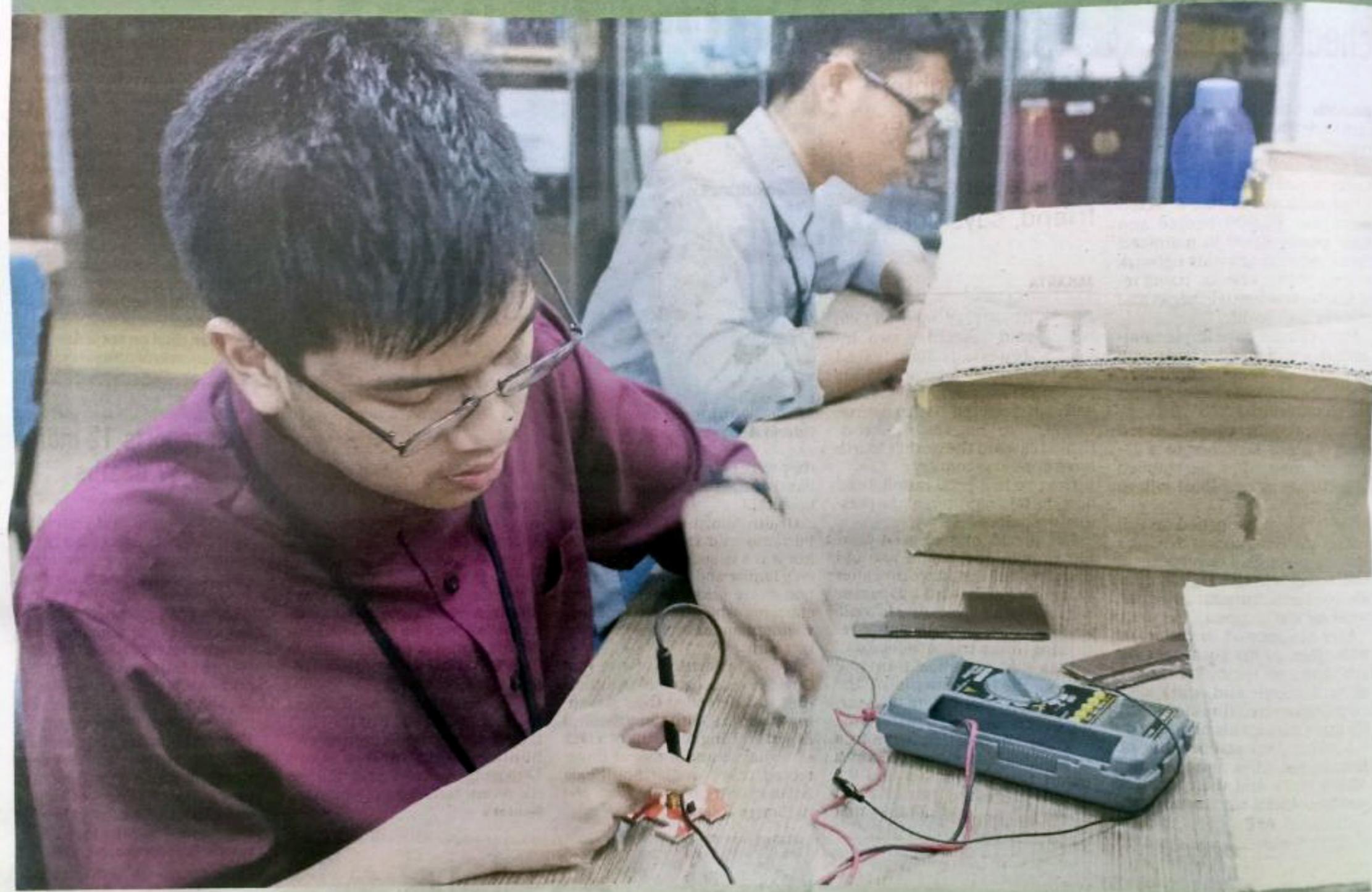# SCHOOLTIMES

Early exposure to STEM degrees

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EXPOSURE to potential careers and university courses can help students decide on their field of interest and ease the transition into tertiary education.

The recent 21st Century Electronics Bootcamp 2020 held at Universiti Kebangsaan Malaysia (UKM) served as a platform for Sijil Pelajaran Malaysia (SPM) leavers to gain key skills and knowledge that can prepare them for an engineering or a STEM degree.

Fourteen students from across the nation gained hands-on experience and technological know-how such as learning to use Arduino, a platform for building electronics projects.

Working in teams to tackle life problems using engineering principles, their ideas were translated into prototypes by the end of the programme.

Nur Ain Zulaikha Zamri, 18, who formerly studied at MRSM Bentong, said: "The most priceless experience that I had was learning about the Internet of things (IoT) and the Arduino software which expanded my design-thinking skills.

"I learnt about this software at school but it was just at surface level. The bootcamp taught me to code properly and how to design and assemble printed circuit boards (PCB) using applications like TraxMaker and CircuitMaker."

For her group project, Nur Ain took part in creating a smart house prototype with smart lighting by applying the IoT principles.

