, S., Moon, J. & Schmelzle, T. (2019). *LEV*. ID 4833 Industrial Design Studio for Minors.

Doe, J. & Smith. A. (2019). *Instructional Coffee Maker.* ID 4833 Studio for ID Minors.

Kasmiskie, C., Perry, H. & Zhu, E. (2019). *Recipe Process Tracking Organizer.* ID 6271 Healthcare Design of the Future.

Kesaria, D., Kim, C., Shrestha, B. & Yan, D. (2019). *Food for Thought.* ID 6271 Healthcare Design of the Future.

Kong, Z., Woo, H., Zhang, X., Zhu, Y., Shah, A. & Shah, P.M. (2022). *Promoting Self-efficiency and Independence in the Kitchen for People with MCI*. ID 8803 Healthcare Design of the Future.

Appendix B

Noh, R., Rukmana, A., Sung, S. & Wang, K. (2020). *ArkStove*. ID 4833 ID Minors Capstone.

Palacio, D., Slepian, L., Kim, J., Iyer, M. & Jang, S.H. (2018). *Google Home Sous.* ID 4071 Industrial Design Innovation Studio.

Song, E., Tan, A., Zhang, B., Wang, S. & Kim, A. (2018). *Curio*. ID 4071 Industrial Design Innovation Studio.

Underwood, A.B., Parker, E.T., Watts, M.N. & Hashemi, S.H. (2019). *Interactive Cutting Board.* ID 4833 Studio for ID Minors.

Yining Chen, A., Grunert, S., Dillman, D., Rachman, A. & Stoddard, R. (2022). *Chef System*. ID 8803 Healthcare Design of the Future.

Zobaila, D. (2021). *Home Environment for People Living with MCI.* ARCH 4822|8833 Evidence-Based Design.

Wayfinding

Arnold, A., Kwak, J., Kutsche, H., Patterson, O. & Minshew, D. (2020). *WayHome*. ID 4833 ID Minors Capstone.

Cho, B. & Shellman, M. (2020). *Find the Way.* ID 6271 Healthcare Design of the Future.

Grill, C., Khalid, E., Lando, G. & Denig, M. (2019). *Wayfinding + MCI*. ARCH 6243 Evidence-Based Design.

Hatley, J., Humphreys, B. & Kopka, M. (2019). *NaviCart*. ID 6271 Healthcare Design of the Future.

Langsdorf, C., Sherif, T. & Arrison, R. (2019). *Wayfinding Transportation Signage.* ID 6271 Healthcare Design of the Future.

Li, Y., Lyu, J. & Mendez, M. (2019). *The Signage "Hub" for MCI Fellows.* ID 6271 Healthcare Design of the Future.

Social Engagement

Abdullahi, A., Zhang, J. & Gu, Y. (2020). *TalkAssist.* ID 6271 Healthcare Design of the Future.

Gill, R., Mueller, K. & Temples, D. (2020). *FineDine*. ID 6271 Healthcare Design of the Future.

Koh, V., Tan, A. & Zhang, B. (2018). *100 Days.* ID 3032 Brain Health Studio.

Lee, S., Cha, E.(J.M.) & Calhoun, T. (2019). *Increasing social interaction of individuals with MCI through evidence-based design of Emory Empowerment Center.* ARCH 6243 Evidence-Based Design.

Modh J., Parmar R. & Singh S. *Facilitating Self-Expression and Social Engagement in Older Adults with Mild Cognitive Impairment.* Individual Student Project, MS-HCI.

Olalde, A., Charanis, D., Virasak, A. & Schoonover, M. (2018). *ADAM*. ID 3032 Brain Health Studio.

Rizvi, R., Woods, N., Shabbir, A. & Ahuja, A. (2020). *CatWalk*. ID 4833 ID Minors Capstone.
Rodrigues, J. & Kuhikar, V. (2019). *Digital Care Partner.* ID 6271 Healthcare Design of the Future.

Wang, C., Jiang, C. & Ma, C. (2023). *Robot Companions Mitigate Elderly Loneliness and Isolation Health.* ARCH 6271 Healthcare Design of the Future.

Vitality

LeRoux, R., Perlin, S. & Savage, A. (2019). *A Feasibility Study and Proposal for Using a Physically Interactive Video Game in the Mild Cognitive Impairment Empowerment Program.* ARCH 6243 Evidence-Based Design.

Modh, J., Parmar, R. & Singh, S. *Facilitating Self-Expression and Social Engagement in Older Adults with Mild Cognitive Impairment.* Individual Student Project, MS-HCI.

Van Duyne, J. (2019). *How Meditation can Benefit MCI Fellows and Care Partners.* ARCH 6243 Evidence-Based Design.

Keeping Track of Objects

Derochers, D., Kim, G.L., Kim, S., Moon, J. & Schmelzle, T. (2019). *LEV.* ID 4833 Studio for ID Minors.

Griffin, B., Cosler, M., Jackson, B., McLeish, N. & Alfatoony, L. (2019). *Lockermate.* ID 4833

Appendix B

Harrison, J., Kettle, A. & Magcalas, M. (2019). *Making Care Easy.* ID 6271 Healthcare Design of the Future.

Hatley, J., Humphreys, B. & Kopka, M. (2019). *NaviCart.* ID 6271 Healthcare Design of the Future.

Kanishk, Chittaluru, N., Kelly, E., Robledo, J. A., Lewis, D., Tantagunninat, T. & Sodimu, O. (2023) *Robotic Caregivers.* BMED 4833 Special Topics.

Kasmiskie, C., Perry, H. & Zhu, E. (2019). *Recipe Process Tracking Organizer.* ID 6271 Healthcare Design of the Future.

Kesaria, D., Kim, C., Shrestha, B. & Yan, D. (2019). *Food for Thought.* ID 6271 Healthcare Design of the Future.

Kong, Z., Woo, H., Zhang, X., Zhu, Y., Shah, A. & Shah, P. M. (2022). *Promoting Self-efficiency and Independence in the Kitchen for People with MCI.* ID 8803 Healthcare Design of the Future.

McGannon, A., Vera, J., Viera, P., Rodrquez, M. & Sullivan, L. (2020). *Clockwise.* ID 4833 Studio for ID Minors.

Melissas, A., Scialabba, A., & Drawdy M. (2021). *Color Block. ID 3032* ID Health Studio.

Ramnarine, I. D., Tamhane, S. & Tosaki, R. (2019). *Reminder Pro.* ID 6271 Healthcare Design of the Future.

Song, E., Tan, A., Zhang, B., Wang, S. & Kim, A. (2018). *Curio.* ID 4071 Innovation Studio.

Ward, B., Iyer, M., Taute, A. & Thomas, K. (2018). *Aura.* ID 3032 Brain Health Studio

Yining Chen, A., Grunert, S., Dillman, D., Rachman, A. & Stoddard, R. (2022). *Chef System*. ID 8803 Healthcare Design of the Future.
Underwood, A.B., Parker, E.T., Watts, M.N., & Hashemi, S.H. (2019). *Interactive Cutting Board.* ID 4833 Studio for ID Minors.

Unknown. (2019). *Instructional Coffee Maker.* ID 4833 Studio for ID Minors.

Acknowledgements

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Thank you to this remarkable group of students who created this report:
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Katie Schreiber
Stacie Smith

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