

HKCTC SPECIAL AWARD FOR OUTSTANDING PROJECT IN TESTING 2023

SCIENCE COMPETITION ENABLES STUDENTS LEARN MORE ABOUT THE IMPORTANCE OF TESTING AND CERTIFICATION IN OUR DAILY LIFE

Testing and certification plays a vital role in our daily life as they help safeguard consumer interests by ensuring the quality and safety of products and services. To increase students' awareness and interest in testing, the Hong Kong Council for Testing and Certification (HKCTC) collaborated with the Hong Kong New Generation Cultural Association to co-organise the "HKCTC Special Award for Outstanding Project in Testing". The award is part of the 25th Hong Kong Youth Science and Technology Innovation Competition, which attracted around 2,000 entries from over 3,300 participants.

The competition invited student teams to submit original research projects or inventions in one of the following five subject areas: mathematics and engineering; chemistry and materials; biology and health; energy and environmental science; and computer and information technology. Ten finalist teams, whose projects integrated rigorous testing elements into their research processes, were shortlisted to compete for the HKCTC Special Award.

To vie for the HKCTC Special Award, the finalist teams further submitted a report for evaluation and made a presentation about their

research project or invention. The three HKCTC members forming the judging panel, namely Mr Eddie Lee, Mr Yonghai Du and Mr Robert Lui, then posed questions to the teams after their presentation mainly to have a better grasp of their thinking and efforts behind. At the prize presentation ceremony held at the Hong Kong Science Park on April 2, 2023, Mr Robert Lui presented the awards to the selected top three teams.

The judges unanimously agreed that the overall quality of finalists' entries were high whereby they showcased originality and in-depth scientific research efforts. Knowing full well of the challenges and needs of our society, students went to great lengths with their attempt to address issues relating to the environment, healthcare etc. from the testing perspective. Several teams had also taken their projects or inventions to a higher level by giving thoughts to possible commercialisation of their prototypes. "We are pleased to see that the students showed a sound understanding of testing. They verified and supported their scientific solutions by means of repeated and rigorous testing. Many went the extra mile to establish their testing procedures with reference to international standards," the judges said. "We were also impressed by the good collaboration of the finalist teams."

"The finalists' projects and inventions reflect their understanding that testing and certification apply to diverse fields," the judges noted. "The HKCTC Special Award not only helps raise students' awareness and interest, but also inspires them to consider pursuing their future careers in testing and certification."



The HKCTC Members (from left) Yonghai Du, Eddie Lee and Robert Lui formed the judging panel of the Special Award.

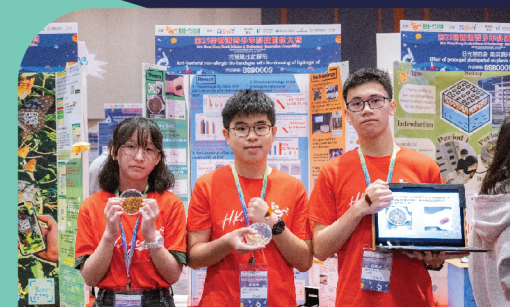
First Place Grand Award Project: Anti-bacterial non-allergic bio-bandages with bio-dressing of Hydrogel of Chitosan (HC) of Black Soldier Fly Carmel Pak U Secondary School: Wong Kai Lok, Cheung Yee Ching and Li Chun Yip

Being aware that commercial bandages such as hydrocolloid are neither biodegradable nor anti-bacterial, the team developed bandages made from shells of black soldier fly (BSF) larvae. Not only are these bandages haemostatic, anti-bacterial, non-allergic, and biodegradable, but also more environmentally-friendly. While there are research studies attempting to produce biodegradable bandages with chitin from shrimp shells, the team noted that such bandages might result in allergy. Producing the bandages with BSF shells may reduce the risk. Having conducted repeat testing, the team confirmed that the bandages also perform well in the areas of water absorbance, strength, and ability to absorb blood.

The team endeavoured to incorporate the fulfilment of applicable international testing standards into their project. They embarked on online research and pored over journals to identify internationally

recognised testing standards, including the IS997:2004 and BS EN 13726-1, to evaluate their invention's absorbency and tensile strength respectively. To test biodegradability, the team buried the bio-bandages in soil to measure the time needed for degradation. Each test was conducted at least five times for the verified outcomes. The team said the biggest challenge was to prove its non-allergic property, as they could not use human blood for testing. They eventually identified the "Clean-Trace Diagnostic Tool" to prove that their invention was non-allergic.

