



Message from the President

Hand in Hand for Sustainability; "ACT TOGETHER, WE GO FAR!"

The United Nations (UN) has set 17 Sustainable Development Goals (SDGs) to be achieved by 2030. The 2020 coronavirus pandemic suddenly interrupted international contacts, and the world is forced to respond quickly to this epidemic and to restore order. Obviously, the vision of the UN' s SDGs is not only profound but also imminent.

Per its motto, "Absorb the new to look far ahead, and work pragmatically," National Chiao Tung University (NCTU), a top university in Taiwan, has the social responsibility of harnessing its expertise and employing technological innovation to eliminate the inequality between urban and rural areas and even the disparities among countries.

Thanks to the hard work of all the staff at NCTU, we continue to innovate our teaching and to cultivate new generations of talent who shape the future and tackle challenges. We conduct vital and ground breaking research to help our local community and to connect with the world. We continually reflect on school affairs to improve our university environment, facilities and campus life.

This year NCTU addressed all the sustainable development goals set by the UN. Due to page limitation, we only list the achievements of some faculty members and students in research, teaching, and service. NCTU has taken one big step toward the sustainable development goals of the United Nations.

Next year, in cooperation with National Yang-Ming University, we will establish a new university, called National Yang-Ming Chiao Tung University (NYCU). Combining our expertise in engineering technology and healthcare, we are laying the blueprints for a healthier, more equitable, and more environmentally friendly future. We look forward to collaborating with more international partners to jointly promote the sustainable development goals of the United Nations.

Sin-H g Chan



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Has visited to the rural and remote schools in Indonesia, India and Cambodia. Up to 2019, NCTU has

carried out **C** volunteer abroad projects.

In 2019, NCTU offered 119, related courses.



Helping non-profit primary schools in Cambodia to renovate school buildings and alleviate education gap in impoverished areas

In July 2019, the Southeast Asia International Volunteer The Bridge of ASEAN and Taiwan (BAT) Group of NCTU and the students from the Department of Architecture of Taipei Municipal Da-An Vocational High School went to Oddar Meanchey. Oddar Meanchey is a frontier province in northern Cambodia. BAT group implemented a volunteer service project with a focus on architecture. Under the guidance of Yu-Wen Lai, the Co-Director of Global Citizenship Education Center at NCTU, June-Hao Hou, the Director of Graduate Institute of Architecture, Chen-Hui Lin of the Department of Architecture of Taipei Municipal Da-An Vocational High School and Chih-Ming Chien, the CEO of the Association of Humanitarian Architecture (AHA), BAT group spent 14 days creating a stepped open space with teaching and recreational functions for the Development for the People of Cambodia (DPC) School (a local non-profit primary school) in Cambodia.

The DPC School, located on the border between Thailand and Cambodia, currently has about 500 students. There are only five stable wood-and-concrete classrooms. Most of the students come from families with an average annual income of less than US\$1,000 in the surrounding areas. Due to the school location, which is in the inland and border areas in Oddar Meanchey, its terroir and social resources have fallen far short of Cambodia's main developed areas. The economic and educational situation in the region has long been fallen behind in development. Apart from poverty, it is a less active region of international aid organizations in Cambodia.

Although the construction is full of challenges due to lack of machines and tools, unstable power supply, and uneven quality of local building materials, NCTU-BAT group and Taipei Municipal Da-An Vocational High School still transformed the school building of DPC School in two weeks. The school had only roofs and wooden beams and columns with timber and steel pipes and low brick walls. It was turned into an open space that corresponds to the local architectural characteristics. This stepped open space owns ventilation and lighting functions. It is suitable for the local hot and dry climate.

In the future, NCTU will continue to provide volunteer services in Cambodia by bringing our teachers and students from different disciplines. The teaching and international services with deep cultural heritage and professional knowledge will be deeply cultivated in Cambodia's rural areas. NCTU will cooperate with local non-profit organizations to bridge the educational resources gap to help build children's capacities and the people in Cambodia's rural areas.

Helping Indian children to get out of poverty and connect with the world through education

Jamyang School, which locates at the Himalayan foothill of Ladakh in India, provides free education to needy children. The students who attend the school all come from families in remote areas and from families with relatively disadvantaged family structure and socioeconomic status. Professor Mei-Lin Pan, the Department of Humanities and Social Sciences of National Chiao Tung University (NCTU), came across the school and collaborated with the NCTU Service-Learning Center to establish the India International Volunteer Jullay Group in 2010. Since then, NCTU has been implementing the service-learning model in its academic curriculum.

"We are not helper, but sharer." is the service spirit of International Volunteer Jullay Group, which has continued to devote time and effort in India. NCTU hopes to help the local people by cooperating between the two schools and the steady annual service plan. The group improves professional teaching skills through complete course training and maintains close communication with the local people at the same time. The group also researches the field notes and experiences in-depth, which were passed down by previous volunteer groups. India International Volunteer Jullay Group designed and practiced the service project based on the mutual connections between the two schools with the core philosophy of "providing helping hands." After years of effort, NCTU's India International Volunteer Jullay Group has introduced the resources from ASUS Foundation and the mathematical expertise to Jamyang School. Gradually, the digital competence of teachers and students was improved. The software and hardware were upgraded. Therefore, the local children's learning is no longer limited to the impoverished environment. This service project will help these children change their future and connect with the world.





citations per paper in 2019.

Above the average (4.2) in Taiwan.

