大连理工大学
DALIAN UNIVERSITY OF TECHNOLOGY

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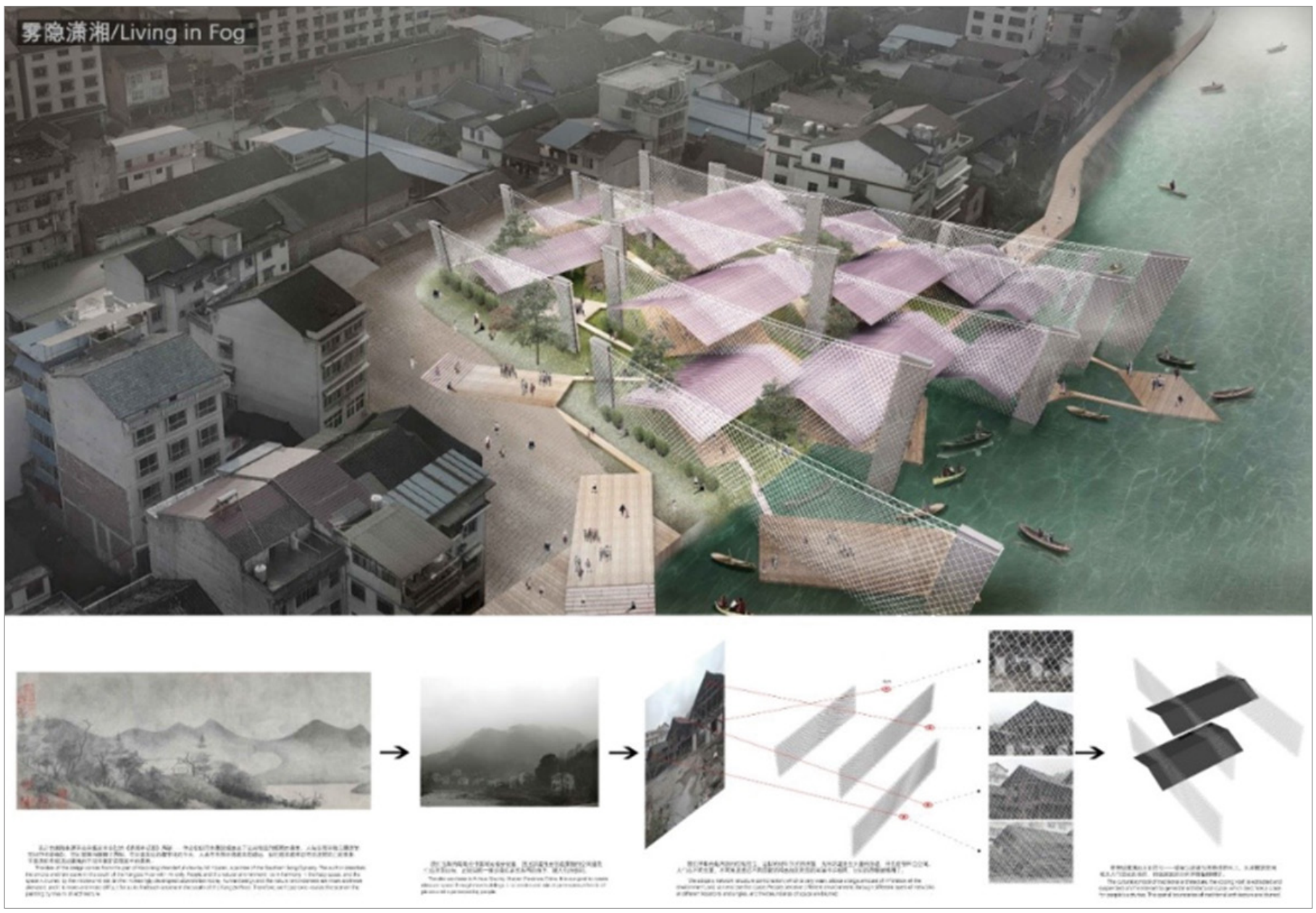
# The Research Results Published by DUT are Selected into the Top International Journals of Chemistry

