Michael Lowry. Source: *The Chattanoogan* at https://tinyurl.com/yc5yd6sq.

Science Education in Singapore and the US
An Interview with Michael Lowry

Michael Lowry teaches science in the upper school of The McCallie School in Chattanooga, Tennessee, and has completed two National Consortium for Teaching About Asia (NCTA) seminars. As a Fulbright Fellow, Lowry has traveled to Japan and Singapore to study their educational systems. He is both an Assessor for the National Board Certification Program for teachers and National Board-Certified. He was named a Presidential Awardee for Excellence in Science Teaching, in addition to being presented the Early Career Award from Columbia University Teachers College.

Maranda Wilkinson, an Asia Program NCTA Faculty Fellow, is a former middle school social studies teacher and curriculum and instruction coach who now serves as the STEM Curriculum Specialist for the Franklin County, Tennessee school district. In addition, she currently serves as a board member at her local hands-on science center and is an affiliated consultant for Education First, cofacilitating training sessions for educators planning to travel abroad on study tours with their students.

In the following interview, conducted as part of an East Asia STEM teaching module developed by Maranda Wilkinson for the UTC Asia Program (https://tinyurl.com/y3oepewy), Maranda questioned Michael on his studies of the Singaporean science education system as a 2016 Fulbright Fellow focusing on comparisons of science education in Singapore and the US.

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Maranda Wilkinson: *Michael, briefly describe your professional background and current position, and what specifically interested you in making the decision to investigate science education in Singapore.*

Michael Lowry: I am a high school science educator, and Department Chair at an independent day and boarding school in Chattanooga, Tennessee and have served as the High School Division Director for the National Science Teachers Association (NSTA). Over the years, I read extensively about the success story that is Singapore and was familiar with the role its educational system has played in creating the economic advancement of the country. Singapore's economic prosperity is directly linked to its educational system.

Maranda: *Please summarize the observation/research activities you engaged in while in Singapore, including any interaction with K–12 schools, Ministry of Education officials, higher education institutions, and teacher organizations*.

Michael: My inquiry project focused on exploring how the role of science department chair can function as an agent of reform for teaching and learning. Singapore is at an interesting inflection point in its economic and educational development. With the workforce increasingly needing to be both knowledge-based and creative, the educational system is adapting to a new landscape. I was interested in knowing how this reform of moving from a strictly mandated, standardized curriculum to a more "American" open-ended system might occur and what role the department chair could play in fostering this change. The Ministry of Education arranged for me to visit six schools with different missions and demographics. I spent two weeks at each school, interviewing teachers, administrators, and students. I also audited courses at the school of education and worked closely with the Academy for Teachers in offering professional development workshops for teachers.

Maranda: *What specifically impressed you the most about science education in Singapore, compared to what you've experienced or learned about in K–12 American schools?*

Michael: The Singaporean educational system places great emphasis on teacher development, training, and professional growth. Rather than leaving teacher pay and advancement to market forces and scarcity, the government intervenes and rewards teachers by creating a true profession that is highly selective and lucrative. Only the top 25 percent of college students enter the education field. Its teacher-training program is subsidized by the state, meaning no student incurs debt as part of his/her education. Most education majors in Singapore have a parallel major in another discipline. For example, it was common for me to converse with an elementary science teacher who also had a major in chemistry, biology, or physics. Teachers receive over 100 hours of professional development a year, and there is also a unique career track for educators. Teachers can advance within one of three pathways: teacher, administrator, or specialist. The system encourages most teachers to stay in the classroom and rewards talent accordingly. A senior master teacher may earn as much as a senior administrator (e.g., principal). The system itself is an interesting blend of Western/English (Singapore was once a British colony) elements fused with an Asian/Confucian mindset. Over and over again, I heard teachers and administrators implore their students to "work hard" to unlock the benefits of learning. Hard work always trumped innate talent.