In 2019, NCTU offered

63 related courses.

Eliminating hunger, improving agricultural productivity and quality through smart agriculture



In recent years, due to the aging agricultural population and food safety crisis, Taiwan's agriculture faces challenges in sustainable development. "New Agriculture", based on the principles of "innovation, employment, distribution and sustainability", has been one of the Taiwan government's industrial policy visions since 2016.

Wen-Liang Chen, Associate Professor of Department of

Biological Science and Technology, and Yi-Bing Lin, Professor of Department of Computer Science, led the students to develop "AgriTalk" intelligent agricultural system through cross-disciplinary collaboration. This intelligent system can implement non-toxic intelligent agriculture by monitoring the growth of crops with technology.

The system uses the field monitoring technology of Internet of Things, which can sense temperature, humidity, and soil construction. Besides, the use of agricultural artificial intelligence will predict plant diseases and insect pests. It can automatically decide irrigation time and irrigation quantity, and customize allocation of agricultural fertilizer and pesticide dosage to improve agricultural products' quality and produce safe and traceable agricultural products.

AgriTalk has participated in the Consumer Electronics Show (CES) for two consecutive years with the subsidy of the Value Creation Project of the Ministry of Science and Technology. AgriTalk won the CES 2020 New Innovation Award. Hopefully, this technology will also be applied to countries with food shortages to end hunger in the future.

Ending hunger by achieving food self-sufficiency through circular agriculture

After the outbreak of COVID-19 around the world, the fragility and hidden crises in the global food chain have become apparent. The shock of a ban on agricultural exports by big exporters has made food self-sufficiency crucial that countries and even families have to pay attention to it. Professor Jehng-Jung Kao, from the Institute of Environmental Engineering, and his team developed "DIY Green", which adopts an environmentally friendly way to plant crops. It uses recycled bottles to store water on the base. The water is brought to the soil through diversion strips, and the plant does not need frequent watering. Vegetables can be harvested in about 20-35 days, depending on the season, making it easy for people to taste fresh vegetables without pesticides at home. Professor Kao has also developed a "low-maintenance gardening method" that uses earthworm waste as fertilizer. Earthworm fertilizer is a natural organic fertilizer that is rich in microorganisms. It will make plants grow better. In this way, people can grow fruits and vegetables at home. The distance between food and the dining table will be shortened, and the carbon emissions from transportation can be reduced.

Promoting sustainable agriculture in Indonesia

NCTU I Do Volunteer Group has been in Indonesia regularly to promote sustainable agriculture for eight years. The group shared the situation of Taiwan's agriculture nowadays and the sales experience of agricultural products. Besides, the group also taught the practice of replacing chemical fertilizer with environmentally friendly agriculture to save cost under limited resource conditions. They introduced the concept of fair trade to the local area to achieve the goal of "sustainability and cooperation between people and the environment". In the future, the economy, environmental protection and sustainability can coexist.





208 publications in 2019, was 177 times more than that in 2015.

3.8 citations per paper in 2019

In 2019, NCTU offered L L 4 related courses.

Providing diversified mental health promotion services to protect the mental health of teachers and students

To maintain and improve the mental health of students and staff, NCTU Center of Counseling offers a variety of mental health services, including individual counseling, group therapy, psychological counseling, psychological testing, departmental counseling services (each department has its own professional teachercounselor), departmental mental health promotion activities, and campus-wide mental health

events (e.g., workshops, seminars, volunteer training programs, exhibitions). The center also has a collection of materials on various topics that are available such as books, magazines, tapes, and videotapes. In 2019, NCTU held 22 mental health promotion activities to improve teachers, students, and the public's mental health.

Working closely with medical institutions to advance medical development through forward-looking technologies to improve the people's health and well-being

NCTU has signed memorandums of cooperation with 12 hospitals in Taiwan. Our university has cooperated with National Yang-Ming University and Taipei Veterans General Hospital for 14 years and accomplished 200 projects. In recent years, NCTU focuses on artificial intelligence, the innovation of wearable smart medical materials and advanced medical materials technology. NCTU continues to integrate big data of imaging, physiology, genetics, and medical records to develop precision medicine.





Implementing a Health Promoting School Project to create a healthy campus and community life

To follow the World Health Organization's concept of integrating health promotion into campus and community, NCTU actively implemented the Health Promoting School Project. Based on the health check data of freshmen and faculty members over the years, NCTU integrates local health units, community hospitals, campus hardware and software resources and student associations. NCTU hopes to start from the bottom-up approach to establish intersectoral and cross-field partnerships. The goal is to arouse students' and staff's selfawareness and actions, creating a healthy campus that can achieve a healthy living community.

In 2019, NCTU focused on four main issues that are physical wellness, smoke control, sex education and AIDS prevention and infectious disease prevention. The idea of living a healthy campus life was put into action for five aspects: health and hygiene school policies, campus environments, health education, community partnerships, and health service consultation.



Above the average(1.6) in Taiwan.

Offers about 1,700 open courses and 327 extension education courses.

Promoting lifelong learning through opening educational platform

NCTU joined the OpenCourseWare Consortium (OCWC) in 2007. A total of 293 courses (254 audio-visual courses) have been added to the platform to date. In 2019, the main website and YouTube Edu zone of NCTU attracted a total of 1.455 million visitors with 8.315 million page views, helping more than 430,000 global learners to learn.