**Author: State Key Laboratory of Fine Chemicals**
**Source: School of Chemical Engineering**


Professor Duan Chunying and Associate Professor Zhao Liang, from the Supramolecular Chemistry and Catalysis Team of DUT, have made a series of innovative achievements in the fields of controlling electron transfer process through the controllable construction of metal-organic supramolecular architectures, which achieved important breakthroughs in matching of the spatial and stereo structures, and multi-step reaction series and collaborative catalytic process by the confinement of metal-organic supramolecular architectures (Angew. Chem. Int. Ed., 2017, 56, 8692−8696; Angew. Chem. Int. Ed., 2017, 56, 15284−15288). By virtue of hydrogen bonds and other supramolecular forces, an innovative idea is proposed to realize the dynamic series connection of multi-step reactions using common intermediates and multiple catalytic units simultaneously, which reveal the structure-activity relationship of metal-organic confined architectures and important guiding value for the development of multi-step catalytic reaction series to practical goal. These researches were reviewed in *Coordination Chemistry Reviews* (Coord. Chem. Rev., 2019, 378, 151−187). Recently, the Duan group has successfully designed and assembled two new negatively charged metal-organic supramolecular architectures by introducing the cobalt dithiolene compounds as the catalytic center for proton reduction. These supramolecular hosts combine positively charged ruthenium compounds around the catalytic center of cobalt cores through the cooperation of electrostatic interactions and multiple hydrogen bonds, so as to shorten the distance between the photosensitive and catalysis for efficient catalysis. Relevant research result published in Chem. Commun., 2019, 55, 8524−8527, and selected as a cover article for key promotion.

Based on previous research, the Duan group pioneered the work to introduce coenzyme active center into the metal-organic supramolecular confined architectures, and prepared a supramolecular flask for the hydrogenation process with switchable selectivity. The natural cofactors not only transfer protons and electrons in conjunction with different reactions, but also reduce hydrogen donors with double electrons. Through elaborate design to install the active center of coenzyme on the surface of the metal-organic supramolecular flask for transferring the protons and electrons inside and outside the cavity of the supramolecular flask, the Duan group proposed a selectivity-switched hydrogenation strategy, i.e. regulating double electron hydrogenation pathway and single electron hydrogenation pathway. The pre-organization of the substrate within supramolecular flask, the typical double electron hydrogenation is promoted in the cavity of the supramolecular flask, which has high selectivity for aldehydes, ketones and imines. However, the single electron hydrogenation takes place outside the flask cavity and has high selectivity for nitro group. Through the confinement effect of metal-organic supramolecular flask, different electron transfer pathways are controlled inside and outside of the flask cavity without mutual interference. At the same time, by changing the concentration of the substrate and selecting the electron donors with different redox ability, the reaction kinetics of the two hydrogenation routes can be adjusted to switch selectivity of hydrogenation. This kind of supramolecular flask shows excellent performance for the hydrogenation with switchable selectivity. And the hydrogenation selectivity of different groups can reach more than 80%, and it can be directly applied to the one-step synthesis of cinnarizine and naftifine. In view of its simple regulation method and excellent performance, this method is expected to provide technical innovation for the selective preparation of drug molecules. This achievement was recently published in J. Am. Chem. Soc., 2019, 141, 12707−12716.

These work were supported by key project, innovative groups and international (regional) cooperation and exchange project of the National Natural Science Foundation of China and Dalian University of Technology.




# Students from School of Architecture and Fine Art of DUT Won Their First Championship in the International Student Competition in Architectural Design

**Source: School of Architecture and Fine Art**

The “UIA-HYP Cup 2019 International Student Competition in Architectural Design” review meeting ended in Tianjin University on October 24th. The work “Living in Fog” designed by Wu Ruoyu, Zhang Xiaoke, Liu Yaojia and Xin Zhiyuan, which guided by Zhang Yu and Fan Yue from School of Architecture and Fine Art of DUT won the first prize, and a bonus of 100,000 yuan.

The “UIA-HYP Cup International Student Competition in Architectural Design” began in 2012 and was held by International Union of Architects (UIA). After six years of implementation, the "HYP Cup" has become the most influential international student architectural design competition in China.

The chairman of the jury, Benedetta Tagliabue, comments on the award-winning work that it is dedicated to symbolizing the new bond between human and the natural environment. She thinks that the idea is very unique and the structure design is very novel, so the jury are fully impressed by its charm.

The work was inspired by "Xiaoxiang Wonderful View", a painting of Mi Youren's in Northern Song Dynasty. Spreading out the cloud and mist with ink and wash, the painting captures the essence of "misty rain" and presents it in the work.

This award-winning work comes from the 2019 undergraduate graduation design of architecture. It is a joint graduation design of DUT, Huazhong University of Science and Technology, Hunan University and Shenzhen University. School of Architecture and Fine Art has been actively engaged in professional construction with a solid and rigorous attitude, especially for the final part of professional training - graduation design. Over the years, the architecture major has adhered to the inter-institution and inter-disciplinary cooperation of graduation design, with a student coverage rate of more than 50%. The school has been laying great emphasis on teaching research, and won the National Excellent Teaching Plan in 2016. It has also been strictly standardizing management, and implemented the external audit system of undergraduate graduation design in 2019. This award is an outstanding achievement in the process of talent training of School of Architecture and Fine Art, and it has given important support to the construction of first-class professionalism.

