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A New trend
in popular science train in Taiwan "Science Day/Week for ALL" and "Round Island Popular Science Train in Taiwan"

In 2015, the popular science convener in the Ministry of Science and Technology (MOST), Prof. Mei-Hung Chiu invited 10 principal investigators (PIs) who were in the area of popular science projects to implement "Science Day/Week for ALL." In 2016, she initiated the "Round Island Popular Science Train in Taiwan" (RI-PSTiT) to coordinate all PIs across different counties and to extend the impact of the integrated project, "Science Day/Week for ALL." In June, 2017, about the same time when this newsletter was released, all PIs completed the third "Science Day/Week for ALL" and the second "Round Island Popular Science Train in Taiwan." These two activities attracted more than 140,000 participants including students and their teachers, parents and even grandparents to enjoy science. In the first article, Prof. Mei-Hung Chiu introduced the motivation and the history of the "Science Day/Week for ALL" and "Round Island Popular Science Train in Taiwan." In the second and the third articles, related popular science activities in Chiayi county and Hualien county were reported, respectively (Detailed in Page 3)

News from Kumano Laboratory,
Shizuoka University, Japan

Starting from Japan, we are in the interesting stages in terms of developing New Course of Study for Japan. This time New Course of Study of Science for all of the elementary schools, lower secondary schools, and upper secondary schools have not changed so much. There are major changes in Social Studies, English, and Moral Education. However, we have noticed that 21st Century Skills were stressed for all of the subjects. This means that within each of the subject areas, strategies for developing the 21st Century Skills have been adopted in each lesson in Japan. It will be so interesting to find out how much Japanese education will progress in the next decade! Concerning to Japanese STEM learning, we are not getting into a systemic reform stage yet. However, "Super Science High Schools (SSH)" can be identified as one of the strong movements of the Japanese style STEM. Theoretically speaking, we do not have exact theories like NGSS. What the Japanese foci during these years were the developments of a system that provides interesting science and technology abilities to the talented students. This year of 2017, there about 200 SSH all over Japan (Detailed in Page 5)

Upcoming conferences

November 21-23, 2018 **The 4th Asian HPS&ST Conference** in Hualien, Taiwan
November 23-25, 2018 **EASE & ASET Joint International Conference** in Hualien, Taiwan (Detailed in Page 22)

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News from Kumano Laboratory, Shizuoka University, Japan

Yoshisuke KUMANO
Vice President of EASE, Shizuoka University

How is everything going concerning to science education in your country? Well, I would like to inform all of you what is happening mainly in Shizuoka University, Shizuoka Prefecture, and Japan!

Starting from Japan, we are in the interesting stages in terms of developing New Course of Study for Japan. This time New Course of Study of Science for all of the elementary schools, lower secondary schools, and upper secondary schools have not changed so much. There are major changes in Social Studies, English, and Moral Education. However, we have noticed that 21st Century Skills were stressed for all of the subjects. This means that within each of the subject areas, strategies for developing the 21st Century Skills have been adopted in each lesson in Japan. It will be so interesting to find out how much Japanese education will progress in the next decade!

Concerning to Japanese STEM learning, we are not getting into a systemic reform stage yet. However, "Super Science High Schools (SSH)" can be identified as one of the strong movements of the Japanese style STEM. Theoretically speaking, we do not have exact theories like NGSS (Next Generation Science Standards). What the Japanese foci during these years were the developments of a system that provides interesting science and technology abilities to the talented students. This year of 2017 we have about 200 SSH all over Japan. According to Dr. Bybee's explanations of STEM, we might say SSH could be the exemplary STEM high schools in the contexts of Japan. Whereas in the US, STEM learnings are basically the implementation of NGSS and much foci are for equity for every student. In other words, we can say that each country can develop interesting models towards new innovations in their own contexts. Shall we wait until many intelligent decision makers realize the importance of STEM learning for the future? We need good science education researchers who can find interesting outcomes or evidences to support the kinds of STEM learning needed.

Well, in May of 2017, five researchers from Minnesota STEM Education Center and Shizuoka University STEM research team exchanged STEM ideas. We had very productive discussions and two major presentations were delivered by the Minnesota team; Prof. Gillian Roehrig, Associate Prof. Julie Brown, Dr. Thomas Meagher, Dr. Doug Paulson, and Ph.D. Candidate Ms. Jeanna Wieselmann. They observed STEM learning at the Shizuoka Children's Museum and SSH at Kyoto and Science & Technology High School at Shizuoka City.

A New Trend of Popular Science in Taiwan

"Science Day/Week for ALL" and "Round Island Popular Science Train in Taiwan"

Jing-Wen LIN, Chih-Ling CHEN
Graduate Institute of Science Education, National Dong Hwa University, Taiwan

In 2015, the popular science convener in the Ministry of Science and Technology (MOST), R. O. C., Prof. Mei-Hung Chiu invited 10 principal investigators (PIs) who were in the area of popular science projects to implement "Science Day/Week for ALL." In 2016, she initiated the "Round Island Popular Science Train in Taiwan" (RI-PSTiT) to coordinate all PIs across different counties and to extend the impact of the integrated project, "Science Day/Week for ALL." In June, 2017, about the same time when this newsletter was released, all PIs completed the third "Science Day/Week for ALL" and the second "Round Island Popular Science Train in Taiwan." These two activities attracted more than 140000 participants including students and their teachers, parents and even grandparents to enjoy science (Lee, 2017).