The eWant open education platform of NCTU was established in 2013. It is the most extensive Massive Open Online Courses (MOOCs) platform in Taiwan. Up to 2019, more than 150,000 people have registered eWant, which included more than 1,400 courses, and reached nearly 300,000-course enrollments. It has the largest number of cooperative schools in Taiwan and offers the most trending courses. It is also the MOOCs platform that has the most users. eWant breaks the boundaries of education, age, region and country, and assists learners in every corner of the world to achieve lifelong learning.

The NCTU Center for Continuing Education provides professional courses to help people gain employment skills or earn professional certifications. It has actively integrated with local industries to promote sustainable industrial development. In 2019, it offered 327 courses and the number of course enrollment reached 4,243.





Rural education services to bridge the gap between urban and rural

Because of the lack of educational resources in the rural areas, the professors of NCTU launched the "Hsin Guang Project" in 2006. This project aims to introduce different topics to the students to help them know more about the world. Up to now, hundreds of teachers and students of NCTU went to the Hsin Guang Primary School and taught Chinese, math, science experiments, English and the other theme courses. This project let the children in rural areas have access to more diverse content and understand a broader world. Besides, with the spirit of caring for the disadvantaged and providing professional services, professors from the Center for Teacher Education actively engaged in the Schweitzer Program. The professors led NCTU students to Baoshan Junior High School every summer. It helps students from rural areas have a meaningful summer and trains the next generation of secondary school teachers.

Cradle of global higher education talent cultivation

NCTU launches the Certificate in Learning and Teaching in Higher Education Program in partnership with Advance Higher Education in the United Kingdom. NCTU is the first and the only university in Taiwan to join Advance Higher Education. The program helps professors, doctoral students and postdoctoral researchers improve their knowledge and skills in teaching, meet the standard of Professional Standards Framework, and apply for the Higher Education Academy (HEA) Fellowship. In 2019, a total of 25 teachers, doctoral students and postdoctoral researchers participated in the 2nd Certificate in Learning and Teaching in Higher Education Program. NCTU hopes to introduce international higher education certification and training resources by the first case in the country to create world-class local doctoral talents. The program will prepare them to have the capacity to teach around the world.



Up to 2019, 9265 students

passed the test of gender equality course.

of NCTU faculty are women

In 2019, NCTU offered 1500 related courses.

Including gender equality education in compulsory curriculum and implementing gender equality

To equip students with the concept of gender equality, strengthen and create a gender-friendly campus environment, and promote substantive gender equality, NCTU has implemented "gender equality online training courses". The gender equality education course is a compulsory course for all students who enrolled after the fall semester in 2018. Freshmen are required to take the gender equality course on the NCTU online learning platform in the first semester and pass the online test. Those who fail the test can retake the test until they pass. So far, there are 9265 students who have passed the test with a passing rate of 99.9%.





Series of seminars on Gender Equality Month

The Gender Equality Education Committee of NCTU plans a monthly series of seminars on gender equality every semester, and the seminars are typically held when students have the group advising meeting with their advisors. The purpose of the seminar is to teach students to respect the diversity of gender differences, eliminate gender discrimination and promote substantive gender equality. The topics for 2019 are "Smiling in Love— Embracing but not Being Violent" and "What You Can Learn from the Occurrences of Sexual Harassment on Campus." In 2019, the seminars were held at seven departments in NCTU when students have group advising meetings.

Encouraging to open gender equality course

To promote substantive gender equality, eliminate gender discrimination, uphold human dignity, and improve the campus environment of gender equality, NCTU hopes to help students establish correct concepts of gender equality and teach students to be respectful for others and themselves. NCTU promotes the idea of sexual autonomy on campus through gender equality courses. When the content of the teacher's curriculum syllabus, features and implementations meets the meaning of gender equality more than one-third, the course will be noted as a [Gender Equality Course] on the course schedule after the Gender Equality Education Committee approves it. In 2019, NCTU already approved 45 courses.







water dispensers in NCTU

The publications in 2019 was

times more than that in 2018.



Campus drinking water

There are one or two drinking fountains on average on each floor of each building in NCTU. NCTU also provides drinking fountains at outdoor sports venues. Drinking water is free of charge for all the students and staff. NCTU establishes maintenance and cleaning schedules for water towers and drinking water equipment, and conducts regular water quality testing to ensure that everyone accesses safe and affordable drinking water. Therefore, everyone will have fair and proper sanitation conditions.

Water conservation

According to the "Regular Action Plan for Water Conservation," which the government approved in 2016, the water fountains of NCTU will be gradually changed to water-saving devices. NCTU expects the installation rate to reach 60% by 2021 and 80% by 2031.



In 2019, the annual electricity consumption of original buildings was reduced by



6.5 citations per paper in 2019.

Above the average (5.5) in Taiwa

In 2019, NCTU offered

68 related courses



Energy management

Since 2015, NCTU has launched the energy conservation program and introduced the ISO/CNS 50001 energy management system. Three buildings have obtained ISO/CNS 50001 Taiwan Accreditation Foundation (TAF) international standard verification, and five buildings have obtained the Taiwan' s Ecology, Energy Saving, Waste Reduction, and Health (EEWH) certification. Engineering Building Five primarily has been rated as EEWH diamond-level, the highest level in EEWH. NCTU has the following energy conservation methods: (1) aiming at high electricity consumption buildings and promoting the energy conservation improvement project of Energy Services Company (ESCO); (2) lighting improvement by replacing conventional power consumption tube lights with electronic fluorescent lamps or LED lamps; (3) air conditioner improvement by changing conventional low energy efficiency ratio (EER) air conditioners into devices with environmental protection or energy-saving labels; (4) changing the conventional motors of cooling towers and air conditioning water pumps; changing the motors of exhaust systems into the variable-frequency drive motors; and (5) developing the user charge management mechanism and the reward and punishment mechanism for each building to enhance the awareness of teachers and students to save energy spontaneously.