"We equipped the prototype with a light-dependent resistance (LDR) sensor which was programmed to light up the house. Carrying out this project was eye-opening and it developed my interest in the electrical engineering field."

In its second year, the month-long programme was spearheaded by the UKM Engineering and Built Environment Faculty's Graduates Academic Competency Empowerment Programme (PKAS).

Participants were also able to tour research laboratories, architectural studios and other university facilities.

Nur Ain said she felt lucky to get a taste of student life at a top university.

"I gained university experience through our group projects and weekly presentations. I realised the value of STEM knowledge and how it can contribute to my personal development and nation building."

Coming from a day school, Muhammad Imran Safwan Jeffry, 18, said the programme opened up a new world of possibilities.

"I was exposed to various engineering disciplines such as chemical engineering. I also learnt how to code using Arduino.

"This bootcamp has helped me realise my interest in architecture and civil engineering," said the SMK Malim, Melaka alumnus.

Azhar Hazim Mohd Ubaidullah, 18, who previously studied at MRSM Pengkalan Chepa, Kelantan said the programme taught him about perseverance and the different engineering specialisations.

"For our project, I struggled initially to get the desired output. But I learnt to troubleshoot and find different ways to solve the problem.

"We visited each engineering department and were exposed to their syllabus contents briefly. For example, in the civil engineering department, we saw how they process the materials to build structures," he said.

Muhammad Imran added: "At the chemical engineering department, we learnt about the properties of organic compounds and how they are turned into products."

On the same team, the two students came up with an Arduino-based password-protected door lock prototype.

Azhar Hazim said: "Users can lock and unlock their house doors remotely just by using a mobile application. A password is sent to the lock using the app. If the door is not closed properly, an LED light and alarm will go off."

Who came up with the idea for the prototype?

Nur Ain Zulaikha Zamri (right) and her team member Raja Haikal Raja Arifshah presenting their smart house prototype to PKAS director Dr Kalaivani Chellappan (fifth from right) and UKM Engineering, Built Environment Faculty Undergraduates deputy dean Professor Ir Dr Siti Rozaimah (sixth from right) and visitors at the 21st Century Electronics Bootcamp 2020 closing ceremony.

"It was a team effort," said Muhammad Imran.

"After designing the circuit, we conducted the PCB etching by immersing the board into an acid bath. Only the required copper traces were left behind. Then we connected the PCB and the lock system to the internet," he said.

Azhar Hazim, who aspires to be a software engineer, added: "We also learnt to market our products using analytics and were able to put our knowledge into practice."

The experience gained at the bootcamp has guided their decision on academic matters.

Alif Amaluddin, 19, Universiti Teknologi Mara mechanical engineering diploma student and 2019 bootcamp alumnus, said the programme helped him immensely.

"It exposed me to the engineering field. I could apply the coding skills that I learnt from the bootcamp in my studies.

"For example, in my Artificial Intelligence coursework, I am required to code to effectively train processors for deep learning," said Alif.

Currently pursuing a Building Services Engineering diploma at Politeknik Shah Alam, Nor Elyas Norazmi, 19, said the intensive electronics curriculum allowed him to get a headstart in his studies.

"At last year's bootcamp, I built a prototype where I used a PCB as a smoke detector. My current diploma programme includes a topic on fire detection systems. The invaluable knowledge that I gained from the bootcamp helped me to understand the topic easier.

"This bootcamp also introduces students to future study and career prospects," said Nor Elyas.

Meanwhile, fellow alumnus and Universiti Sains Islam Malaysia student Muhammad Arif Najmi Abdul Rahim, 19, decided to pursue actuarial science. However, he valued the network and guidance he gained from the bootcamp greatly.

"I was interested in physics and math and I was introduced to financial engineering, an engineering field that's similar to actuarial science.

"I hope more students can join this bootcamp. The knowledge can be shared on a larger scale," he said.

PKAS director Dr Kalaivani Chellappan said 60 per cent of the bootcamp syllabus is based on electronics.

"This programme was developed by integrating aspects of design thinking, which is a pillar of Industry 4.0 and a combination of Google web and analytics applications.

"We use an interdisciplinary approach and experience-based learning pedagogy that will stimulate students' interest to improve knowledge, skills and values."

For this year, 125 applications were received from across the country, she said.

"While the programme is open to all SPM leavers, we have some criteria in place, namely, family background, academic achievement, financial status and psychometric assessment. Participants are fully funded by PKAS, except for accommodation, for the T20 community."

Kalaivani added that research universities are the frontrunners in nurturing more knowledgeable citizens.

"I believe research universities need to build the interest and identify potential students in the field of research from the school level. This is important in facing Industry 4.0 or 5.0 challenges.

"Through this platform, we hope to generate more quality human capital, especially in the field of IoT, automation, healthcare, education and industrial security."

Muhammad Imran Safwan Jeffry

The 21st Century Electronics Bootcamp participants with PKAS director Dr Kalaivani Chellappan (front, fifth from right) and UKM Engineering and Built Environment Faculty Undergraduates deputy dean Professor Ir Dr Siti Rozaimah (front, fourth from right) at the closing ceremony.