This special issue of the newsletter included three articles about "Science Day/Week for All" and "Round Island Popular Science Train in Taiwan" from Taiwan. In the first article, Prof. Mei-Hung Chiu introduced the motivation and the history of the "Science Day/Week for ALL" and "Round Island Popular Science Train in Taiwan." In the second and the third articles, related popular science activities in Chiayi county and Hualien county were reported, respectively. Prof. Ching-Yi Lien in Chiayi county originally thought doing experiments, in particular chemistry experiments in a moving train would be impossible. However, despite her initial skepticism, she cooperated with other PIs, schools, organizations, and the local government to complete this challenging mission. Prof. Lien's article also introduced the process and some typical science activities in Chiayi county. Her article was an important piece of science popular literature about how to cooperate with others to complete these meaningful events. The third article by Prof. Yu-Chung Yang reported related popular science activities in Hualien county. As this year is Ding You year (丁酉年) in lunar calendar and the representative animal is Golden Rooster, Prof. Yu-Chung Yang and her team in Hualien designed a science activity, "Golden Rooster standing on one leg" to link science and culture. She introduced the experimental steps of "Golden Rooster standing on one leg," and some other interesting science activities in her article.

According to our close observation, nine teachers from rural and urban primary schools in Hualien agreed that with elaborate design, those informal science activities can be regarded as important supplement to dulling formal settings and a connection between textbook and daily life, science and culture. Both of the younger students and elder students can be tutors to teach, they learn not merely knowledge, hands-on activities, but cooperate with, care about whom are of all ages in this activity. Sometimes tutors and tutees may not really understand the theory of those activities instantly, even so, all teachers trust the interesting experience and interactive process is a seed, students' exploring, problem solving ability will be detonated to grow someday.

"Science Day/Week for ALL" and "Round Island Popular Science Train in Taiwan" are two significant popular science activities in Taiwan in recent years. We hope you can witness this new trend of popular science in Taiwan by these three articles. Enjoy your reading!

Reference

Lee, W. L. (2017). Popular science activity: 2017 round island popular science train in Taiwan. Technical Report of Ministry of Science and Technology, unpublished.

Round Island Popular Science Train in Taiwan

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Graduate Institute of Science Education, National Taiwan Normal University, Taiwan

Origin

In the digital era that is undergoing an explosion of knowledge, it is imperative to raise science literacy among the general public. Citizens must be prepared with basic scientific knowledge and correct mindset towards science in the face of many socio-scientific problems (e.g., food safety, air pollutions etc.). science literacy will allow our citizens to make the right decisions and take appropriate actions. As such, the Ministry of Science and Technology (MOST), R. O. C. has put forth a scientific literacy agenda that actively supports all kinds of science literacy promotion events.

In May of 2014, as the main Principal Investigator (PI) of Projects on Science Popular Activities of MOST, I was invited to attend the opening ceremony of a popular science activity held by Professor Lance Horng of National Changhua University of Education. About 10,000 elementary school students from 40 schools participated in the activities at their respective schools on the same day. MOST and local governments have been sponsoring these activities for seven years. In accordance to my belief in "it is more joyful to share than to keep it for oneself", I invited the ten PIs who were in the area of popular science projects and together we tried to implement an activity in ten counties/cities (namely, New Taipei City, Taipei City, HsinChu County, Miaoli County, Taichung City, Chunghwa County, Chiayi County, Tainan County, and Hualien County) with a theme "Science Day/Week for ALL" in 2015. More than 50,000 students benefited from the popular science activities held in these counties and cities. That was also the first time that ten counties and cities held simultaneously a month-long event (Please see Figure 1).

Figure 1. Popular Science Day/Week for ALL activities in ten cities/counties

Action

In order to respond to the passion from the PIs and the expectations from local and national governments, and to further integrating governmental resources and disseminating the science to rural areas, a formal call for research proposals for promoting popular science activities across the country was launched and funding for 15 projects (14 projects on Taiwan's main island and one in Kinmen Island) were granted for 2016. To extend the impact of this integrated project, I initiated the "Round Island Popular Science Train in Taiwan" (RI-PSTiT), which was to collaborate with MOST, Taiwan Railways Administration, and National Taiwan Normal University, along with the 15 PIs to join the activities (Please see the official homepage of the website in Figure 2). "RI-PSTiT" was carried out again in May of 2017. In addition to the four-day "RI-PSTiT" activity, the PIs also ran various types of science hands-on activities (encompassing biology, physics, chemistry, and earth science) for students ranging from elementary schools to high schools in each city/county.

Figure 2. Official homepage of the "RI-PSTiT" website

The first "RI-PSTiT" event was held from May 3 to May 6, 2016. At Taipei Main Station, several activities were conducted by elementary, junior high, and senior high schools, such as singing song without a band, using smartphones to detect sound wave, using papers to fold paper planes and to make the paper planes fly through adopting buoyancy theory, and other activities. More than 300 students, parents, school teachers, and VIPs arrived at the station and experienced hands-on activities hosted by local PIs and school teachers. After doing the experiments, 240 students took the train from Taipei Main Station in Taipei City to the next station, Banqiao in New Taipei City. Students were encouraged to try hands-on scientific activities on the train too. Students from Taipei Main Station would disembark at Banqiao and a new group of students from New Taipei City would board the train to the next station in Taoyuan City. Five stations were visited that day, May 2. This same process was repeated at other counties/cities. Eight train stations were visited on May 3. Since there were more cities and counties on Taiwan's west coast, 13 train stations were visited during the first two days of the event. The high visibility of the event attracted a lot of attention from the local media and TV stations. Although there were only two counties on the eastern coast of Taiwan, the train called at four stations to allow students to do the science experiments on the train and to get off the train for them to get home in time on May 5 (See Figure 3). The students were mainly from the rural areas and were extremely enthusiastic to get involved in science tasks. The train traveled from Yilan County to Keelung City's National Museum of Marine Science and Technology for some marine and ocean-related scientific activities. The activities included underwater gliders, ways to weigh an elephant in ancient times, and generating electricity by ocean currents. The train arrived back at Taipei at noon

of May 6. Altogether, the train went through 17 counties/cities and 19 train stations, setting a record for popular science promotion event in Taiwan, and probably the world as well.