TSMC x NCTU Energy Education Center - Energy Education Program

The TSMC × NCTU Energy Education Center started in 2017. This center is open to the public for making reservations to visit and it is also available for the relevant departments at NCTU for research and experiment purposes. It aims to disseminate the concepts of sustainable energy, smart living, social engineering and architecture technology. The TSMC × NCTU Energy Education Center can be used as an experimental laboratory for architectural technology. The center attempts to convey sustainability by each guided tour under the themes of "Innovative Technology, Comfortable Life, Environmental Cycle". In addition to passing down the professional knowledge, the center's construction cost depended on the precise module design, construction method and material evaluation. It can also provide practical modules for people who are interested in copying.







Above the average (3.4) in Taiwan.

Rank # *L* in Taiwan in the 2020 QS Graduate Employability Rankings.

In 2019, NCTU offered 235 related courses.

The employability of NCTU graduates ranks second in Taiwan, highly appreciated by employers

NCTU focuses on cultivating a new generation of engineering talents, which pays attention to crossdisciplinary learning and application. The engineering and cross-disciplinary education built a solid foundation for graduates and current students' employability, highly appreciated by industry employers. NCTU ranks second among universities and colleges in the 2020 QS Graduate Employability Rankings in Taiwan. Besides, according to the statistics in 2020 Global Views Monthly, which is the most credible and influential cultural enterprise in Taiwan, the starting salary of a master of Computer Science from NCTU is NT\$56,000. The salary is the highest among all universities in Taiwan.



Providing diversified training for teachers, non-governmental organizations, and global business leaders and improving their professional knowledge

NCTU has offered a wide range of free activities to faculty members, business leaders, and the public. NCTU has cooperated with the Advance Higher Education in the United Kingdom to offer free international higher education training courses to improve the teaching skills and capacities of the university's teachers. Global Citizenship Education Center at NCTU held lectures, workshops, seminars and educational training programs to discuss the core concepts of global citizenship education and the design of lesson plans. Besides, these events also offer participants opportunities to exchange ideas on how to integrate the sustainable development goals of the United Nations in designing cross-disciplinary lesson plans. NCTU also established the Global Business Future Leadership Class, aiming to build a learning community focused on global management. The worldwide Taiwan business leaders who enrolled in this course can exchange information, knowledge, and resources as well as build connections, which can make the globalization of enterprises smoother. The 2020 Taiwan Business Globalization New Trends Forum is open to all small-to-medium enterprise managers, senior managers and people who are concerned with global developments. The forum is free and the discussion is mainly about industrial development trends and government policies in the postepidemic era.

Building a transparent, fair and safe work environment and policies to protect the rights and interests of staff

NCTU uses open and transparent treatment for staff remuneration and evaluation standards. NCTU respects staff's gender, sexual orientation, age, ethnic group, religious belief or other conditions without any discrimination. To promote workplace harmony and protect workplace safety and work rights of all the staff, NCTU prohibits any workplace violence or discrimination between supervisors and employees. To protect teacher's rights, NCTU sets up the Teacher Grievance Review Committee and the Employee Grievance Review Committee. Besides, an employee assistance implementation plan has been established through various services, including career counseling service, and physical and mental health programs.



NCTU cultivated more than

750 startup/scientific research teams. 9.5 citations per paper in 2015-2019.

Above the average (7.3) in Taiwan.

The total amount of funds raised > NT \$300 million each year.

Establishing Startup Lab to cultivate innovative talents

The Center of Academia-Industry Collaboration of NCTU has set up a Startup Lab, which provides free work area and entrepreneurship counseling resources. The Lab sets up an entrepreneurship seed fund, holds entrepreneurship team competitions, and encourages students to start their own business. From 2018 to 2019, it successfully cultivated four international startup companies. In 2019, the NCTU Seed Fund Entrepreneurial Competition provided 1 million TWD to sponsor five startup teams to set up companies. NCTU integrates the resources of the Center of Academia-Industry Collaboration and the Global Research and Industry Alliance Program of the Ministry of Science and Technology to actively promote academia-industry cooperation and provide guidance for the incubation of startup teams.

AgriTalk, a new company led by Associate Professor Wen-Liang Chen of the Department of Biological Science and Technology, specializes in "smart agriculture." AgriTalk intelligent agricultural system uses the Internet of Things (IoT) to monitor soil environmental changes, predict plant diseases and insect pests, and carries out intelligent fertilization through agricultural artificial intelligence. It also provides customized agricultural fertilizer and pesticide with accurate application time and dosage.



Encouraging innovative research and patent development

NCTU actively promotes integrated research teams and establishes good connection between academia and industry. NCTU encourages teachers and students to participate in large-scale integrated academia-industry research programs to improve industry and commerce's technological capabilities. NCTU also increases research and development (R&D) expenditure to encourage innovation.

From 2016 to 2018, the average total funding for projects undertaken by each faculty has increased year by year, ranking first among the top universities in Taiwan. The faculties have also displayed their creativity and engagement in patents. From 2016 to 2018, the income derived from the non-payment of intellectual property rights is the highest in all universities in Taiwan.

