INDUSTRIAL DESIGN AND OCCUPATIONAL THERAPY

A LASTING COLLABORATION PROMOTING MEANINGFUL DESIGN SOLUTIONS AND ACCESSIBILITY FOR CLIENTS

Yearly interdisciplinary collaborative projects between industrial design students and occupational therapy at our university began in 1998, making it the longest running interdisciplinary collaboration on-campus. Ongoing continual engagement over the years has provided us with ample opportunity to understand the nature of collaboration as well as repeatedly analyze the numerous ways in which these two distinct disciplines complement and learn from each other.

Collaboration began as an initiative between senior faculty and the head of our Industrial Design department and the head of our Occupational Therapy program. The project was embedded in the Spring Semester in Design 6, our Junior Industrial Design studio and the Assistive Technology Design course which is part of our MS Occupational Therapy (MSOT) program. While we continue to refine the details based on current student needs, the basic structure of the project continues to the present day.

During Design 6, an industrial design student and an OT student team up to collaborate and work with a specific client who is experiencing a health condition or developmental challenge that in some way impacts their ability to carry out one or more activities in their lives. Clients may be experiencing life differently after an injury or illness (such as a stroke), coping with a long-term health condition, developmental disability, or possibly a decline in daily functioning.

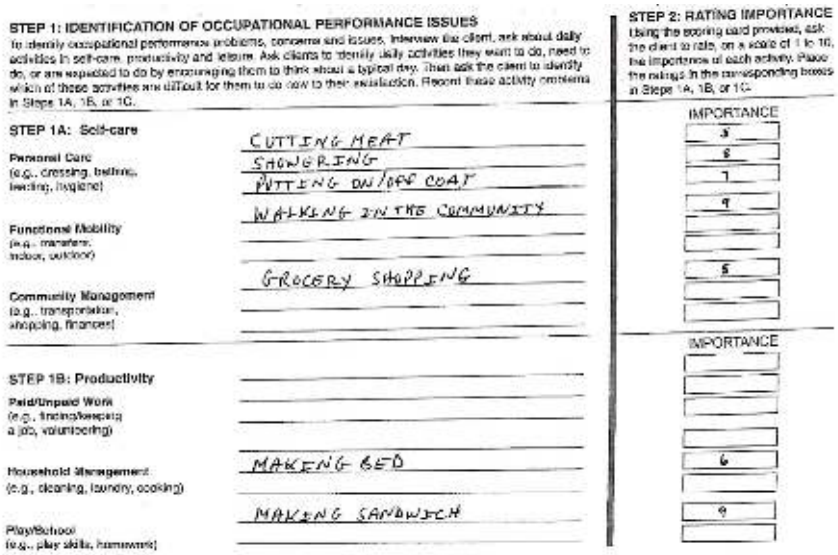
Student teams interview the client about daily performance limitations, utilize skilled observation methods, and repeatedly include him/her during the design process to obtain realistic feedback regarding proposed solutions that address a mutually agreed-upon limitation impacting function. Ongoing 1-1 interactions with the client and each other over the span of the semester serves to enrich and deepen student understanding about the lived experiences of individuals with health or developmental challenges as well as broaden awareness of each other's profession. The design team develops a close therapeutic relationship with the client, eventually becoming an advocate. Participating clients are called "client educators", which attests to their vital role in fostering the development of future professionals, regardless of discipline.

As per the Canadian Model of Occupational Performance and Engagement (CAOT, 1997), together, student teams consider the person, the occupation, and the environment as an interrelated system in which any change in one component impacts another. Interventions at the personal level can address body structure or functional challenges, and/or changes can be made to the environment, and/or tasks can be changed in some way (perhaps by the introduction of new tools or devices) to achieve a positive outcome to promote daily functioning in the identified area of need. This systemic view of the client's situation is a key occupational therapy concept from which the industrial design students learning is greatly enhanced.

The OT students use assessment tools such as the Canadian Occupational Performance Measure (COPM) (Law et al., 1990) which asks the client to rate their performance and satisfaction levels with regard to things they want or need to do in the areas of:

- Self-care (personal care, functional mobility, community management);
- Productivity (paid or un-paid work, household management, school/play); and
- Leisure (quiet or active recreation, socialization).

The industrial design and OT students then conduct a task analysis on the problematic areas identified from the COPM. Additionally, the industrial design students carry out a 7-14-28 analysis, in which a sequence of sub tasks are broken down in successively smaller steps in order to identify key friction points which might not be readily apparent at a higher-level view. This blending of interdisciplinary diagnostic techniques promotes shared learning for all students and leads to more comprehensive solutions for the client.