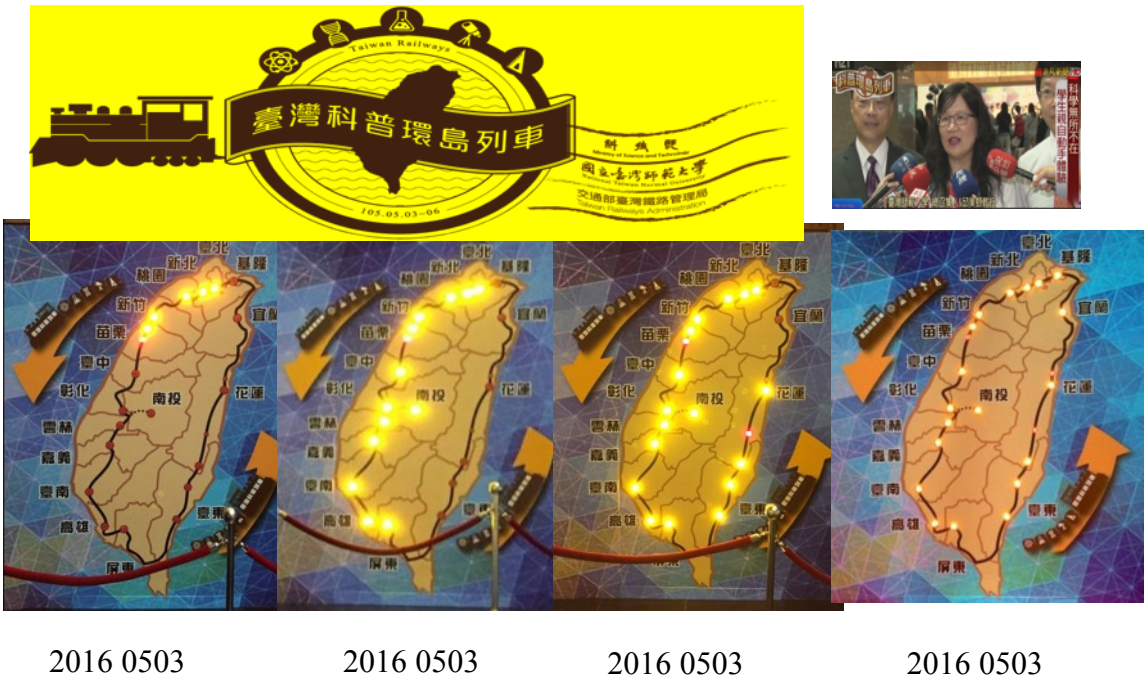

Figure 3. The logo and the map of four-day trips

Design of Event Logo and Setting Display

Several designs were made for this special event. For instance, the logo of the event was based on Swinhoe's pheasant (officially Lophura Swinhoii, also known as the Taiwan blue pheasant). An artist designed the logo based on a Swinhoe's pheasant photo I took in the Alishan National Scenic Area. The reason behind choosing this picture was because Swinhoe's pheasant is endemic to Taiwan and also carried the colors of the national flag (red, white, and blue) (Please see Figure 4).

In addition to the logo, a map of Taiwan indicating the location of our train was created and placed at the central hall of Taipei Main Station. The counties on the map would light up once the train has arrived at that county/city. By the time the train has returned to Taipei City, the entire country would have been lit up, symbolizing the spirit of popular science having reached all corners of the country.

We also made a map of Taiwan for VIPs to sign whenever the train reaches a new station during our event and the corresponding county on the map would be colored (Please see Figure 4). It was like a relay race where one PI would pass the baton to the next PI. By the time, we arrived back in Taipei City, the entire map would have been filled by colors.

Figure 4. The logo and, the map and the train ticket with Fresnel lens

Challenges in Designing On-Train Activities

What special experiences in science learning do we want to bring to the students who would participate in this unique train-based event? What kinds of hands-on activities are appropriate for a moving train and unable to be carried out easily in the classrooms? In this trip, all the students and teachers who took the train would receive a specially designed ticket titled Fresnel Lens (designed by Professor Lance Horng), which would allow the students to observe the scenery outside the moving train by controlling the adjustable lenses (Please see Figure 4). The other specially designed item was the electromagnetic brake (designed by Professor Ching-Chi Chu), which explained how brakes work to make trains stop (Please see Figure 5 for this experiment and other activities). And simple pendulum experiments were also designed by Professor Tzu-Fen Lin. The experiments were carried out on east coast for students to test the relationship between the length of a pendulum and its period of oscillation. In addition to these three special activities that were designed for moving trains, there were other interesting hands-on activities that allowed students, teachers, and parents to explore the experiments. They also allowed the students to apply their school-learned knowledge and skills to these everyday science activities. These experiences extended students' understanding of science and appreciation of the power of school-learned knowledge and skills. It made students realize that these knowledge can actually be useful in our daily lives and could be applied to solve problems in different contexts.

Attracting Attention via Popular Science Communication

There were more than 200 pieces of news articles covering this event, including print, television, and web-based news reports. A special arrangement was made with a local TV station that made a 10-part series report for the 19 stations across the country. The rating for the report was 6.26% and accumulated 822,000 viewers.

Reflections and Implications

The level of scientific literacy can be an indicator for the development of a country. Having a science train circling the country was an initiative that had the support of more than 20 professors, and was aimed at serving schools around the country via the popular science activities. Currently, there were very few opportunities for students to do hands-on activities in schools because of the high stakes entrance examinations and constraints of teaching time. We believe this event provided the opportunities for teachers and students to re-evaluate the meaning of doing sciences, to be motivated in learning science, and to appreciate the rationale of learning sciences. Although we had concerns about participants' safety both at the train stations and on the train, proper communication with the teachers and students and advanced planning had ensured all students would enjoy the science experiments and return home safely. From our observation during the four-day event, it was revealed that all the

students were motivated to learn science and enjoyed doing scientific experiments very much. Although we do not know how many students will eventually become scientists in the future, we know there is an urgent need to plant a "scientist seed" in their mind now.