# DUT Students Won Two Gold Medals in the International Genetically Engineered Machine Competition (iGEM)

**Source: School of Bioengineering**

On November 4th ET, the closing ceremony of 2019 International Genetically Engineered Machine Competition (iGEM) was held in Boston, USA. Two teams from DUT won gold medals, which is a breakthrough after last year's single silver medal and nomination award for the best new application. Two teams from DUT this year consist of 31 members, with 21 of them coming from the School of Bioengineering, and the remaining 9 members from 9 different majors including applied chemistry, automation, software engineering, environmental engineering and architecture. Associate Professor Yang Jun, Han Lulu, Kong Fantao and Senior Engineer Zi Lihan from School of Bioengineering served as team instructors.

iGEM was first initiated by Massachusetts Institute of Technology (MIT). It requires teams to finish prediction, manipulation, and measurement of artificial biological systems, which need to use standard biobricks to build genetic circuits and effective mathematical models.

The two projects that won the gold medals this year are "Capture of circulating tumor cells with DNA hydrogel" and "Design of light controllable C. *reinhardtii* micro-robot".

## Cell in CELL

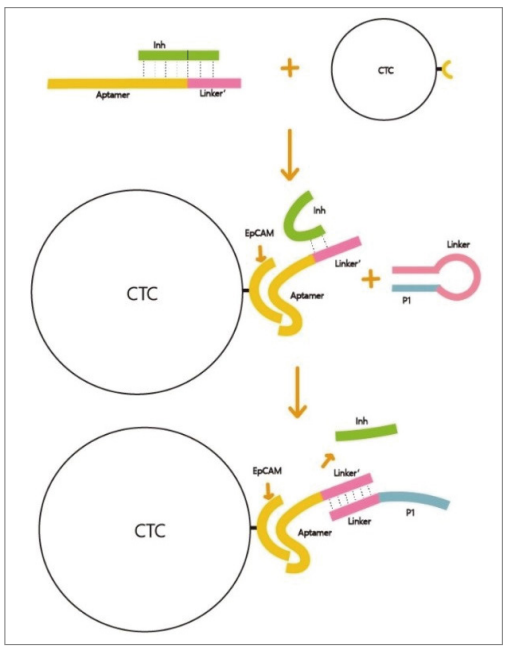
In order to address the difficulties on recognition, visualization, and capture of living CTCs with high purity and integrity, the team constructed a multifunctional DNA hydrogel like a prison CELL capsuling CTCs, and defined this new platform as "cell in CELL" (CiC). With this strategy, clinics may have a new way to understand the condition of the patients while the researchers can have the opportunity to obtain the CTCs with high biological activity. The strategy contains three vital parts, the fluorescence-labeled ssDNA aptamers, switches and DNA hydrogels.

(i) The fluorescence-labeled ssDNA aptamers specifically binds to the receptors of CTCs and visualize them.

(ii) Once successfully targeting CTCs, the ssDNA aptamers will expose the sticky end further for triggering the adhesion of sticky-end pairing ssDNA. This process is the switch of the formation of DNA hydrogel around CTCs.

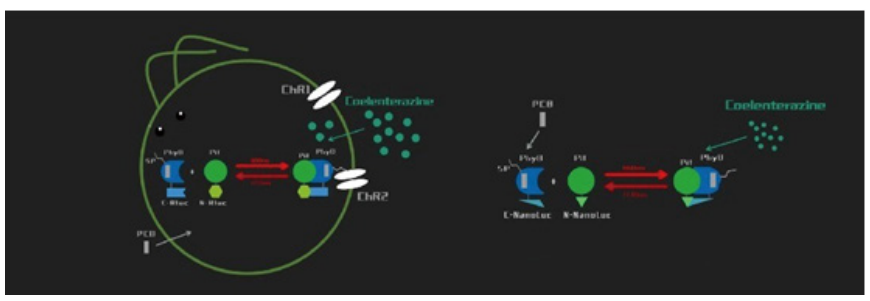
(iii) The pairing ssDNA can induce two sequential processes: (a) a rolling circle amplification (RCA, or R) followed by (b) a multi-primed chain amplification (MCA, or M), making CTCs enveloped with hydrogels. This step can enlarge the size of CTCs for centrifugal isolation. After being treated with exonucleases, CTCs are released intactly with high activity.