Promoting Science, Technology, Engineering and Math (STEM) Education and cultivating teachers all over the country

To fulfill the information and technology education of 108 Curriculum Guidelines, NCTU launched an Artificial Intelligent and Internet of Thing (AIoT) capacity building program. The program integrates the needs of local government, school principals and teachers with the professional resource on campus. The program provides training to solve the lack of information and technology education teacher in primary and secondary schools. The first phase of the program has designed the "12u10" teaching materials according to the core competencies of Information and Technology Education emphasized in the 12-Year Basic Education Curriculum Guidelines. The program has held training courses around the country in Hsinchu, Keelung, Yilan, Taitung and Miaoli. One hundred eighty-two hours of lectures have been completed.

Cultivating hundreds of innovative and scientific research teams in the Center of Industry Accelerator and Patent Strategy (IAPS)

IAPS was founded in 2013, and it is the first incubation accelerator set up by the academic circle in Taiwan, which combines university, government and industry resources to provide systematic guidance for SMEs by experts. So far, it has cultivated more than 750 startup and scientific research teams, and the total amount of funds raised is more than NT \$300 million each year.



In 2019, 552 students applied

In 2019, NCTU offered

283 related courses.

for tuition and miscellaneous fee waivers



Ensuring successful enrollment and completion for disadvantaged students and achieving equality in education

NCTU has established special enrollment channels, for instance, "Hsuan Kun Yang Fan Recruitment" and "Special Expertise Selection", to provide more opportunities for disadvantaged students, achieving social mobility through higher education. Besides, NCTU has implemented "Student Assistance Measures" to attend to disadvantaged students. Through various learning guidance mechanism and academic scholarships with the evaluations of learning effectiveness, NCTU helps students balance their needs for study and life and promotes vertical mobility.

In 2019, NCTU provided a wide variety of learning supports to a total of 991 students in need: 157 students in tutoring, 275 students in capacity development in different fields, 21 students in interdisciplinary programs, 300 students in career exploration, 15 students in career competition, 43 students in off-campus internship jobs, and 180 students in life service learning activities. In 2019, NCTU has approved 37 disadvantaged students' applications for the short-term overseas program, leading to a total subsidy of NT\$785,000. In addition, disadvantaged students are eligible to apply for various tuition and miscellaneous fee remission and waivers. In 2019, 522 students applied for tuition and miscellaneous fee remission, 74 for grants to help with living expenses, and 202 for Disadvantaged Students Scholarships.

Eliminating discrimination by respecting and supporting diversity in all forms

The Aboriginal Student Resource Center at NCTU assists economically disadvantaged indigenous students and provides indigenous students with life and schoolwork guidance, employment counselling, career development, and ethnic education curricular activities. The Counseling Center at NCTU provides LGBTQ+ support services. It cooperates with the homosexual and gender-equality associations to implement genderdiversity and gender-equality education in college and life planning courses and group advising sessions, with a view to arousing students and staff's awareness of LGBTQ+ issues. The Counseling Center also provides psychological counseling service for LGBTQ+ individuals.

Developing Campus Access Map for people with disabilities

To promote educational equality and friendly campus for teachers and students with disabilities as well as their parents and caregivers, NCTU has provided them with information about barrier-free environment, facilities, and service. The Graduate Institute of Architecture of NCTU has cooperated with the Department of Student Affairs and Special Education of the Ministry of Education since 2018 to develop the University Campus Access Map Taiwan (UCAT). Furthermore, NCTU' s students collaborated with students from other universities to jointly develop "UCAT GO School Fun – an Accessible Map of Public Transportation Transfer Information" for teachers and students with limited mobility.



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In 2019, NCTU offered



9 4 citations per paper in 2015-2019.

Above the average (8.3) in Taiwan.



Integrating the local Hakka historic sites and inheriting the international Hakka academic and cultural mission

NCTU Liujia Campus used to be traditional Hakka settlements. Commissioned by the Central Government and Hsinchu County Government and with the consideration of academic development, NCTU proposed the establishment of "College of Hakka Studies" to the Ministry of Education at the end of 2002, hoping to consolidate a premier international research center of Hakka academic studies and policies. NCTU Liujia Campus is adjacent to Zhubei Hakka Folk Park. In order to constitute a Hakka settlement integrated with academia, NCTU not only built the College of Hakka Studies in the shape of a traditional Hakka "roundhouse" in Liujia Campus, but also preserved numerous Hakka traditional dwellings and buildings, among which are two historic buildings, "Little Wenli Hall" and "Zhongxiao Hall". At present, speeches, art exhibitions, or concerts are regularly held in these two buildings. NCTU has been strengthening the connections with locals and fulfilling its social responsibilities.

Reconstructing and reactivating the military dependents' villages and historic relics of World War II

Institute of Applied Arts at NCTU has been commissioned by the Cultural Affairs Bureau of Hsinchu City government to implement the project of "Good Neighborliness Residency at the Big Chimney Factory Base" for Hsinchu Sixth Fuel Factory. The "Big Chimney Factory Base" is a historical relic of an industrial building from the Imperial Japanese Navy's Sixth Fuel Factory (abbreviated to Hsinchu Sixth Fuel) in World War II. It is not only a national historical architectural heritage, but also one of the thirteen featured military dependents' villages authorized by Military of National Defense of Taiwan.