Figure 5. The science hands-on activities

Making "RI-PSTiT" a sustainable project

It is a unique opportunity to have so many university professors collaborating on one joint, themed project promoting popular science in Taiwan. Several advantages were revealed during this event, which indicated the project as potentially a sustainable project.

To students: Students were able to do outdoor-activities and link their school-learned knowledge and skills to hands-on activities in contexts.

To teachers: Teachers had the opportunities to be exposed to popular science activities and train their students to be interpreters of the experiments to the public. Also, they had the opportunity to interact with university professors for future activity designs.

To schools: Schools had the opportunities to develop popular science activities and find more resources for promoting science in schools.

To local governments: It allowed the decision makers to allocate resources to rural areas in their cities/counties.

To parents and the public: It offered various channels for parents and the public to understand how science was related to our daily lives and how science could influence our thinking and life style.

Suggestions

1. Enhance the collaboration among MOST, universities, school teachers, Department of Education of local governments for the improvement of public scientific literacy;
2. Raise public awareness and the value of popular science;
3. Increase various organizations' (such as industries, enterprises, and non-governmental organizations) awareness of their social responsibilities;
4. Emphasize the importance of cultivating the people's understanding of science and ensure ALL citizens are scientifically literate by setting up "Law of Science Education".

Acknowledgement
The author would like to express her sincere appreciation to the following organization and individuals, namely, MOST, Taiwan Railways Administration, National Taiwan Normal University, local governments, school teachers, volunteers, Chunghwa Telecom Company, and my assistants and students. In particular, my special thanks to the PIs of Popular Science Activities, namely, Lance Horng, Wang-Long Lee, C. Dai Chia, Bo-Cheng Wang, Ching-Chi Chu, Ming-Fong Tai, Liyu Fu, Wei-Lung Wang, Y. T. Shin, Ching-Yi Lien, Kuang-Yao Lo, Chie-Tong Kuo, Jeng Hsu, Tzu-Fen Lin, Yu-Chuan Yang, Hui-Huang Chen, Li-Shu Chen, Hsin-Chung Ting, Chin-Cheng Chou, and Jing-Wen Lin,

Note:
1. Opening ceremony at Taipei train station and other stations:
https://www.youtube.com/watch?v=mV9WZZEKTiw
2. Closing ceremony at Taipei train station and other stations: https://www.youtube.com/watch?v=yj5nVL6NXcI

Round Island Popular Science Train in Taiwan at the Minxiong Railway Station, Chiayi County

Ching-Yi LIEN
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When Dr. Mei-Hung Chiu, the professor from the Graduate Institute of Science Education, National Taiwan Normal University, Taiwan, mentioned the idea of performing scientific activities on a train, from one station to another, all around Taiwan in four days at a meeting in 2015, most people in that meeting wondered about that idea. Doing experiments in a moving train, especially chemistry experiments, was challenging. Many things need to be considered and prepared in advance when experiments were performed in a moving train. However, this impossible mission came true before my own eyes not only in 2016 for the first time, but also in 2017, when train designated for "Round Island Popular Science Train in Taiwan" (RI-PSTiT) arrived at the Minxiong railway station, Chiayi County.

Activities at the Minxiong railway station

The "RI-PSTiT" held at the Minxiong railway station in May of 2016 and 2017 included science activities on board and the various science barricades set in front of the railway station (Figure 1a). When the train designated for popular science arrived at Minxiong railway station, students from the Minxiong and Tong-rong elementary schools got on the train and experienced the science activities on the way to the next station, Tainan. A total of around 240 students from Douliu City, Yunlin County, got off the train and enjoyed the science barricades hosted by the students from the Department of Applied Chemistry, National Chiayi University, and the National Shan-Hua Senior High School in front of the railway station. For students on board, it was a field trip with science themes. Students worked on activities related to chemistry, physics, and engineering on the train and in front of railway station as well (Figure 1b). Since many activities were performed on a moving train, students on board must be accompanied by either one of their parents or grandparents for safety reasons. Parents' participation not only ensured students safety, but also enhanced the learning efficiency of younger students. Younger students became more focused under the guidance of their parents (Figure 1 (d)).

Figure 1. (a) The science barricades set up in front of the Minxiong railway station. (b) Students from the National Chiayi University explained the science and demonstrated how to do experiments. (c)

Students accompanied by their parents listened to the instruction on the train. (d) A student listened carefully to what his mother said.

The numbers of participants on board were limited. The science barricades set up in front of Minxiong railway station allowed as many people to experience the fun of science as possible. The science barricades lasted from 10 am to 3 pm. Students of all ages and people passing by station who were interested in doing experiments were welcomed. The science barricades were specifically designed and modified to be done outdoors. Each barricade could be passed within a few minutes with the help of experienced students. For example, kids from the Minxiong Kindergarten lined up to listen to the instruction and then tried their best to blow bubbles enclosed by other bubbles (Figure 2). They may be too young to understand the science, but they were definitely attracted by the color of bubbles and impressed by the fun of science. Table 1 listed several examples with a brief description to demonstrate the barricades held in these two years. It took about one hour for each participant to finish 12 barricades.

