

Making sense out of STEM and IoT

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THE alleged waning interest in science, technology, engineering and mathematics (STEM) among school students have been lamented by various quarters.

Among the main issues students face is that the teaching and learning of STEM in schools generally present very little excitement and is very much a one-sided affair in the classroom with teachers providing the information and knowledge. As the delivery is not engaging, many students are not able to grasp scientific concepts and their relevance in every day life, hence, the disinterest in STEM.

The situation is worse at schools in rural or semi-urban areas, where exposure to all things STEM and the chance to have interactive activities to learn about STEM are hard to come by.

Members of the Graduate Academic Competence Enhancement Programme (Program Peningkatan Kompetensi Akademik Siswa) at Faculty of Engineering and Built Environment (PEIE) in Universiti Kebangsaan Malaysia (UKM), also known as PKAG, took the matter into their own hands and decided to do a series of talks at three secondary schools in Sepang, Serangor, in the world of STEM.

The schools — SMK Sungai Rawang, SMK Faris, Sepang Putra and SMK Sungai Petai — participated in a five-phase master-mentor project that kicked off in October 2015 and lasted until December last year.

PKAG director Dr Kalvin Chellapan said PKAG was an interdisciplinary research group focusing on industry 4.0 — particularly the Internet of Things (IoT) automation in healthcare, education and industry safety, and productivity improvement.

“Working closely with UKM’s Faculty of Education and the Selangor State Education Department (LPKS), we emphasised the importance of STEM and highlighted to teachers, parents and students how knowledge and skills in STEM will bring us into the era of the Fourth Industrial Revolution (IR4.0),” she said.

With the help of mentors comprising super-graduates and academics, the UKM-PEIE Master-Mentor-STEM-IoT programme aimed to spark interest in students in STEM, and show them the potential of technology and how it could shape their career choices in the future.

The programme started with awareness talks and a STEM career quiz that was aimed to introduce the concept of STEM and the development of STEM-based innovations.



Dr Anisshahri (Anisshahri)



Muhammad Haqid Ibrahim Zubairan



Nur Izzah Azzah Abdulkhalid Fatah



Muhammad Haqid Ibrahim Zubairan (left) and his mentor, Mohd Syahir Fathulrahman, demonstrating the Smart Door Management System. PIC by Nur Izzah

It then progressed to the selection of 20 Form 2 students from each school to enter a STEM design thinking challenge. It saw the students participating in embedded systems and circuit design workshops as well as in workshops where they learned to develop mobile applications that could interface with their design.

This was followed by mentoring sessions by UKM undergraduate and postgraduate students, who guided their mentees for the STEM-IoT 2016 competition, which required them to come up with a solution for urban farming.

The subject is close to them as they are members of an agricultural-based community in Sepang.

“Through the competition, we could test their understanding and assess their level of thinking. We also need students with potential to attend the STEM-IoT School Attachment programme at the UKM main campus in Bangi for three weeks starting from Oct 2,” said Anisshahri, adding that the enthusiasm and seriousness of mentees in the programme made the selection process a challenge.

Muhammad Haqid Ibrahim Zubairan, 16, from SMK Sungai Rawang and Nur Izzah Abdulkhalid Fatah, 14, from SMK Puncak Sepang Putra were selected as apprentices at UKM’s PEIE.

For three weeks, Haqid and Izzah stayed at the university hostel and led the life of university students, which included getting to the labs via the UKM bus transport and working from 9am to 5pm on their STEM-IoT projects.

Under the tutelage of mentor Mohd Syahir Fathulrahman, a UKM research officer who has an electronics systems engineering master’s degree, Haqid came up with an android-based smart queue management system that he said was ideal for the healthcare service industry.

The solution allows patients to be notified of their turn and the room where they will be treated through their mobile phones. They no longer need to wait in front of the LED signs in the clinic for their numbers to be displayed.

I said Anisshahri, the open source electronic prototyping platform, enabling users to create innovative electronic objects, developed a mobile app and learned about the use of Web servers among others.

During the last week of his attachment, Haqid mostly followed Syahir’s instructions.

By the second week, however, Haqid was confident and independent enough to work out the

problems and try his hand at wiring up with solutions.

“This programme helped me to think critically to develop the app and work out the solution with the knowledge and skills that I have acquired. I hope more students can experience this.

Izzah, meanwhile developed a smart door system that would enable a house owner to lock or unlock doors without being physically present through the use of a mobile application.

Her mentor, Nur Shafiqah Shukri Daud — a post-graduate student in electrical, electronic and systems, said many blossomed from being a quiet girl to someone who could discuss and argue about ideas in the lab in the three-week period.

“She became a proactive and self-motivated student — qualities that even university students had to acquire. Her exposure to IoT and systems integration as well as technical skills enabled her to be more creative,” said Nur Shafiqah.

Izzah believes other high schools should have the opportunity to experience the programme.

Before this, I thought going to university was just a process after secondary school. From my experience, I can see that being at university exposes you to beyond classroom experience — there are so many avenues for exploration of all kinds of knowledge here.”

Selangor Education Department assistant director Mohd Akas Awang said the mentor-mentor programme had given a positive impact on the schools.

“It would be delightful if the programme continues. Effective mentoring programmes enable students to continually explore STEM in the future. With mentoring added with patience, hard work and a high level of discipline, it is not impossible for local students to be back from rural areas,” he said, adding that Izzah and Haqid had to be role models for their friends and schoolmates and inspire their interest in STEM.

Kalvin said PKAG tended to continue and expand the mentor-mentor programme in future.

PKAG is confident that it will give university students are motivated from those who have a strong STEM interest and knowledge at the school level. PKAG also trains students and alumni of UKM to become entrepreneurs and technopreneurs in the respect we hold of expertise. PKAG aims to produce high quality human capital in terms of scientific inquiry by well as willingness to serve the country in the future.”



Nur Izzah Mohd Syahir Fatah (left) and Mohd Syahir Fatah (right) demonstrating the Smart Door System to other students. Nur Shafiqah Shukri (middle) assisting right) leads on.