To preserve and activate the Hsinchu Sixth Fuel Factory, NCTU has established the Sixth Fuel Team to promote "Hsinchu Living Museum" by integrating art practice with community construction, using artificial intelligence to support ecological conservation and integrating field research with mixed reality to reconstruct historical sites. NCTU has brought the participation of both the public and the international community, promoted "Participatory Sustainable Living Design", and walked into the local community to discuss every aspect of the past, present and future of the Hsinchu Sixth Fuel Factory.

Providing bike-sharing and campus-tour-bus services for energy saving and carbon reduction

To encourage teachers and students to use public bicycles with low pollution and low energy consumption as short-distance vehicles, NCTU has set up YouBike stations since 2017. Four stations with 234 YouBikes have been provided until now. NCTU has the highest density of YouBike stations among universities in Taiwan. Having YouBike on campus provides more convenient and diversified services for all teachers and students, which is conducive to the promotion of bicycle sharing on campus. Considering that NCTU teachers and students need to shuttle between different campuses, and to encourage teachers and students to have more indepth and close communication with the adjacent academic institutions or universities, NCTU has arranged a variety of campus-tour buses and public transport vehicles to meet different traffic needs of teachers and students, community residents and alumni.





In 2019, NCTU offered

146_{related courses.}

The number of publications is growing year by year. The publications in 2019 was

times more than that in 2015.



Using innovative materials to lead a new revolution in architecture

NCTU's Transdisciplinary Design Innovation Shop (TDIS) created a green building " Nest Dwelling" by using boards and bricks produced using innovative nPulp technology. The nPulp technology is developed by Yong Feng Yu, a famous paper manufacturing company in Taiwan. "Nest Dwelling" demonstrates the possibility of utilizing novel materials in construction applications and it can be viewed as a realization of environmental justice and social justice. To achieve "zero waste" and "free heavy pollution chemistry", the nPulp technology uses a large quantity of rice and wheat straw left in the fields after harvest as raw materials and adopts a biological manufacturing process to produce pulp and paper without adding any strong-acid or strong-alkali chemical raw materials. This technology transforms the seemingly useless straw into a new ecofriendly material by recycling and reusing it, which can not only increase farmers' incomes, but also realize the circular economy.



Employing newly-emerging perovskite materials to make photovoltaic modules for energy saving and carbon reduction

Since interior lighting has always been a major source of household electricity consumption, how to reduce the power consumption of indoor lighting or recycle energy consumption become critical issues when it comes to the development of future architecture with low carbon and carbon balance. The silicon solar cells, which are commonly used today, do not perform well in low light or indoor lighting. Thus, scientists around the world are constantly looking for sustainable solutions for household electricity and Internet of Thing (IoT) applications. The team of Professor Fang-Chung Chen from the Department of Photonics of NCTU used photovoltaic modules made from newly-emerging perovskite materials to recover the indoor lighting energy. After theoretical calculation and evaluation, the team found that up to 60% of indoor lighting energy could be recovered, and that the high-efficiency and low-cost characteristics of perovskite photovoltaic modules could also be applied to low-power sensors or actuators in IoT, indicating the explicit direction for achieving the goals of energy conservation and carbon reduction.



In 2019, NCTU offered



3.6 citations per paper in 2019.

Above the average (3.3) in Taiwan.



Sustainable architecture which can exist in extreme climates

NCTU participated in Solar Decathlon Europe (SDE), an international competition. NCTU integrated different engineering and scientific fields such as architectural design, structural electromechanical engineering, energy efficiency simulation, energy conservation and environmental protection, and used Microclimate Controlling Core (MCC) cooling chip technology and cross-laminated timber to achieve the goal of carbon reduction, so as to soften the impact caused by the climate and environment on the traditional construction industry. In the stage of proposing during the competition, the intention of the proposal was to shed light on various aspects of the current urban situation in Taiwan, such as transportation, social structure, and forms of residence. The proposal aimed to improve living efficiency, function sharing, and environmental protection and energy saving by responding to the issues of overcrowding, separation and privatization, and climate crisis. In addition, considering local humanistic and social conditions, NCTU put forward a proposal of social housing project, which will be demonstrated in Taiwan and Germany in 2021 in the form of small-scale housing units.

Special guest speaker of Chair Professor Peter Russell from Delft University of Technology: "Why digitization will save architecture and the planet"

NCTU' s Transdisciplinary Design Innovation Shop (TDIS) and the Jut Foundation for Arts and Architecture jointly invited Peter Russell, a chair professor (former dean of the School of Architecture and Environment) from Delft University of Technology, Netherlands, to deliver a speech on "Why digitization will save architecture and the planet" in Taiwan in December 2019. The speech started from the application of digitalization in the construction industry nowadays and beyond, exploring the significance and importance of digitalization when facing the pressing issues of climate change and the rise of disruptive innovative technology.



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Cleanup 325 kg 32 related courses.



Collaborating with Hiin Studio to clean up marine garbage

Taiwan is an island country that is surrounded by water. It only takes 15 minutes to drive from the Guangfu Campus of NCTU to the nearest Nanliao Beach. NCTU Service-Learning Center leads students to truly look into the challenges and problems which the environment is facing, and to mitigate the impacts of pollution on marine ecology through practical actions. In 2019, NCTU teamed up with Hiin Studio with 61 students participating in a 2-hour beach cleanup, removing a total of 325 kg garbage from the coast. In spite of the short period of the beach cleanup, students were personally impressed by the profound meaning of environmental protection and started to take action to reduce plastic use in their daily life.