(a)  (b) 

Figure 2. (a) Kids from the Minxiong Kindergarten lined up to listen to the instruction. (b) Kids blew bubbles enclosed by other bubbles

Table 1. Examples of science barricades set up in the "RI-PSTiT" in 2016 and 2017

1. Slime: Students prepared slime that changed color when temperature changed.	2. Fruit battery: Students connected two to three sets of Galvanic cells to power a calculator. Fruits provided electrolytes needed in cells.
3. Invisible ink: Students used inks made of acid-base indicators to write words on paper and then visualized the words by applying basic solution.	4. Mosquito repellent DIY: Students combined essential oils to make their own mosquito repellent to learn surfactants and interactions between hydrophilic and hydrophobic components.
5. Electrolysis of water: Students learned to electrolyze water using a device made of a small plastic bottle and paper clips. A mixture of hydrogen and oxygen gases was collected and ignited to observe the combustion reaction.	6. Do-it-yourself tattoo: Students drew patterns on starch papers and transferred the patterns on their arms. Then drops of the diluted povidone iodine solution were added on starch papers to enable students to observe the color change.
7. How to make a trompo made of table tennis ball go through a maze: Students tried to spin a trompo to go through a maze.	8. Chemical tadpoles-semipermeable membranes: Students added drops of sodium alginate solution into the calcium chloride solution. Cross linking formed between sodium alginate molecules and liquid drops got hardened.

9. Blowgun DIY: Students used paper and tooth picks to make darts and then used straws as blowguns to shoot balloons.	10. Heat transferring associated with the reaction between sodium bicarbonate and citrate acid solution: Students added sodium bicarbonate powder to the citric acid solution to generate carbon dioxide and felt the temperature change.

Cooperation between schools and organization

In order to have a successful "RI-PSTiT" for the general public, several schools and a local non-profit organization made efforts to support the science barricades and activities on board. The science barricades promoted the cooperation between senior high schools and universities. For example, students from the National Shan-Hua Senior High School and the National Chiayi University worked together to set up the barricades in 2016 for the first time. This year, the Tung-Ji high school from Dalin Township volunteered to provide an additional barricade to make the barricades more versatile. This kind of activity is not only beneficial to the participants but also to the students at senior high schools and universities. Students needed to learn the science knowledge in advance in order to help others. Their self-esteem was promoted by helping others. In addition, the volunteers from the Minxiong Organization for Culture and Education, a local non-profit organization, accompanied participants on board to watch their safety and helped the proceedings of activities. Since the goal of this organization is to promote cultural and educational activities in Minxiong Township, its support helped encourage public participation and advocated the public awareness of popular science in the local area.

The Influence of On-Train activities

Why do we have to do On-Train activities? Most people may have some doubts. If the public engagement of science and technology needs to be promoted, this kind of activity, no doubt, is an excellent strategy, especially in a small town like Minxiong. "RI-PSTiT" was a special event and drew a lot of public attention. Many people who live in Minxiong are busy with their daily lives. Parents do not have too much of extra time to bring their kids to other cities to attend extracurricular activities. Thus, Science Popular Activities held in the local area provided the opportunities to conveniently expose students to science activities. The ultimate mission to advocate the popular science was successfully achieved by doing these activities.

Science may be abstract and difficult to understand for many people, even for students who are studying science. Using various approaches to promote students' interest in learning science is very important. Students on board had an impressive journey. Doing experiments on a train was not easy, but they won't forget the experiences easily. In order to finish the experiments, students became more focused and listened to the instructions more carefully. They may not fully understand the scientific theory, but they will remember the fun of science. Hopefully these pleasant experiences will help them explore science in the future.

Round Island Popular Science Train in Taiwan
Science Fun Hualien

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Science Fun Hualien - unique, cooperative, safe and fun

It was a sunny day on 2017/05/04 that the "Round Island Popular Science Train in Taiwan" (RI-PSTiT) arrived in Hualien, eastern Taiwan. The train stopped at two stations: the Fuli station in southern Hualien and the Shoufeng station in central Hualien. In order to welcome the guests from the Ministry of Science and Technology (MOST), R. O. C. and Taitung County, we prepared the science fairs in the stations with a theme on "the relation between science and environment". Combining local life, science and humanities, the science fairs introduced to the public the natural beauty, the local food, and the science in the daily lives of the people in Hualien, by cooperative hands-on activities which were fun and safe. Following the dances by local K-12 students and the Taitung - Hualien handover ceremony, the science fairs, also named as the RI-PSTiT in Hualien, and the 3rd Hualien Science Week officially began.

Life is full of science!

Young students of grades 5-9 and college students hosted the science fairs. They taught people how to do experiments by adopting the inquiry teaching method stressing on motivation, operation, principle and conclusion. A total of 27 experiments, including 16 in physics, 4 in chemistry, 3 in biomimicry, 1 in environmental education, and 3 in computer science, were carried out. Seven experiments were specified experiments assigned to 3rd Hualien Science Week and were carried out in 18 K-12 schools too. In three experiments, local non-toxic ingredients were used to make food, so the players can taste the delicious food and learn science at the same time. Some experiments are listed in Table 1.

Table 1. Some experiments in the science fair of "RI-PSTiT" in Hualien

Name	Science field	Scientific concept	Brief introduction
1. Golden rooster standing on one leg	Physics[1]	balance, center of gravity, Lever principle	Through making a balancing bird, students would understand how an object maintains the balance under a number of forces, and learn how to apply the lever principles to everyday life
2. Dreamy rainbow	Physics[1]	Density, proportion, salt water	Through making a colorful tube with salt water layers, students would understand density better by changing the proportions of salt and water.
3. Egg drop parachute	Physics[1]	Gravitation, air resistance	Through making an egg drop parachute, students would understand the relations between contact area and air resistance, and observe how a balanced parachute could slow down the velocity and keep the egg safe.
4. Faraday (fidget spinner)	Physics	Flux changes produce voltage and light the LED	Through making a fidget spinner with strong magnets, students would understand how flux changes produce voltage and light the LED.
5. Aiyu jelly	Chemistry[2]	Pectin condensation	Through making Aiyu jelly by rubbing the

			pods of Aiyu in hard water, students would understand the interaction between the pectin of the pods of Aiyu and the minerals of hard water
6. Sticking adventure	Chemistry	Slime, plasticity, macromolecule, condensation reaction, cross-linking reaction	Through making the slime, students would understand how the cross-linking reaction between the borax and glue, would produce the elastic ball, which can jump high and can remove dust from keyboard
7. Lotus effect	Biomimicry	Lotus effect, hydrophobicity, self-cleaning, nano-structure	Through testing the leaves of various plants in making the nano carbon black, students would understand the hydrophobicity and the self-cleaning effects on the surfaces of the objects.
8. A tour to Fuli	Environmental education	AR (Augmented Reality), watermelon chess, Environmental education	Through playing a treasure hunt game combining the watermelon chess with AR, students would appreciate the natural beauty and the aboriginal culture in Fu-Li Township.
9. Exploring the mBot robot	Computer science	MBot robot, mbot basic introduction, mBlock software introduction, ultrasonic distance sensing	Through playing with a mBot, students would understand the basics of the mBlock software and the ultrasonic distance sensor