Compared to other methods, the strategy of DUT team is more superior in these ways. Firstly, adopting the unique combination of RCA and MCA, the team can achieve a controllable size and morphology of the DNA hydrogel. Secondly, CTCs are extremely rare and they are same in size and similar in shape as the leucocytes. The device can magnificate the difference and make the subsequent isolation convenient. Thirdly, the traditional capture methods based on DNA hydrogel monomers consume a big amount of nucleate acid. The strategy is able to cut down the costs.




Design and extraction of circulating tumor cells using DNA hydrogel capture

## Bio-microrobot: A Light Driven *C.reinhardtii*




Circuit design of red-light control light converter

Marvel's superhero ant man has aroused DUT team's interest in micro-robots, Chlamydomonas reinhardtii is a kind of eukaryotic, photosynthetic model organism with two flagella which has phototaxis towards blue light. That's why the team wanted to design a light-controlled micro biological algae robot focusing on expanding the sensitivity spectrum of Chlamydomonas reinhardtii. The team designed from two perspectives: on the one hand, transforming channel rhodopsin, the key photosensitive structure in the system, they exogenously expressed the rhodopsin channel mutant VchR from the volvox to make it feel the orange light of 589 nm; on the other hand, designing a light converter to realize the activation of endogenous blue light to movement, they take the red light-controlled protein PhyB/Pif3 as an example, combining them with the split Renilla luciferase, which is regarded as a general idea of designing light converter and completely created by themselves. In the end, they provided a scheme for controlling Chlamydomonas movement under UV light, 589 nm, and 660 nm in addition to blue light, and three kinds of engineered algae. Due to the weak catalytic luminescence intensity of Rluc, they chose NanoLuc from registry, which has stronger catalytic luminescence to generated stronger endogenous blue light to activate Chlamydomonas movement, and established a model to predict its cleavage site, providing a simple split protein prediction method.

The team has prepared carefully this year by organizing summary meetings and absorbing successful experience from traditional outstanding teams, and laid a solid foundation for the establishment of this year's new teams. Since December in 2018, School of Bioengineering has invited synthetic biology experts such as Zhang Haoqian and Zhou Yongjin, and iGEMers from Peking University and Shanghai Jiaotong University, etc., into the class of the innovation and experiment practicing class. Communications with them strengthened the comprehensive understanding of synthetic biology and the iGEM competition rules, and systematically training of literature search, experiment operations and team building had cultivated fresh troops for this year's competition.

In recent years, the School of Bioengineering of Dalian University of Technology, with the support of the International Office, the Academic Affairs Office, the Alumni Office and the School of Innovation and Entrepreneurship, etc., has established a platform based on first-class disciplines and supported students to participate in various discipline competitions, encourage them to go abroad and contact the frontier development areas of the disciplines, which has achieved practical results in cultivating compound talents with excellent scientific research, international vision and innovative spirit.

It is reported that the International Genetically Engineered Machine Design Competition (iGEM) is an internationally authoritative academic competition for students in the field of synthetic biology. It was founded in 2003 by Massachusetts Institute of Technology and became an international event in 2005. In 2019, iGEM attracted 375 teams from more than 40 countries, with more than 4,000 students from Harvard University, MIT, Imperial College Universities, Peking University, Tsinghua University and other top universities in the world competing on the same stage. As a top event in the field of synthetic biology, the research results of participated teams are widely concerned by international top academic journals such as Nature, Science, Scientific American, and Economist.

# Project Management Research Center of DUT Won the "Outstanding Education Contribution Award" of the 20 Years' Development of Project Management in China

**Source: School of Economics and Management**


The 20 Years' Development of Project Management in China: Achievement Presentation and Summit Forum, hosted by China International Talent Exchange Foundation and co-organized by Project Management Institute (PMI), was held in Beijing, 29 Oct. 2019. Lu Ming, member of the Party Committee of the Ministry of Science and Technology, Wan Jinfa, deputy director of the China International Talent Exchange Foundation, and Sunil Prashara, PMI Global President and CEO attended the forum. Nearly 500 experts and professors from the Ministry of Science and Technology and relevant government departments, enterprises and universities attended the meeting. Project Management Research Center of DUT won the "Outstanding Education Contribution Award" of the 20 years' project management development in China (1999-2019), and Professor Song Jinbo, Vice President of the School of Economics and Management, took the stage to receive the award.

Project Management Research Center of DUT focuses on public project investment and financing decision-making, project governance, complex project management, project-driven enterprise management and other research fields. It has trained a large number of outstanding project management talents for government, enterprises, and social organizations, and has also promoted domestic and international certification of project management. Furthermore, it has made positive contributions to the improved performance of government and private capital investment, capacity improvement of large central enterprises, and construction of the Belt and Road Initiative.