Inventing an intelligent aquatic garbage cleanup vessel to protect marine ecology

The Autonomous Underwater Vehicle (AUV) team, composed of students from the Department of Mechanical Engineering of NCTU, developed the "intelligent aquatic garbage cleanup vessel" by using the "Rabboni sensor" as the core component, combined with machinery, sensing, solar energy, software, and wireless communication. The team also applied the system of Artificial Intelligence and the Internet of Things (AIoT) to marine ecological protection to collect wastes on the lake or on the sea via intelligent remote-control sensors.

In addition, the AUV team was invited to the "Little Edison-Ocean Cleanup Vessel Experience Camp" to share the achievement of the "intelligent aquatic garbage cleanup vessel" with high school and elementary school students. The teenagers were introduced to the AloT system, marine education, environmental protection issues and other interdisciplinary knowledge, and were expected to apply these ideas to develop an "ocean cleanup vessel" to salvage the garbage floating on the surface of ocean.







citations per paper in 2019.

In 2019, NCTU offered

45 related courses.

Establishing a Research Center of Biochar for Environmental Applications – recyclable and reusable agricultural wastes

In 2018, NCTU signed a contract with University of Delaware (UD), United States, to establish the NCTU-UD Joint Research Center of Biochar for Environmental Applications (JRC-BEA). The research team used high-temperature tube furnaces and box furnaces to do pyrolysis carbonization on sewage sludge (e.g., wood, coconut shell fiber, rice husk, pinecones, and bagasse) obtained from different sewage treatment plants. Simultaneously, the research team mixed the sludge with agricultural wastes to produce biochar in order to improve the heating value and the strength of the sludge. In this way, the sludge can be recycled and reused as sewage disposal materials, fuel supplements or building materials. The bilateral exchange of research results can not only suit the actual needs of industries in Taiwan and the United States, but also provide the most feasible technical consultations and service. The research team strives for the future works of producing, applying, and promoting biochar with concerted efforts.





DIYGreen Technology – being self-sufficient in growing vegetables

In order to solve three major environmental problems in Taiwan, namely heat island effect, excessive recycled bottles and the low disposal rate of kitchen waste, Professor Jehng Jung Kao from the Institute of Environmental Engineering of NCTU led a research team to develop the very first new "DIYGreen roof" on the basis of recycled bottles, which is suitable for the environment of Taiwan. In addition to the advantages of traditional green roofs, such as good cooling and energy-saving performance, DIYGreen roof also solves problems like the need of waterproofing, bad heat dissipation at night and outflow of sewage. In order to promote the DIYGreen kit more effectively, the construction time of this kit is much shorter than the traditional ones so that children and even the elderly can build and maintain it by themselves. What' s more, the DIYGreen kit has great flexibility in expanding and low difficulty in maintaining. It is not limited to be installed on roofs or balconies; instead, it' s suitable for all flat surfaces. Thus, everyone can grow vegetables and fruits on their own roofs or balconies, which is the most environmentally friendly way of producing food with zero food miles.



Citations per paper in 2019. Above the average (1.5) in Taiwan. In 2019, NCTU offered

193 related courses.



NCTU School of Law—cultivating legal talents to promote equity, justice and peace

NCTU School of Law initiated the learning group of social justice, gender equality and labor rights, focusing on social justice and equality, and cultivating students' views on social care and justice through combination of law courses, research and non-governmental organization internships.

Offering free legal consultation in partnership with the Legal Aid Foundation

The students of the NCTU School of Law initiated the cooperation with the lawyers of the Legal Aid Foundation in Hsinchu. Every year from September to December, they provide legal consultation services for teachers and students of both NCTU and National Tsing Hua University as well as off-campus residents for free, hoping to promote social justice with their legal expertise.

Global Humanities Institute – promoting fairness, justice, and peace and eliminating inequality

To achieve the goals of promoting fairness, justice, and peace and eliminating inequality, the International Center for Cultural Studies (ICCS) established a transnational partnership with 12 international institutes, inviting 36 senior international scholars and 24 young transnational scholars from different disciplines to form a research group. The goal of this research group is to organize the Global Humanities Institute (GHI) under the theme of "Migration, Logistics, and Unequal Citizens in Contemporary Global Context". GHI aims to focus on the different forms of conflicts and inequality in the Third World, particularly the large population of refugees, migrant workers, stateless persons, and human trafficking victims under the wave of massive migration in the 21st century, and to discuss how discrimination, oppression, violent mentality, laws and institutes are formed in different societies. Besides, through the experience exchange between scholars and transnational non-governmental organizations, GHI is considering how to propose a more tolerant discourse and a proposal to revise inappropriate laws and policies.



Salute to Taiwanese indigenous people and writing back the history of Hakka culture development in Taiwan

To re-explore the intersubjective historical view of Taiwanese indigenous people and Hakka people, the NCTU College of Hakka Studies has launched the program of " Salute to Taiwanese Indigenous People: Writing Back the History of Hakka Culture Development in Taiwan". Numerous scholars will be invited to inquire into the relevant historical materials of Taiwanese indigenous people and Hakka people, in order to inspire more research from different perspectives and to further advance the academic research on Taiwan's ethnic groups.





international co-authored publications in 2019 (35.7% of all NCTU publications in 2019)

296 international partner institutions.