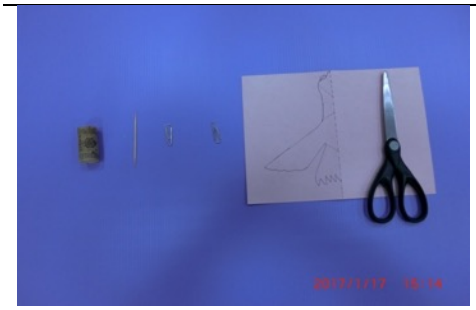
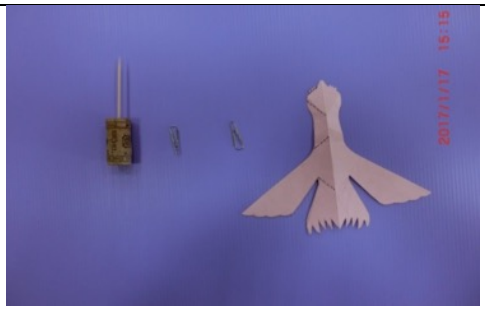
[1] Specified experiments assigned to the 3rd Hualien Science Week

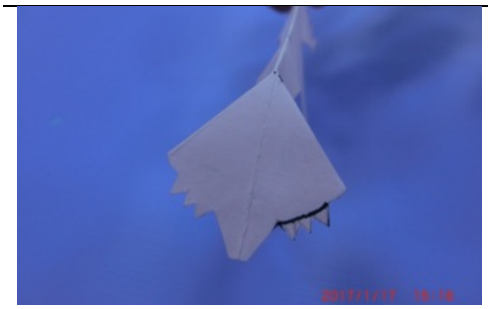
[2] Local food in Fuli Township

The experiment for 2017 Golden Rooster year

In lunar calendar, 2017 is Ding You year (丁酉年), also known as the Golden Rooster year. So we carried out an experiment called "a Golden Rooster standing on one leg". Using pieces of paper, clips, toothpicks, clays, scissors, and other tools, students made a simple balancing bird. The beak of the bird is not in the front but noticeably behind the wings. The wings and body are also curved slightly downward, so the center of gravity was right below the beak, creating the most stable balancing situation in physics. Through this experiment, students would understand how an object maintains the balance under a number of forces, and learn how to apply the lever principles to everyday life.

Table 2. The experimental steps of "Golden Rooster standing on one leg"

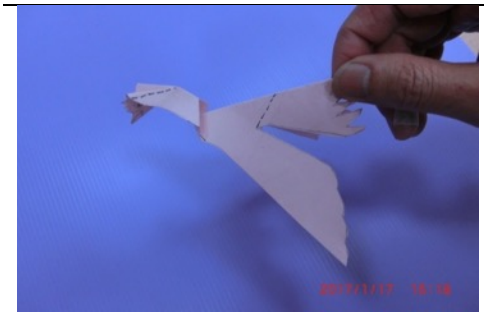
 1. Fold the paper	 2. Cut the graph with scissors	 3. Along the dashed lines, fold the head inside



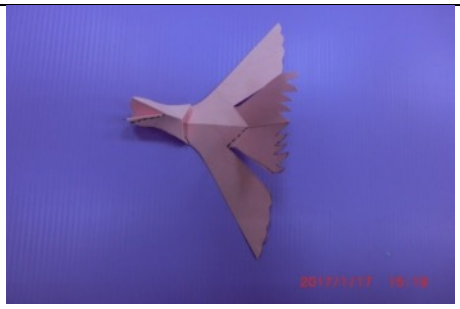
4. Along the dashed lines, fold the head area inside

5. Adjust the graph

6. The head is formed

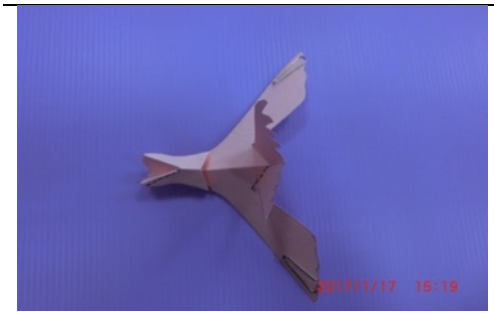


7. Along the dashed lines, fold the neck

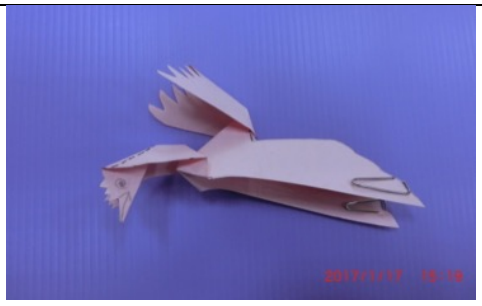


8. Along the dashed lines, fold the tail

9. The Golden Roster is created



10. In the ends of two wings, place the clips symmetrically



11. Adjust the figure

12. Make a base with a toothpick and clay

13. Golden Rooster standing on one leg

The experiment for 2017 Golden Rooster year

In lunar calendar, 2017 is Ding You year (丁酉年), also known as the Golden Rooster year. So we carried out an experiment called "a Golden Rooster standing on one leg". Using pieces of paper, clips, toothpicks, clays, scissors, and other tools, students made a simple balancing bird. The beak of the bird is not in the front but noticeably behind the wings. The wings and body are also curved slightly downward, so the center of gravity was right below the beak, creating the most stable balancing situation in physics. Through this experiment, students would understand how an object maintains the balance under a number of forces, and learn how to apply the lever principles to everyday life.

