

▼ Left to right: Mr CHUNG Cheuk-hung, Vincent, Mr HO Tik-shun, Ms LEUNG Yue-shan, Jennifer and Dr CHAN Pik-ying



Empowering Students to Become Independent Learners in Scientific Investigation

“ Teaching Philosophy

We believe that an understanding of the biodiversity of plants promotes awareness of environmental conservation. Adopting a multidisciplinary approach, STREAM, we would like to educate the younger generation to observe the principles of sustainable development, develop an awareness of environmental conservation, and act as a responsible citizen.

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Teachers presented with the Award

Mr HO Tik-shun
Ms LEUNG Yue-shan, Jennifer
Dr CHAN Pik-ying
Mr CHUNG Cheuk-hung, Vincent

School

The Chinese Foundation
Secondary School

Subjects taught

Science (S1-3)
Biology (S4-6)



Interview with the Teachers

Learning outside classrooms

Over the years, sustainable development has been one of the core agendas promoted by United Nations, and it is also one of the core values of the education at the Chinese Foundation Secondary School (CFSS). One of the major tasks of the school is to enhance students' well-being and nurture their whole-person development. Students are provided with numerous opportunities to learn outside classrooms, such as the CFSS Environmental Trail and Medicinal Plant Garden.

Since CFSS was founded in 2000, the School has made concerted efforts to develop the Environmental Trail, gradually adding various facilities such as the garden for ferns, cacti and precious medicinal plants. The Seed Bank, Herbarium & Seedling Nursery Center, and Geology and Climate Change Center were also set up in the School to help students gain a more comprehensive understanding of topics relating to biodiversity. Now the campus is housing 1046 species of plants, among which there are over 200 species of seed specimens and fossil specimens. And the collection is still expanding. Simply stepping outside the classroom, students could venture into nature to learn about plants. "The Environmental Trail is home to an array of birds and insects. More birds and butterflies have been attracted to visit our school since the Trail was built," said Ms Jennifer LEUNG, the Head of Biology Department, sharing the joy of seeing the natural environment blending in with the school.

A variety of activities can be conducted when students are immersed in an environment which gives them authentic learning experiences. For instance, students can check out mushrooms budding on the Trail after rain, video-record the



▲ Students conducting science investigation



▲ Mr HO leading students to investigate the plants biodiversity in the Environmental Trail at school

process of growth at time interval and share the recordings with their peers. "Experiential learning has certainly aroused students' interest in learning Science. We have noticed a change in attitude over time. They have become more inquisitive and appreciative of what nature has given us, which reflects that the approach used is effective," said Mr HO Tik-shun, the Assistant Principal responsible for Academic Affairs and Curriculum.

Developing generic skills

"To think outside the box" is not a mere motto but a practice upheld by all at CFSS. Teachers keep exploring innovative ways to guide students. Instead of being asked to memorise concepts as a matter of fact, students are encouraged to examine, integrate and internalise the information they have acquired. Application of Information Technology has proven to be one of the effective means, both in learning and teaching. Since 2009, QR code has been used as a teaching aid to facilitate learning. Students can use their mobile devices to scan the code to obtain information of individual plants. Besides, they can analyse the temperature and light intensity data collected by using mobile devices, or hold discussions among themselves through the mobile application. "Treasure hunt apps are very popular too. Students enjoy the experience of learning through exploring. They keep asking me about the hunting game," said Mr Vincent CHUNG, a Science teacher. He is well aware of the advantages of introducing e-learning tools to the classroom, which enable students to increase their passion for learning. The awarded teaching team has created an online learning community to encourage the sharing of knowledge on electronic platforms. The Cloud Knowledge-Based (CKB) was therefore constructed to store students' findings.

When students are engaged in various activities, they use multiple generic skills at the same time, such as reading and writing skills, analytical/numeracy skills, presentation skills and investigation skills. They can explore art while making drawings of morphology of selected specimens. Those interested in engineering can take a step further to construct robotic sensor devices for scientific investigations.

Applying Knowledge

"Students' creativity amazes me," said Dr CHAN Pik-Ying, the Head of Science Department. "During the experiment on testing the anti-oxidising properties of herbal tea, the extract from mint leaves only shown low anti-oxidising ability. Students then came up with the idea of adding lemon and lime to the mint extract. To their surprise, the anti-oxidizing ability of extract from mint leaves drastically increased ten times." They gained a sense of satisfaction after finding out the solution through trial and error. This shows how students benefit from self-directed learning.

According to Dr CHAN, most of the experiments are designed to help students develop investigative skills. For instance, when students test the effectiveness of using sugar cane residues and tangerine peels as the absorbents to remove lead content from water, they are not only required to apply knowledge of Chemistry, Biology and Mathematics during the experiment, they are also developing their problem-solving and thinking skills.

