



# SHIFTING GEARS WITH DISRUPTIVE INNOVATION

BY LESLEY EVANS OGDEN

*Sometimes an innovation comes along that changes everything. Like Google and the Model T Ford, the innovation doesn't just change the status quo—it displaces it. Every once in a while that "disruptive innovation" is not a technology. It's a person.*

Such is the case with Dr. HsingChi von Bergmann, who felt like a round peg in a square hole when she joined UBC Faculty of Dentistry as an associate professor in 2010. Neither an oral science researcher nor a dentist, Dr. von Bergmann was hired because of her expertise in educational research and her desire to work toward one of the faculty's strategic goals—enhancing the student experience.

At first it was "a difficult marriage," says von Bergmann, who came to UBC from her position as an associate professor in science education at the University of Calgary. She describes her integration into UBC Dentistry as a culture shock for both herself and other faculty members. Her presence on the faculty, she suspects, was initially enigmatic—many colleagues were unsure of how to make use of her expertise.

Von Bergmann has a remarkable track record of science education research. During her

seven years on faculty at the University of Calgary as coordinator of curriculum, teaching and learning in the Faculty of Education, and evaluation consultant for the Faculty of Science, she dug deep into the application of evidence-based educational practices to science teaching. This made her an ideal candidate for UBC Dentistry in its quest to attract a partner that would support their teaching of evidence-based dentistry.

In 2008 she co-founded the Hong Kong Accord on Global Science Education. The accord represented a move away from just comparing countries' science education systems, and a step toward promoting international collaboration. Von Bergmann looks upon global science education—well delivered—as a mechanism for solving global problems. Her global philosophy and experience align well with another of UBC Dentistry's strategic goals: to expand the international presence at UBC and UBC's presence globally.

Dr. HsingChi von Bergmann



Von Bergmann's arrival at UBC's dentistry faculty has stretched her in new ways. Her prior focus was K-12 science education, where considerable energy is invested to develop theories of learning. The higher education context, however, is a different kettle of fish, with "very little research around curriculum design," explains von Bergmann. "It's difficult because you have to think about it in a vacuum." So in designing her research, von Bergmann lifts parallels from K-12 science education into the higher education setting.

After two years at UBC, von Bergmann is confident that her approaches are relevant, useful and no longer completely alien to dentistry. Her research—on topics ranging from the development of critical thinking activities to enhancing undergraduate student study habits—is designed to take UBC's already progressive dental curriculum a few notches higher. In one recent project, for example, von Bergmann collaborated on a course redesign that transformed a previously passive learning situation (teacher-centred, with lecturing as the main instructional approach) into active learning. Graduate students prepared seminars for their classmates and developed synthesis exercises that resulted in greater engagement for the whole class.

In another ongoing research project, von Bergmann is piloting the use of new media, such as online videos, to replace some of the lecturing time for content she describes as "didactic stuff." This approach of looking beyond the traditional classroom could free up more face-to-face time for students to focus on learning the critical psychomotor

skills they need for a career in dentistry; particularly, skills that require instructor guidance of precise, tactile movements. Another benefit of moving some of the content online is that it allows flexibility for students to learn at their own pace. Some students may arrive with a firm grasp of topics like the physics of colour (important for understanding tooth health and aesthetic dentistry), for example. These students may not need extensive lecture-based coverage, while others lacking that background might benefit from online content that can be viewed repeatedly. A further benefit is "differentiated instruction": teachers have more face-to-face time to address diverse student learning needs.

One of von Bergmann's major undertakings has been a systematic examination of the medical school curriculum that dental students are required to take during their first two years. "Students were constantly talking about how some of the topics were completely irrelevant to them," says von Bergmann. The faculty shared the students' concerns, but wanted an objective evaluation of the situation.

Von Bergmann came up with the idea of using the Delphi method—a structured, systematic communication technique that uses a panel of experts—to evaluate all the biomedical learning objectives in these two years. Dentists, dental specialists, oral biologists, oral health scientists and senior students in the dentistry program identified which aspects of the curriculum were relevant versus irrelevant—separating out the "nice to know" from the "need to know," she explains.

The results revealed that only about 50 percent of the biomedical learning objectives from the Faculty of Medicine were "need to know" for dentistry. This sparked some intense thinking by Dr. Leandra Best, associate dean of Academic Affairs, and members of the Academic Advisory Committee, about what might be possible if some of that curriculum was removed.

In further discussion with Dentistry's curriculum committee, von Bergmann advocated that faculty resist the temptation to "add more stuff" to replace what could be

taken out. Often, when it comes to curriculum in higher education, "we think about adding new things in, but we don't do the taking out," she says. Taking time to weed out the non-essential material is an innovative approach to curriculum that von Bergmann is determined to apply to dental education at UBC.

"Students need some wide space to think about what they have been learning," she explains. It's an educational approach that borrows from the slow food movement that arose in Italy in the 1980s. Analogous to people sitting down and eating slowly rather than gulping down fast food on the move, the slow learning concept suggests that learners slow down, reflect and take the time to learn things well. "Having a curriculum that is a mile wide and an inch deep" results in students trying to learn everything but not mastering anything, von Bergmann explains.

One outcome of this illuminating research has been the removal of one of the 13 biomedical modules offered by the Faculty of Medicine. It's no joke that students have traditionally learned to deliver a baby before learning about tooth structure, says von Bergmann, so the extraction of the reproduction module is already providing welcome relief to many dental students. A few relevant aspects of that module have been salvaged, says von Bergmann, but the module's removal could provide more time for independent work and reflection, and increases the overall relevance of the dental curriculum to future dentists.

Von Bergmann is particularly passionate about designing the research. "Data collection is the most painful part," she admits, "but once I see the data analyzed, it really excites me." Her research reveals possibilities for making educational shifts that impact student learning. And with much more data yet to analyze, more positive changes will be coming. [See the fall 2012 *Impressions* article about curriculum renewal online at [www.dentistry.ubc.ca/go/renewal](http://www.dentistry.ubc.ca/go/renewal)]

"Disruptive innovation in technology is a very good analogy for educators like me," says von Bergmann. Until her expertise was understood and put to work in driving

educational improvements within the faculty, her colleagues probably didn't think they needed her, she says. But now being embedded in more than 18 collaborative research projects is a testament to the disruptive innovation that her presence brings to the Faculty of Dentistry at UBC.

Applying her expertise to improving curriculum and ultimately the student experience involves placing "all of the cards on the table," says von Bergmann. "I don't know anything about dentistry," she admits, but recognizing respective limitations is an essential part of the ongoing and increasing number of conversations she has with dental faculty. As faculty have come to recognize what they can bring and what she can bring, it has transformed a difficult marriage ... into a stronger and vibrant one.

## Shifting Gears—At Work and Home

Whatever the weather, von Bergmann commutes to work each day on a vehicle that was very much a disruptive innovation when it burst on the scene—the bicycle. Just as she applies her knowledge tool kit to educational research, when it comes to cycling, she is well prepared: "I have all the gear," she explains. "Vancouver rain is actually not that bad, it's more like drizzle," she says, exemplifying her positive attitude about life in general, as well as the impacts of her research. "I tend not to focus on the dark side," she muses. During her downtime von Bergmann loves listening to jazz and classical music, seeking out the city's best Japanese ramen noodles, and hiking in the mountains with her mathematician-turned-app designer husband and her young son.



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—Dr. HsingChi von Bergmann