STEP 1: IDENTIFICATION OF OCCUPATIONAL PERFORMANCE ISSUES

To identify occupational performance problems, concerns and issues, interview the client, ask about daily activities in self-care, productivity and leisure. Ask clients to identify daily activities they want to do, need to do, or are expected to do by encouraging them to think about a typical day. Then ask the client to identify which of those activities are difficult for them to do now to their satisfaction. Record these activity problems in Steps 1A, 1B, or 1C.

STEP 2: RATING IMPORTANCE

Using the scoring card provided, ask the client to rate, on a scale of 1 to 10, the importance of each activity. Place the ratings in the corresponding boxes in Steps 1A, 1B, or 1C.

		IMPORTANCE
STEP 1A: Self-care		
Personal Care (e.g., dressing, bathing, feeding, hygiene)	CUTTING MEAT	3
	SHOWERING	8
	PUTTING ON/OFF COAT	7
Functional Mobility (e.g., transfers, indoor, outdoor)	WALKING IN THE COMMUNITY	9
Community Management (e.g., transportation, shopping, finances)	GROCERY SHOPPING	5
STEP 1B: Productivity		IMPORTANCE
Paid/Unpaid Work (e.g., finding/keeping a job, volunteering)		
Household Management (e.g., cleaning, laundry, cooking)	MAKING BED	6
Play/School (e.g., play skills, homework)	MAKING SANDWICH	9

The standard form for COPM:

Gathering data through the COPM not only provides a means for identifying potential intervention points; more importantly, the tool provides a baseline that can be used for reassessment after the design intervention has been implemented. Industrial design students rarely have an opportunity in other projects to follow up and objectively evaluate the benefit of their designs, so using the COPM becomes an important component that can introduce a methodology not previously used (and that can be carried over to other kinds of design projects in the future). To further enhance task analysis, the student team photographs and takes videos of the client performing the activities in question. Key measurements in the lived environment are obtained and extensive research is completed to determine currently existing/available devices intended for similar or analogous needs. The team then collaboratively engages in an iterative design process, starting with sketches and progressing to mockups which are presented for review by the client, caregivers, and professional experts. Past projects have included:

- Kitchen devices to support food preparation safety using only one hand;
- Devices to enable bathing and grooming;
- Devices supporting people's hobbies (such as long handled tools for gardening, cooking);
- Devices to aid with cognition/organization; and
- Devices incorporating sensory augmentation to make visually "noisy" toys for toddlers with hearing impairments.

Figure 1: A newspaper holder

Figure 2: An adaptive leaning device,

Figure 3. A soldering station for a client with one arm.

Work between the industrial design and OT programs was expanded in 2018 with a project that tasked graduate-level students to identify and address an issue related to accessability in the environment or situation of their choosing.

Here, graduate industrial design students first identified their areas of interest, after which OT students selected the project which bore particular interest for them. The OT students served as consultant experts, working via online sessions and studio reviews. Occupational therapy faculty also attended most design studios for the duration of the project to provide additional guidance.

Projects included:

- Development of a microwave oven with simplified controls and enanced safety features for people with dementia;
- System for carrying food for people using crutches;
- Cushion system which allows people with spinal cord injuries to perform therapeutic yoga;
- Examination of escalator designs for people with mobility impairment; and
- Development of a modular “universal cuff” which allows stroke patients to more easily switch between tasks. This design made use of a combination of digital knitting and Grilon reinforcement to achieve a customized fit with rigidity on where it is needed.

Figure 4. A universal cuff design. This design made use of a combination of digital knitting and Grilon reinforcement to achieve a customized fit with rigidity on where it is needed.

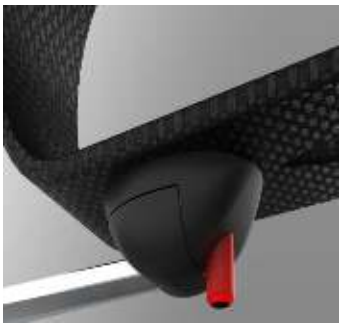


Figure 5: The cuff tool quick release mechanism

Recognizing the proven value of industrial design and OT collaboration over the years, this past September Jefferson established a groundbreaking capstone program for doctoral OT students in which they have remained embedded within the industrial design curriculum program for two semesters (Fall/Spring). Two doctoral OT students spent their first 2 months in program participating in industrial design courses, completing observations in the ID department, building rapport with students and faculty, researching curriculum strengths and weaknesses, and completing a SOAR Needs Assessment. OT students also regularly attended ergonomics and user research courses, interviewed industrial design faculty and students, and provided feedback in design studio classes.