Dr CHAN went on to explain another experiment students conducted, of which the aim was to find out if Pu'er tea, among different kinds of tea, could reduce the hangover effect after alcohol consumption. To most people, Pu'er tea, sugar cane, tangerine, lemon and lime are merely food and drinks, but students treat them as materials for experiment. They treasure the opportunity to learn Popular Science, hoping that they could make a valuable contribution towards enhancing sustainable development of our environment. Often, a big discovery begins from a small thought.

To help students develop global perspectives, the school offers sponsorship for students to participate in exchange programmes. In the study tour to Finland, students, with the guidance from teachers, conducted surveys and science investigations to understand more about the Finnish innovation and sustainable development of natural resources. Among all the activities, students find school visits the most rewarding. "The Finnish students like to think, discuss, raise questions and then find solutions by reading further. This is something that we should learn from them," a student remarked after participating in the tour.

Contributing to the community

The school culture encourages students to live in peace with the environment and with the community. This has inspired students to actively take part in community services. Through the Community Roadside Tree Project, students explained to the public about the benefits of planting trees along the roadside. In a workshop held by HK SciFest 2017, the public were invited to the Medicinal Plant Garden of CFSS to learn from students about how to make insect repellents using Chinese herbs. "Knowing that there is growing interest in using natural herbs as insect repellent owing to the spread of diseases such as Dengue Fever and Zika, students show the public how to grow the right choice of plants to stop mosquitoes from breeding in Fun Science Festival," Mr HO recalled with enthusiasm. It is a pleasure to see nearly everyone at school try to put knowledge into practice.



▲ Mr HO explaining the features of the specimen to students inside the Specimen Room which has a collection of over hundreds of fossils

The way forward

The team of awarded teachers at CFSS is full of enthusiasm for teaching. They have dedicated themselves whole-heartedly to education. To them, teaching is not merely about the transfer of knowledge, but nurturing the whole-person development of students. "Winning the Chief Executive's Award for Teaching Excellence is a recognition of the School's concerted efforts. We still have lots to learn," said Mr HO. The team of teachers will continue to fine-tune the curriculum to enhance students' knowledge of sustainable development in a broader and deeper perspective. "We have many new ideas in mind," said Mr CHUNG. Perhaps students might forget some of the subject knowledge after they have left school, but they will surely remember the interactive lessons that teach them how to be responsible global citizens.



Teachers' Sharing

Building an environmental trail

Ten years ago, the place where the Environmental Trail was currently situated used to be a resting place for students during recess and lunchtime. Attracted by the vast diversity of trees, many birds build nests there. The tranquility of the place led us to think about whether the Trail could be converted into a learning ground to promote Popular Science and raise students' awareness of environmental protection. It is our hope that the boundless setting could allow students to explore biodiversity and develop global perspectives on environmental issues. Knowing that the Earth is plagued by problems such as resources exploitation and habitat destruction, students need to take steps to alleviate the aggravating environmental problems. The Environmental Trail embodies the values we would like to instil in students-being a mindful and responsible citizen who cares for the Earth. It might sound like a high expectation, yet we know it is a worthy cause deserving our endeavour when we see students relish the investigation of conducting biodiversity experiments in the Trail.

Challenges encountered

To utilise the Trail for learning and teaching, we do not only have to identify all the plant species, but also reform the S3 Science and Information Technology curriculum so as to create interdisciplinary links between the two subjects.



▲ Student using a mobile device to scan the QR code on the display boards in the Trail to obtain information about the plant



▲ Students using mobile devices to study plant biodiversity at the Environmental Trail at school

Science teachers are responsible to develop the interactive content on plant biodiversity, while I.T. teachers provide assistance in setting up a network which allows students to learn plant biodiversity using mobile devices outdoors.

The development of the Mobile Learning Pilot Scheme took a year to complete. With the concerted efforts of the staff in the Science Department and the I.T. Department at school, we successfully established an online knowledge-based platform which contains detailed information of the plants, together with short video clips made by students. Students could access the information using their mobile devices by scanning the QR code on the display boards in the Trail. Though the development process requires strenuous efforts, the results are truly rewarding. After using this platform, Biology lessons have since then become more interesting and engaging.

However, just a few thematic lessons in junior science and I.T. are insufficient for students to fully utilise the Trail for inquiry learning. Different school clubs and subject departments also conduct activities at the Trail to give students authentic learning experiences. The Science Club and Green Guru Team use the Trail for their treasure hunt workshops and plant specimen collection and preservation workshops.