In 2019, NCTU offered 212 related courses.

Proactively participating in international organizations to build transnational communication and entrepreneurial opportunities

NCTU proactively joins various international organizations, which not only increases the international visibility of NCTU, but also further enhances the participation of NCTU in the international arena.

1. The Association of East Asian Research Universities (AEARU)

AEARU was founded in 1996 as a regional research organization in East Asia. Its current members include 19 research-oriented universities from Japan, South Korea, Mainland China, Hong Kong Special Administrative Region and Taiwan. NCTU joined the AEARU in 2018. In addition to proactively participating in activities organized by international higher education organizations, NCTU also actively devoted to and hosted student summer camps, sports competitions, workshops and academic seminars, so as to increase opportunities for NCTU teachers and students to be in line with the international academic communities. For example, NCTU and AEARU have cooperated to develop the Global Learning Initiatives Program and provided theme-based interdisciplinary courses for students to access diversified resources and experience international learning environment by communicating with teachers and students from different universities.

2. University Alliance in Talent Education Development (UAiTED)

The University System of Taiwan collaborated with Sayling Wen Cultural and Educational Foundation, together with the prestigious universities in Singapore, Malaysia, Hong Kong and Taiwan, to jointly establish the University Alliance in Talent Education Development (UAITED) in 2019. The goal of UAITED is to implement projects creating connections among students, industries and universities, and bridge talent recruitment and cooperation between universities and industries. In addition to carrying out internship programs in foreign enterprises and training courses for exquisite service talents, it also promotes innovation and entrepreneurship cultivation and competition-related activities. UAITED strengthens academia-industry cooperation to put knowledge into practice and transfer technology to business, and promotes sustainable social development. UAITED forms a forum for all walks of life to work closely with the universities and cultivate future global academia-industry talents together.



Promoting smart agriculture with artificial intelligence technology and enhancing international cooperation

AgriTalk Technology was founded at the end of 2019 by Lifetime Chair Professor Jason Yi-Bing Lin from the Department of Computer Science, Associate Professor Wen-Liang Chen from the Department of Biological Science and Technology, and Chien-Chang Chen, founder of the Internet of Thing (IoT) company as well as the executive director of the non-toxic intelligent agricultural system of NCTU. The team created the "Non-toxic Intelligent Agricultural System - AgriTalk Management Platform" and developed six artificial intelligence (AI) management systems, including pest prediction, disease prediction, water-saving irrigation, fertilization control, temperature control, and light control, on the basis of IoT structure. This agricultural system can simultaneously collect environmental and fieldwork data, and produce food traceability that meets the Guidelines for Good Agricultural and Wild Collection Practice (GACP) of Medicinal Plants through blockchain technology, to ensure the safety, efficiency, and quality of crops. The team participated in Consumer Electronics Show (CES) in Las Vegas in January 2019, attracting attentions of Japan, Dubai, Chile, Canada, India, Philippines, Italy and other countries, and even received a call from the President of Romania, who hoped to introduce this technology to Romania to promote smart agriculture. Since then, international cooperation with Romania has been started.





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Collaborating with the President of the Global Citizenship Education of the United Nations Educational, Scientific and Cultural Organization (UNESCO) to promote sustainable development of the world through education

NCTU Global Citizenship Education Center (NCTU-GCEC) is the first research center founded on the theme of global citizenship education in Taiwan, aiming to improve the research and teaching development of global citizenship education. It holds seminars and training activities, promotes exchanges and cooperation with neighboring countries, and establishes a global platform for the research and practices of global citizenship education.

The promotion of global citizenship education in national curricula is highlighted in the "Education 2030 Framework for Action" proposed by UNESCO in 2015 and regarded as one of the crucial implementation strategies to achieve target 4.7 of the Sustainable Development Goals (SDG4 Quality Education). The NCTU-GCEC has built long-term partnership with Professor Carlos A. Torres, who is the UNESCO Chair in Global Learning and Global Citizenship Education and a professor at UCLA. As the chair professor and international director, Professor Torres will work with the NCTU-GCEC to achieve the following goals:

- Conduct academic research with scholars around the world to promote relevant research programs, and lead Taiwan scholars to participate in UNESCO activities and publish research findings;
- Organize lectures, workshops, seminars, educational training programs and other activities to enhance the awareness and discussion between Taiwan and neighboring countries of global citizenship education issues, and propose theoretical and practical solutions for the implementation of global citizenship education in Taiwan; and
- Promote communication with academic institutions in neighboring countries and establish connections with non-governmental organizations, to make Taiwan a base of global communication forum for global citizenship education research and practices.

Aligning with seven countries for the establishment of a Global Hakka Research Alliance as a pioneer in Hakka research

After a year of preparation with the support of the Hakka Affairs Council in Taiwan, NCTU established the "Consortium of Global Hakka Studies (GHAS)" at the College of Hakka Studies in 2019. Eleven academic institutions from seven countries have signed a memorandum of cooperation, which aims to improve the quality of Hakka and Ethnic studies, and to share the results of Hakka research and Hakka movement experience with the international academic communities. The founding members include Hakka Academic Development Committee of the Hakka Affairs Council, National Central University, NCTU, National United University and National Kaohsiung Normal University in Taiwan, University of Hyogo of Japan, Petra Christian University of Indonesia, University Malaya of Malaysia, National University of Singapore, Mahidol University of Thailand, and San Francisco State University of the United States.







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大數據研究中心 Big Data Research Center

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