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The Boy Genius of Ulan Bator



Chiara Goia for The New York Times

Battushig Myanganbayar and his sister outside their home in Mongolia.

By LAURA PAPPANO

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Days before I was to meet Battushig Myanganbayar at his home in Mongolia, he sent me an e-mail with a modest request: Would I bring him a pair of tiny XBee wireless antennas? Electronic parts are scarce in Mongolia (he used components from old elevators for some of his projects), and packages ordered online take weeks to show up.



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Battushig's desk in his bedroom in Ulan Bator.

When I arrived, antennas in hand, at his apartment in the middle-class neighborhood of Khan Uul, in Ulan Bator, Battushig, 16, led me down a steep incline into the building's underground garage to show me what they were for. Many children in the city play in their apartment buildings' driveways, but this one seemed oriented in a particularly dangerous way. Battushig worried about his 10-year-old sister and her friends being hit by an exiting car. Standing in the concrete space, its aqua walls nicked, he pointed overhead to a white box containing a sensor from which he had run wires to a siren with a flashing red light outside in the building's driveway. His Garage Siren gave his sister and the other children time to get out of the way when a car was coming.

Battushig, playing the role of the car, moved into the sensor's path to show me how it worked, but it was clear he was not entirely satisfied with his design. "The use of the long wires is very inconvenient for my users," he said, almost apologetically, clasping his hands together in emphasis. He realized that contractors would be reluctant to install the siren in other buildings if they had to deal with cumbersome wiring, so he was developing a wireless version. Thus, the antennas.

Battushig has the round cheeks of a young boy, but he is not your typical teenager. He hasn't read Harry Potter ("What will I learn from that?") and doesn't like listening to music (when a friend saw him wearing headphones, he couldn't believe it; it turned out Battushig was preparing for the SAT). His projects are what make him happy. "In electrical engineering, there is no limit," he said. "It is like playing with toys." He unveiled Garage Siren in August 2012, posting [instructions and a demonstration video on YouTube](#). The project impressed officials at the Massachusetts Institute of Technology — where Battushig planned to apply for college — but at that point they were already aware

of his abilities. Two months earlier, Battushig, then 15, became one of 340 students out of 150,000 to earn a perfect score in Circuits and Electronics, a sophomore-level class at M.I.T. and the first Massive Open Online Course, or MOOC — a college course filmed and broadcast free or nearly free to anyone with an Internet connection — offered by the university.

How does a student from a country in which a third of the population is nomadic, living in round white felt tents called gers on the vast steppe, ace an M.I.T. course even though nothing like this is typically taught in Mongolian schools? The answer has to do with Battushig's extraordinary abilities, of course, but also with the ambitions of his high-school principal. Enkhmunkh Zurgaanjin, the principal of the Sant School, was the first Mongolian to graduate from M.I.T., in 2009, and he has tried since then to bring science and technology labs to his students. "My vision," he told me, "is to have more skilled engineers to develop Mongolia. To do that, everything has to start from the beginning." In the past decade, Mongolia, which had limited landlines, invested heavily in its information technology infrastructure and now has an extensive 3G network. Most homes in Ulan Bator have Internet connections, and almost everyone, including nomads, has at least one cellphone. Even on the steppe, with only sheep in sight, you can get a signal.

Zurgaanjin had students watch the Circuits and Electronics MOOC lectures at home, just like thousands around the world, but he wanted to supplement them with real-world labs. Tony Kim, a college friend working on his Ph.D. in electrical engineering at Stanford, agreed to visit Mongolia for 10 weeks and guide students through the labs using real equipment. Kim brought three suitcases of electronics supplies, immediately making his classroom one of the best-equipped labs in the entire country. Because the class was not approved by the ministry of education, students had to take it in addition to their regular courses. Battushig persuaded his parents to upgrade the Internet speed at their home from 1 megabit per second to 3 (the average in the United States is 8.6) to make it easier to watch the lectures.

Battushig was one of 20 students, ranging in age from 13 to 17, to enroll in the class. About half dropped out. The course is difficult in any setting — M.I.T. sophomores often pull all-nighters — and the Mongolian students were taking it in a second language. Battushig, however, thrived. "I can't compare it to a regular class," he said. "I had never done that kind of thing before. It was really a watershed moment for me." To help his classmates, he made videos in Mongolian that offered pointers and explanations of difficult concepts and posted them on YouTube. Kim, who had taught similar classes at

[M.I.T.](#), told me, “If Battushig, at the age of 15, were a student at M.I.T., he would be one of the top students — if not the top.”

In the past year and a half, more than 100 schools, including Harvard, Caltech and the University of Texas, have invested millions of dollars in MOOCs. Many in higher education believe that these courses can make a quality education more affordable and accessible to far more students and eventually provide additional revenue streams for the universities that offer them. Critics, though, argue that MOOCs threaten the economic survival of nonelite colleges and are an inadequate replacement for the teaching and support of live professors. Anant Agarwal, a professor of Circuits and Electronics and the president of edX, a MOOC platform started last year by M.I.T. and Harvard, said that seeing Kim and Zurgaanjin combine his online lectures with in-person teaching spurred edX to help organize 20 such “blended” classes. “It was extraordinarily creative,” he said. “It changed the way I think.”

Battushig’s success also showed that schools could use MOOCs to find exceptional students all over the globe. After the course, Kim and Zurgaanjin suggested that Battushig apply to M.I.T., and he has just started his freshman year — one of 88 international students in a freshman class of 1,116. Stuart Schmill, the dean of admissions, said Battushig’s perfect score proved that he could handle the work. Schmill also said that although M.I.T. already seeks students from around the world, many come via special programs organized by charities or international schools. (Zurgaanjin attended the United World College in Wales before applying to M.I.T.) “The MOOCs may well offer the opportunity for us to get more students from remote areas who haven’t been in these magnet cultures,” Schmill said.

Battushig, who is now 17, settled into his German-themed dorm last month, a single in Desmond House. He has begun classes, including introductory courses in electronics, solid-state chemistry and biology, and had his photo taken with the renowned physics professor Walter Lewin (which he posted on Facebook). He joined photography and tennis clubs — and, he said, discovered that “I’m really a great player at billiards.” He is heeding his mother’s warning not to overindulge on pizza (he has a self-imposed limit of two slices a week). Battushig may be embracing student life, but as his father told me months earlier when we sat down to a family lunch of Korean-style kimbap, rice-noodle salad and cooked sheep: “He is thinking, all the time, how to solve problems. He has so

many ideas. He often says to me, 'I want to make good things for humans.' If he does good things for humans, he does a great thing for us."

Laura Pappano is an education journalist and the writer in residence at Wellesley Centers for Women at Wellesley College. She is the author of several books, including "Inside School Turnarounds."

Editor: Claire Gutierrez

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