Maranda: *What were major concerns of science teachers in Singapore, based on your interactions with educators?*

Michael: Success in the Singapore educational system is based exclusively on test scores. The Confucian priority of advancement through exams is a pervasive and sometimes-crushing influence. For example, the Primary School Leaving Exam (PLSE), given at the end of sixth grade, is the very definition of a high-stakes test. The results of this exam will dictate the future trajectory of most students: who will go to college versus vocational school, what career a student will have, their peer groups, etc. All the educators I interviewed agreed the PSLE was warping the system in unusual ways, but they all conceded that it was important to "sort" students early to ensure "the best use of resources." Because of the importance of standardized exams, teachers rarely had permission or an incentive to deviate from the highly scripted and centralized curriculum. Teachers had little sense

of agency and felt compelled to stick with the familiar and generate "good scores." Parents felt the overwhelming pressure of ensuring their child performed well on the PSLE. Those parents with the financial means enrolled their child in review courses much like the *juku* (cram schools) found in Japan and other Asian countries. It was not uncommon for a student to attend several review courses. The Ministry of Education was aware of the phenomenon and began offering tutorials for students whose families could not afford private tutors. The obsession of preparing for exams was so pervasive that I would encounter it in unusual places: the education section of the *Singapore Straits Times,* a major daily newspaper, would have several pages of practice problems for readers. It was interesting to contrast the pages dedicated to test prep to the single page dedicated to sports. I remember walking into a bookstore and seeing aisles and aisles of books dedicated to test prep. Worrying about their children's future was never far from the typical Singaporean parent's mind.

Maranda: *From what you've learned, do you see aspects of American K–12 science education that Singaporeans could benefit from considering and vice versa?*

Michael: Singaporean science educators were familiar with the notion of inquiry—but were not sure how to pull it off. There is a strand of thought that asserts the teaching and learning of science should better reflect how science is done (e.g., inquiry and investigating phenomena rather than just "covering" a topic in a textbook). When I conducted classes at my host schools using inquiry techniques, teachers were often shocked by what their students could do. However, they were reluctant to use the method because it would not appear on the national tests and "took too much time." I was able to demonstrate that it was possible to both "cover" content and foster more scientific processes along the way. In my discussion with policymakers, they exhibited a desire to foster these skills among teachers, but a hesitancy to execute the plan. As one senior administrator said, "We like how well our students do on tests. We don't want to throw the baby out with the bathwater." Change most likely will not occur until economic forces signal the need for new skills in the workforce. Singapore has shown a remarkable ability to adapt to changing environments. As their famous prime minister, the late Lee Kuan Yew, stated, "What I fear most is complacency. When things become better, people tend to want more for less work."

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One idea that American schools should adopt is creating a new type of hybrid administrative position known as the school staff developer. The SSD acted as a bridge between teachers and administrators. The SSD was a classroom teacher whose primary role was to support and provide professional development opportunities for teachers. Because they had "street cred" as classroom teachers and did not act in any evaluator fashion, they developed relationships with teachers to promote growth and advancement. I was impressed with how SSDs interacted with teachers, frequently asking how they could support them in their work as an educator.

Maranda: *Readers of this interview will be from a number of different backgrounds, but an earlier version of the interview appeared as part of a presentation specifically designed for American STEM-related teachers or administrators who are responsible for STEM schools or programs. Based upon your experiences on both sides of the Pacific, what recommendations do you have for the particular audiences mentioned in this question?*

Michael: The Buddha is believed to have asserted, "Do not dwell in the past; do not dream of the future; concentrate the mind on the present moment." Both countries are longing to become the other: Singapore seeks to inject more creativity and innovation into its education system, while the US seeks to create a more rigorous standards-based system that guarantees achievement. I would remind readers that it is not an either/or option and that a third way combines both. In the US, STEM educators are beginning to explore the Next Generation Science Standards (NGSS), a document that is charting a new course in teaching and learning. This reform document can be the "third way" that allows elements of both systems to thrive under one umbrella. ■