



June 26, 2024

2024 Polytechnic Showcase spotlight: How Kwantlen Polytechnic University is innovating for extreme challenges

With: Sue Fairburn

Developing new products is an iterative process of design, test, fail and repeat, requiring a diverse skillset that includes research, design and creative problem-solving. Reflecting on the insightful conversations held at the [2024 Polytechnic Showcase](#) in May, Polytechnics Canada connected with speakers from [Kwantlen Polytechnic University](#) (KPU) to discuss their session *Learning Grounded in Design for Extremes: ALTA – A Portable Hyperbaric Chamber for use in High Altitude*.

Sue Fairburn, Chair of Research and Design, recently shared how the Wilson School of Design is encouraging students to apply their design skills to some of today's most-pressing challenges, including human distress at high altitude.

Polytechnics Canada: Congratulations on ALTA becoming an award-winning project! How did the concept of ALTA, the portable hyperbaric chamber, come together?

Sue Fairburn: Projects like ALTA aren't possible without the generous support and expertise of external partners. I'm always amazed by the breadth

of interesting and highly specialized projects people identify in conversations.

On this occasion, ALTA arose through an initial conversation with Maxim de Jong, Owner of [Thin Red Line Aerospace](#). While visiting Maxim at his studio in Chilliwack, BC, we began discussing design for various high-risk settings. While discussing inflatables, Maxim mentioned the need for a way to support climbers or individuals at high altitudes, who often develop health problems such as high-altitude illness (HAI). Maxim had worked in the Himalayas and spoke of the need for more portable hyperbaric chambers. With Maxim onboard as an expert contributor, we partnered with [Dr. Sonja Savic Kallose](#), who agreed to share her knowledge in high-pressure physiology. Another key part of ALTA's project development came from individuals who've directly experienced high altitudes and the associated health challenges. Through our external network, we partnered with two Canadian mountaineers who recently completed the [7 Summits](#), Captain Chris Dare and Elizabeth Rose.

PC: What were some significant challenges or obstacles faced during the development of the ALTA prototype and how did the student team overcome them?

SF: These projects often present the students with three main challenges:

- Effectively communicating in a team environment
- Digesting information from various sources
- Moving from research to design within a tight timeline

Communication methods vary, but we focus on giving students autonomy to decipher the role of the designer

and how they interface with each other. With instructor guidance, each team of students chooses different techniques to develop their project. Faculty members act in a role more akin to Design Directors and mentors than instructors. This method of guidance allows the students to develop design and research autonomy.

Making sense of a lot of information is a challenge we all face. We encourage students to read broadly while also reaching out to experts to help build their understanding of unfamiliar contexts and disciplines. From the beginning, students learn the skills and the value of reaching out and acknowledging the limits of their own knowledge so that they know to access and appreciate external expertise.

Those research methods set the stage for iterative design solutions, with early focus on physical design conceptualization. Students learn that concept design is achieved through feasibility, buildability, and testability proofs.

PC: In what ways does the ALTA project illustrate the risks and rewards of continuous improvement in product design? What insights can other polytechnic institutions take from this approach?

SF: We look to create full-scale, fully functional concept prototypes within 8-9 weeks. While there is a degree of field testing that takes place, there are limits to what KPU can provide without developing specialty capabilities. Design of personal protective gear and equipment is a highly regulated area and our students are working with donated materials in a cross disciplinary design school. Thus, students design prototypes as closely as possible to relevant materials and specifications, but further improvements are necessary to prepare concept prototypes for more extensive field and user testing. With additional funding, our Design School will be able to expand material development, manufacturing and testing capabilities, further improving prototype quality and readiness.

My advice to other institutions is to work to your strengths and not shy away from challenging design contexts, such as extreme environments or large-scale problems. Students are eager to tackle the big issues and what they learn is relevant and essential in today's world.

PC: How does KPU's experiential learning approach equip graduates to confront complex design challenges?

SF: Experiential learning at KPU is on-the-ground and hands-on. We're privileged to have incredible geography, cultural diversity and extensive technical expertise in green energy, alternative financing, agriculture, wellness and manufacturing/material cycles, all within the Fraser River area. We're also witness to the complex design challenges facing the places where we all live and work, where our food comes from and the surrounding industries and supply chains. While projects like ALTA may seem specialized, the learning is highly relevant to everyday challenges.

PC: Do you have a sense of what challenges lie ahead for design students?

SF: As challenges like climate change continue to affect the intensity and likelihood of extreme weather events, industry is looking for solutions to a number of new problems. For example, in light of the 2023 [Canadian wildfire season](#), the Wilson School of Design has partnered with BC Wildlife Service on a [Clean Air Shelters](#) project. Students have designed prototype shelters for use on fire lines and at fire camps, providing wildfire crews with respite from smoky environments.

To learn more about these projects:

- Clean Air Shelters: [O-tent deployment video](#)
- ALTA: [Award winning entry](#) (2021) at the Core 77 Design Awards
- ALTA: [Project Framework](#)



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