On the 50th anniversary of PMI, The Ten Top Project Management Outstanding Education Contribution Awards which jointly selected by China International Talent Exchange Foundation and PMI represent the highest level of educational awards in the field of project management in China.

**FYI:**

The China International Talent Exchange Foundation is a non-profit organization authorized approved by the Chinese government to provide fund support and related services for promoting international exchange and cooperation of talents. It is administered and directed by the Ministry of Science and Technology. The fund is funded by government grants and donations from the public to support and promote international exchange and cooperation of talents among Chinese governments at all levels, enterprises, research and development institutions, universities and various social organizations.

PMI (Project Management Institute) is an international professional association in the field of Project Management in the United States. It has more than 1 million members and certified personnel in 191 countries.

# The Visit of Excellence 9 to Sixers Closed Successfully in Autumn, the Harvest Season of the "Schoolfellow Friendship" Initiative

**Source: International Office**

2019 is the China-Japan Youth Exchange Promotion Year. In order to further promote higher education cooperation between China and Japan, as well as enhance exchanges between young students of the two countries, Dalian University of Technology has taken a lead and convened nearly 100 students from 5 universities in the Excellence 9 (E9) to visit Chiba University and Kanazawa University of Sixers from October 28th to November 2nd.

It is the first time for E9 students to visit Chiba University and Kanazawa University collectively, which has greatly promoted further understanding and cooperation between the alliances, enhanced the interaction between Chinese and Japanese youth, and practically implemented the provisions of *the Awaji Island Declaration*. It is also an effective way to continuously promote the "Schoolfellow Friendship" Initiative which initiated by DUT between Chinese and Japanese youth.


**Have lessons together to fulfill the dream of "Schoolfellow Friendship"**

On the morning of October 28th, the study group visited Chiba University. The two sides stated that the visit has advanced the exchange of elite talents between China and Japan, as well as promoted the continuous and diversified cooperation between the two alliances.

From 28th to 29th, Chiba University arranged two simulated lectures for the students of E9. Professor Sato, the Vice President of Chiba University, delivered a lecture concerning the fundamentals of chemical engineering. Professor Hashimoto of the Engineering Research Department, gave a lecture entitled "Study in Abroad for Your Career Up".

**Sing a song together to honor "Schoolfellow Friendship"**

On the morning of October 31st, the study group visited Kanazawa University. Nishibe Nanako from Kanazawa University, who have visited Dalian University of Technology, Yang Ruitong from Northwestern Polytechnical University and Li Boyang from Dalian University of Technology, jointly presented the song "The Wind Rises" in Chinese and Japanese. At that time, the students in the room began to clap with the music rhythm and everyone was embraced by the relaxed and lively atmosphere.

**Depict a dream together to share "Schoolfellow Friendship"**

During the visit, the study group exchanged their experience in studying abroad with enrolled students and international students from Chiba University and Kanazawa University. The exchange students of DUT at Chiba University and Kanazawa University also actively participated in student exchange activities, and depicted beautiful dreams and cultivated schoolfellow friendship with Japanese students.

**Study a subject together to enhance "Schoolfellow Friendship"**

The study group had an in-depth exchange at the computer lab and electronic intelligence laboratory of Kanazawa University. The students of Kanazawa University explained the research content related to deep learning to E9 students, that is how to realize the accuracy of the detection direction through the time difference of the detection object and SNN algorithm, and also showed the principle of the filter designed by themselves to E9 students.

**A life-long "Schoolfellow Friendship" will be engraved in their hearts**

Although the one-week visit is short, the students of E9 and Chiba University and Kanazawa University have established profound schoolfellow friendship. As a catalyst, this activity has laid a more solid foundation for promoting the friendly cooperation between DUT and Japanese universities, as well as deepening the "Schoolfellow Friendship" Initiative between China and Japan. Through this visit, we believe that the friendly exchanges between Chinese and Japanese universities will have a better future.

**FYI:**

"Sixers" refers to an alliance of six national universities in Japan, which was founded in 2013. It consists of Chiba University, Niigata University, Kanazawa University, Okayama University, Nagasaki University, and Kumamoto University. The goal is to strengthen the educational and academic research level of the universities and promote their social contribution.

***The Awaji Island Declaration***: On November 26, 2018, Excellent 9 and Sixers signed The Awaji Island Declaration, stating that the two alliances will always be committed to building a platform for exchanges and cooperation between Chinese and Japanese universities and non-government organizations to promote Sino-Japanese humanities and educational exchange research.