◀ Students making plant specimen in one of the activities conducted by the Science Club



▲ Students developing their investigative skills in studying the specimen stored in the Seed Bank

Campus TV team and I.T. teachers use the Trail for delivering the module of Creative Media. Visual Art teachers design tasks for students to do sketching of birds and plants on campus. Biology teachers ask students to collect herbal samples for extracting phytochemicals for their research projects and ecological studies. Our team has played an important role in coordination and resource management. The Scheme has inspired colleagues to collaborate with various teams and department for enhancing learning and teaching.

Contributing to the community

The success of the online platform for outdoor learning at our school has provoked us to think about whether we can do something not just for our school but also the society. Besides acquiring knowledge and skills, students should internalise the concepts and values acquired in the curriculum, and spread the message of environmental conservation in the community.

With reference to the online platform developed for our school, we created a similar mobile application which allows children and the elderly to make herbal specimens from



▲ Students promoting plant biodiversity conservation in HK SciFest 2017 Fun Science Carnival



▲ Students conducting an investigative experiment

roadside trees in our community upon obtaining a license of herbal collection from the Agriculture, Fisheries and Conservation Department for this social service project. Several mobile learning workshops have also been launched in the local community to raise citizens' awareness of environmental conservation. It has been the second year we collaborate with the Science Museum in HK SciFest to promote biodiversity in the territory.

Nurturing students

It is rewarding to see students take the initiatives to work on the projects related to biodiversity conservation and sustainability. They won local and national awards for their projects in science competitions and their efforts were widely recognised. We are most delighted that students are not examination-oriented, but are genuinely interested in constructing, integrating and internalising science knowledge through investigations. With a good learning attitude, students' academic performance in public examinations has greatly improved.

Some graduates are now working in government and non-government sectors on environmental conservation. Many students have also revealed their interest in pursuing further studies in science-related fields. Our alumni have helped their juniors through career talks and experience sharing sessions in their alma mater in recent years. We are pleased to be able to contribute to society by nurturing youngsters that can shoulder responsibility.

We are delighted that our effort has been recognised and we were given the Chief Executive's Award for Teaching Excellence. We would continue to strive for excellence in teaching and establish a positive and energetic environment for nurturing young talents.



Assessment Summary

“ *To enhance students' scientific literacy and research skills through the study of plant biodiversity* ”

The awarded teaching team is composed of four teachers. They all have profound knowledge in various science subjects and have shown great passion and innovation in teaching and curriculum planning. By fostering a culture of continuous reflection on pedagogical issues for enhancing the effectiveness of learning and teaching, they have made concerted effort to help students develop their collaboration skills, investigative skills and higher-order thinking skills.

The awarded teaching team has worked out a holistic and systematic plan to promote scientific literacy, which includes students' robust understanding of scientific concepts and processes and the application of science in authentic contexts. They have developed a coherent and systematic school-based Science curriculum that integrates the learning of plant biodiversity and environmental conservation with the Secondary Science curriculum. In addition, the awarded teachers have employed an inquiry approach and mobile learning to help students develop scientific literacy and groom their talent for future development.

The awarded teachers have made good use of the resources available both in the school and in the community to conduct activities which arouse students' interest in learning and engage them in exploring plant biodiversity and environmental conservation both inside and outside classrooms with a view to helping them gain global perspectives on environmental issues. Students of all levels are involved in many school-based science projects, such as the Seed Bank, Tree Project and the Chinese Foundation Secondary School Environmental Trail, so as to cultivate their interest in learning, particularly in plant biodiversity. Professional sharing and lesson observation have been conducted regularly to enable team members to monitor and evaluate curriculum implementation.

Members of the team effectively help students explore further on plant biodiversity and environmental conservation in



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▲ Encouraging students to conduct science investigation on properties of fruit juice

an inquiry and interdisciplinary approach, i.e. STREAM (Science, Technology, Reading and Writing, Engineering, Arts and Mathematics) approach.

The awarded teachers demonstrated excellent classroom skills. Some interesting experiments were arranged to effectively arouse students' curiosity and interest in science investigation. Essential science process skills, such as making observation and taking measurements to verify the predicted results, were adequately included in the lessons. Teachers demonstrated their confidence and skills in leading students to carry out collaborative learning activities. As observed, students had strong learner autonomy, and were able to complete the learning tasks in groups efficiently. They could also use e-learning tool for pre-lesson reading and sharing ideas or findings during the lessons. Students were able to discuss, summarise and present their findings systematically.

The awarded teaching team has been invited for sharing and conducting seminars and exhibitions in relation to the promotion of biodiversity and other good practices in Science Education.

Ways to Obtain Information on the Teaching Practice

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