In November, our masters industrial design students began the “Caregiver Project,” in which they were asked to address a problem related to a health or developmental condition while considering both the person experiencing the condition and the person, often a family member, who becomes a primary caregiver. This project was formulated in collaboration with the OT capstone students and their faculty, understanding that they would provide vital contextualization, guidance, and feedback on identified health conditions. OT students provided:

- Formal lectures on occupational therapy practice, theory, taxonomy, and Universal Design;

- Lectures on disability etiquette and experience;
- Demonstrations on the affect of health conditions on activities of daily living in our laboratory classroom; and
- Explanations and review of pertinent health-related material specific to Alzheimer's/dementia, intellectual disability, autism, and stroke.

The industrial design students then identified the issues that they sought to address. These included:

- Individuals who experienced stroke that have since lost the use of an arm and tending to slide or fall out their wheelchairs;
- The inadequacy of current devices intended to help individuals who experiened stroke put their socks on, button their clothing, or transfer on/off the toilet independently;
- Difficulty that individuals experiencing Alzheimer's/dementia have in carrying out daily hygiene activities at the sink;
- Difficulty that caregivers have in helping a loved one with Alzheimer's/dementia with completing dental hygiene tasks; and
- Communication problems between children with autism and their peers/ teachers that inhibit inclusion and mainstreaming.

The resident OT students have served as ongoing consultants; their presence has been crucial in arranging site visits and interviews and in supporting the industrial design students deeply and emphatically analyze the problem they have chosen. Final presentations to students and faculty for both disciplines is set for late April/May, 2019. Deliverables are expected to include funtioning demonstration mockups, renderings, and outcomes related to the student and faculty experience over the course of the school year.

What do we learn from each other?

As noted earlier, the length, breadth, and continuity of engagement between industrial design and OT students and faculty at our university has given us an opportunity to understand how both disciplines complement one another and offer insight into the nature of successful collaboration in general. Although educational and professional practices can differ, both disciplines are inherently user- or client-centered; other commonalities that promote growth and learning include:

Communication: There is inherent value in having professionals of one discipline communicate with another. The OT students report that it was helpful to learn how to communicate outside the healthcare domain in jargon-free language. This is of course valuable training for future work with other disciplines, and also for future practice in communicating with clients and family members. Conversely, it is extremely important for design students to learn how to communicate concepts to others who may be less familiar with our visual languages and more focused on therapeutic functionality. Industrial design students often

tend to focus in their explanations on what something will do from the standpoint of material or mechanical interaction. Having the OT students involved in a design review helps to push the discussion back toward the primary function of the concept: value for the client/user.

Problem solving: OTs are often “end users” of devices intended to address a particlular client need. In some cases those devices can be used as-is, and in others modifcations can be “hacked” with the materials at hand. There is little opportunity for OTs to think of or construct completely alternative approaches, and/or to design/fabricate a tool or device to professional-grade quality; exposure to industrial designers can help OTs be involved at the beginning stages of new devices to make them more effective for market.

While the OT students are critical in providing context and understanding of a given problem, the industrial design students are well trained to provide context as to materials, manufacturing, or mechanical function. The OTs may know that something doesn’t work, but the desgners may be able to pinpoint the solution as a change in material or detail/refinement (form). As the OT residents reported, their focus tends to be on the “big picture” of the individual client needs, but the designers are adept at shifting focus between larger and smaller issues; working together, both professions can find similarlities in conditions, supporting tools/devices meant for broader populations.

Iteration and Feedback: Industrial design students are encouraged to seek frequent and often informal feedback from users, faculty, and peers; OT also seeks frequent feedback from their clients through multiple visits that occur during the intervention process. For the OT students, experiencing informal testing and quick iteration, particularly at the early stages of a project promoted greater understanding and respect for the complexity inherent in the design process. For the industrial design students, understanding when/why rigourous evidence-based research is called for and what it consists of was equally critical. The value of the COPM tool in validating an intervention was described earlier; it is extremely useful in demonstrating to industrial design students that there are ways of providing evidence for the efficacy of a design solution.

Future Work

As noted earlier, work on the Caregiver Project will continue to the end of this semester; faculty plan to convene “post mortem” to review the year’s experience and to consider how the process might be evolved next Fall. It is already apparent from the informal discussions that have taken place during the course of the project to date that the industrial design students are learning a great deal; they are embracing the client perspective and considering the complexity of designing to promote human function in an inclusive manner for various populations. It is our hope this process will become an integral part of their development process not only while in their curriculum, but post graduation when they all become parts of the workforce. Plans are already in place for continuing the OT capstone program next year and for future growth into other healthcare-related projects. We are hoping that this program will become yet another pillar of our longstanding industrial design and OT collaboration.

REFERENCES

Law, M., Baptiste, S., McColl, M., Opzoomer, A., Polatajko, H., & Pollock, N. (1990). The Canadian Occupational Performance Measure: An Outcome Measure for Occupational Therapy. *Canadian Journal of Occupational Therapy*, *57*(2), 82–87. https://doi.org/10.1177/000841749005700207