Have fun in the "RI-PSTiT"

Time flew while we did science experiments together. The "RI-PSTiT" was going to run again. Hundreds of young students and grandparents were invited to take the train and do the science experiments on it. Well-dressed grandmothers used acid-base test papers to compare the acidity of the lemon juice and vinegar. Children learned how to use indicators and reductants to detect the calcium and magnesium ions in water. There will be more fun science experiments and we will all agree that life is full of science! Farewell the train, see you next year!

Reference

1. 2017 Round Island Popular Science Train in Taiwan: Science Fun Hualien: http://pstrain2016.colife.org.tw/content_train2016.aspx?location=hualien
2. ERNT on YouTube: https://www.youtube.com/channel/UCbCFRuFcMdwEfZ2k-F6nbvQ
3. ERNT on FB: https://www.facebook.com/erntmap/

Introducing International Region of ASTE
(Association of Science Teacher Education)

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I want to talk about science education associations which are international. This is my personal opinion so you can have different views from mine. Some people are familiar with these associations, but some are not. I hope you can be more familiar with them so that you can join the appropriate association for your education and research.

First, there are NARST (National Association for Research in Science Teaching) and ASTE (Association for Science Teacher Education) in the USA. Many science educators attend these two annual conferences in the world. The former, held in every April, is more theoretical research centered, and the latter, held in every January, is more practical research centered. For me, when I stayed in the States I used to attend these two conferences and now I attend the ASTE conference mainly during winter breaks in Korea. You can meet many science educators whose researches are more about methodology courses in science teacher education, preparation programs for preservice teachers at universities, induction programs for beginning teachers, and professional development programs for in-service teachers in informal as well as formal educational settings. Surely you can be exposed to many other theoretical research issues in ASTE too.

Second, there is ASERA (Australasian Science Education Research Association) in Australia, an annual conference taking place in every June. You can be exposed to various types of issues in research and education of science. Australia is a pretty big isolated continent where many educators meet and share their issues there, so there is its own annual conference.

Third, there is ESERA (European Science Education Research Association) in European regions, which are connected with each other in the big continent. This is a biennial conference which will take place in Dublin, Ireland, this year of 2017. You can attend this conference to taste another flavor of science education and many scholars from Asia and the States also attend this conference.

Lastly, I would like to introduce EASE (East-Asian Association for Science Education) which is also a biennial conference where scholars in Asian area meet and share ideas about research and education. EASE has a short history (founded in 2007) but it has progressed very much. The 6th EASE international conference will be held in Taiwan on November 2018, next year.

These 6 different science education conferences might attract you to attend. At this point, I want to talk about ASTE more and encourage you to have an interest in ASTE. I am the Vice President of EASE now, so you who are reading this newsletter must be a loyal attendee to EASE since we are making EASE a more competitive and progressive association in the science education field when compared to other associations. At the same time, I encourage you to attend the ASTE conference, which will be held in Baltimore, MD, Jan 3-6, 2018. This association focuses on more practical research and the education of science, so at this conference you can find research issues and meet people related to science education methodology courses at universities. How do you design a preparation program to provide qualified preservice teachers? How do you prepare beginning teachers to be more competitive in on-site teaching? How do you equip in-service teachers with expertise in teaching and learning science at all levels? You can meet people who are working in informal as well as formal educational settings about teacher education.

This ASTE international conference will take place annually and this association is supported by 8 different regions in the States (7 regions) and out of the States (one region). The States is divided into 7 ASTE regions according to the location, such as North-East with 11 states and Eastern Canadian provinces. You can find more

information about the regions in ASTE here (http://theaste.org/regions/). There has been an international region also for the past years, and the President of ASTE in the past years took the role of director of the international region. However, since last year, I became the director of this international region for the following three years and this year is the second year for me. Since I am the first director of the international region, there are so many things to be systematically developed as other regions. I need to host an annual regional meeting in each region, but international region includes all countries except the USA so it is inconvenient for international scholars to get together. Therefore, I am using two different conferences of ESERA (odd number year) and EASE (even number year) for the annual meeting. The first INT_ASTE (international region meeting of ASTE) took place at EASE last year, 2016 in Tokyo, where two presidents of ASTE and EASE signed up for MOU to exchange and share the opinions of research and education in science education. I hope you who are reading this newsletter could have an interest in becoming a member of INT_ASTE and also a member of ASTE. You do not have to pay a membership fee for INT_ASTE but you have to pay it for ASTE (for more, http://theaste.org/join-aste/details/). Once you become a member of ASTE, you can be another automatically for the region you are in. You can choose your region, but usually, a region is decided according to where you are from. The 2nd INT_ASTE will take place at ESERA, Ireland, this August.

If I do not see you at ESERA this August, I encourage you to be a member of INT-ASTE and hope to see you for an international regional meeting in Korea (the 3rd one will take place in Korea through KASE, Jan 26-28, 2018). I need to keep recruiting members from many countries outside of the USA and manage board members for INT_ASTE. All membership is free now but I plan to raise some funds to provide scholarships for graduate students if necessary. I need your ideas so feel free to contact me if you have any good idea about how to develop an INT-ASTE region. I am trying to connect two associations, ASTE and EASE, for better collaboration in research and education. Basically, we have one symposium (teacher preparation program) in 2016, “what make your science education from cultural view” in 2017, oral paper sessions (STEM/STEAM) in 2016, teacher education system in 2017 and one business regional meeting (discussing on how to make INT_ASTE to be beneficial to members and ASTE). I invite and welcome you to be a member of INT_ASTE. I need you.