Despite their success, the process was by no means a smooth sailing. "We came across multiple obstacles in the course of the project. We've persevered through trial and error in the testing process and realised that reliable results can only be reached through repeat testing, particularly for healthcare related products," the team said. The team also believed that it was a fruitful experience in taking forward the project. "We learned to master some lab techniques, such as spreading plates for antibacterial tests, which are often used in university study. This project is useful for our future study and also helped sharpen our problem-solving skills."



Carmel Pak U Secondary School: (from left) Cheung Yee Ching, Wong Kai Lok and Li Chun Yip

Second Place Grand Award Project: Improving the effectiveness of osteogenic stimulation using micro motion sensory data measurement Shatin College: Panav Kalra



Sha Tin College: Panav Kalra

Bone fractures are not uncommon. Unfortunately, it is next to impossible to judge the healing progress with the naked eye. Currently, patients often need to undergo X-ray or computer tomography (CT) scans to understand the healing progress. During the period when Panav Kalra's family member was receiving treatment for a bone fracture and waiting for medical reports, the doctors were unable to grasp the patient's latest condition in a timely manner, which might lead to delay in applying further treatment. In view of this, Kalra worked closely with Dr Qi Weichen, a researcher in the Department of Orthopaedics and Traumatology at the University of Hong Kong, and attempted to develop a non-invasive wearable device which collects and measures vital data points for the evaluation of bone fracture healing. The device uses microcontrollers, sensors, and signal processing technology to measure the movement, displacement, blood oxygen saturation, and body activity of the fracture site. The collected data is stored in a micro SD card. With Wi-Fi, the collected data can be transmitted to an app for further analysis by medical staff.

"This device is the first of its kind and sets a new milestone in how fracture data is gathered. This

also allows medical staff to understand the healing progress of the fracture more timely. With the potential to become a breakthrough in continual data calculation to support bone fracture healing, the device may serve as an alternative to frequent CT scan and radiography," said Kalra.

Kalra used different methods to test the device, ensuring that all parts of the device could function properly and effectively. This included calibrating the sensors and testing the sensors to ensure accurate measurement of heart rate and blood oxygen. "This was something new for me," he said. "Frankly, computer programming is not my strong suit. For this project, I learnt C++ programming language in order to write the programme codes on my own. I also gained knowledge in different areas, ranging from data analysis to detector design. This is definitely a worthwhile experience."

Third Place Grand Award Project: Task B The Chinese Foundation Secondary School: Li Chin Wang, Xu Nuor and Yung Wai Ho

One of the team members was infected with antibiotic-resistant *Staphylococcus aureus*, and showed improvement after taking Vitamin B12 prescribed by the doctor. This led the team to explore the effects of Vitamin B on the growth and antibiotic sensitivity of *Staphylococcus aureus*. In the course of the research, although the team found that Vitamin B12 and B50 were not as effective as they had expected for the growth and antibiotic sensitivity of *Staphylococcus aureus*, they did not give up and eventually discovered that Vitamin B has a protective effect on skin under strong ultraviolet radiation. As they noticed that many sunscreens available on the market contain chemical ingredients, the team came up with the idea of adding Vitamin B to sunscreen as a natural sun protection material to reduce the use of chemicals.

The team formulated a series of meticulous tests and repeated them at least three times to ensure credibility. The tests included 'aerobic cell count', 'antibiotic sensitivity test', and 'test on UV resistance'. In addition, the team conducted multiple tests and proved that B12 and other B complex vitamins have a protective effect against UVB and UVC radiation. "Because Vitamin B supplement helps improve the protective action of *S.aureus* against strong UV-B and UV-C radiation, Vitamin B supplement can be added to sunscreen for extra protection," the team said.

The team is pleased to receive the award and shared that they thoroughly relished the experience. "We applied statistical methods such as T tests and ANOVA to analyse the results, which irrefutably strengthened our data analysis skills. The competition also provided us opportunity to hone our ability to design as well as to conduct experiments. Such skills lay a foundation for our future research."



The Chinese Foundation Secondary School: Yung Wai Ho, Xu Nuor and Li Chun Wang, and HKCTC Member, Robert Lui