One more, there is a submission for regular ASTE annual conference next year 2018. I hope you can join ASTE and submit the abstract whose due date is July 9th. For more information, you can visit http://theaste.org/meeting/proposal-submission/. Still confused? Then contact me directly. I am here for you. See you all at EASE and ASTE!!

Review of the outstanding paper in Mainland China
Identifying students' difficulties when learning technical skills via a wireless sensor network

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The recent changes in science and technology attract the public's attention to the future shift, so-called, the fourth industrial revolution. Artificial intelligence as well as big data may affect the change of educational system in the future. Even, the cognitive and behavioral abilities of human will be enhanced, which is called as super-human. For example, Jason Stark, in the movie *Iron man*, communicates with *Jarvis*, the artificial intelligence program, and could solve complex problems in a very short time. While the concept of *knowing* has been regarded as personally bounded ability for an individual, the combination of human and computers will bring about the change of the concept. Distributed cognition means a collaboration of individual and artifacts, and their relations to each other in a particular environment. For example, we had to memorize a long list for the telephone numbers, we just click the friend's name on the screen to call him/her up. As well, we can easily find out any complex formula or figure by googling. That is to say, knowledge or skills are shared in the surrounded systems or devices. In this situation, the most necessary capability for humans is not to put something into the brain, but to deploy and apply surrounded resources for problem solving.

In this vein, Wang and others, who worked at Mainland China and Taiwan, published a remarkable article entitled "Identifying students' difficulties when learning technical skills via wireless sensor network", in the journal *Interactive Learning Environments* (Impact factor: 1.674 & CiteScore: 1.45). In this study, they categorized technical skill dimensions into four: technical principles, machine operations, parameter control and process planning in Table 1, and asked students to engage activities using wireless sensor network system (WSNS). The results showed that the overall abilities of the students were significantly higher than before the instruction and that their reflective abilities were significantly correlated with the technical skills. It is concluded that reflection induced by the WSNS is helpful to relieve their learning difficulties for technical skills among students.

Table 1. Items for students' technical skills

Technical skill dimension	Items
A. Technical principles	A-1. Technical structure A-2. Technical functions A-3. Relationship between technology and manufacturing processes
B. Machine operations	B-1. Basic operations B-2. Operations of multifunctional machines B-3. Integrated operations
C. Parameter control	C-1. Identifying process variables C-2. Selecting a feasible method C-3. Effective control of variables
D. Process planning	D-1. Identifying the problem D-2. Formulating a manufacturing plan D-3. Optimization and completion of the manufacturing process

Taiwanese students took part in the research and the abstract and author information are as follows:

Title: Identifying students' difficulties when learning technical skills via wireless sensor network
Journal name: Interactive Learning Environments (Taylor & Francis, SSCI, Scopus)

Volume, Issue and Page: 24, 3, 396-408
DOI: http://dx.doi.org/10.1080/10494820.2013.851091
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- Min JOU (Industrial Education, National Taiwan Normal University, Taiwan)

Abstract

Practical training and actual application of acquired knowledge and techniques are crucial for the learning of technical skills. We established a wireless sensor network system (WSNS) based on the 5E learning cycle in a practical learning environment to improve students' reflective abilities and to reduce difficulties for the learning of technical skills. Student learning was investigated using a Technical Expertise Assessment Form and Reflective Abilities Investigation Tool that we had developed. Results of the forms showed that the 5E learning cycle-based WSNS helped improve students' reflection and the ease in acquiring technical skills. Students' reflection was also shown to be significantly correlated with the learning of technical skills. We concluded that reflection provided by the sensory functions of the WSNS was able to reduce students' difficulties when learning technical skills.

Upcoming conferences

The fourth Asian HPST&ST Conference

November 21-23, 2018 @ National Dong Hwa University, Hualien, Taiwan

The fourth conference will be held at the National Dong Hwa University, Hualien, Taiwan, 21-23 November 2018. The conference will precede, and overlap by one day, the East-Asian Association for Science Education conference also occurring at Dong Hwa University. The conferences have featured plenary lectures, contributed papers and workshops. Plenary lectures have been given by:

Yung Sik Kim, Seoul National University, Korea
Norman Lederman, Illinois Institute of Technology, USA
Hasok Chang, Cambridge University, UK
Gregory Radick, University of Leeds, UK
Igal Galili, The Hebrew University, Israel
Takehiko Hashimoto, University of Tokyo, Japan
Alice Siu Wong, University of Hong Kong, Hong Kong
John Dupré, University of Exeter, UK
Juang-Tai Hsu, National Tsing Hua University, Taiwan
Mansoor Niaz, University de Oriente, Venezuela
Otávio Bueno, University of Miami, USA
Dung Sheng Chen, National Taiwan University, Taiwan
Szu-Ting Chen, National Tsing Hua University, Taiwan
Martin Kusch, University of Vienna, Austria
Alan Love, University of Minnesota, USA
Hans Peter Peter, Free University of Berlin, Germany
C. Kenneth Waters, University of Minnesota, USA
Darrel Rowbottom, Lingnan University, Hong Kong
Chanju Kim, Ewha Woman's University, Korea.
Sang-Wook Yi, Hanyang University, Korea
Michael R. Matthews, UNSW, Australia

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EASE & ASET Joint International Conference

A dialogue between the local and the global

November 23-25, 2018 @ National Dong Hwa University, Hualien, Taiwan

The next conference of East-Asian Association for Science Education will be held in Taiwan. At this time, EASE and ASET have a cooperation to host the conference at the same venue, National Dong Hwa University, Hualien. For more information, please visit the website https://2018east_aset.ndhu.edu.tw

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