

Report on Class Observations at Singapore Primary Schools in August 2016

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1. Visiting Purpose

In August 2016, we visited Singapore to observe and learn how mathematics and science educations are conducted at primary schools in Singapore. Along with this purpose, we also wanted to build our relationship with some of primary schools for possible future joint or cooperative research between Singapore and Naruto University of Education. In this paper, we summarize the background and report on our visit of August 2016.

2. Background

We have started contacting primary schools and National Institute of Education (NIE) within Nanyang Technological University of Singapore back in summer of 2015. As a result, we visited one primary school and met with professors and lecturers at the NIE (with another group from Japan happened to visit NIE at the same time). The primary school is one of the top ranking school within Singapore and the lessons conducted that we observed were very superior. We however wanted to observe lessons at more ordinary primary schools.

Since the visit of 2015, we kept our relationship with Dr. Lee Yew Jin and Dr. Ng Kit Ee Dawn who are from Science and Mathematics Departments of NIE. They have visited Naruto in February 2016 to visit an elementary/primary school and Naruto University of Education attached elementary school to observe math and science lessons.

After their visit, we asked them if it is possible to arrange some school visits for us during the summer of 2016. Our team consists of five people with different interests as follows:

1. Ishizaka & Sakai-mathematics education
2. Ozawa & Tamura-science education
3. Kano-Exchange program on world heritages between Singapore and Japan
4. Tamura-Life skill education

With the much help of professors from NIE, several local primary schools showed interests for our visits. As a result, five primary schools let us observe some of their classes and have conversation with teachers afterwards.

3. Schedule

July 31, 2016:

- Arrive at Singapore in early morning.
- Correcting information and buying textbooks.

August 1, 2016:

- Visiting two primary schools A & B (observing lessons and conversation with teachers).

August 2, 2016:

- Visiting NIE at Nanyang Technological University (meeting with professors and lecturers in Math Department and then Science Department).

August 3, 2016:

- Visiting the third primary school C (observing lessons and conversations with teachers).
- Visiting Singapore Botanic Gardens (SBG) (tour of the garden and conversations with educational staff members).

August 4, 2016:

- Visiting two primary schools D & E (observing lessons and conversations with teachers). Two schools

were arranged to visit at the same time, so we had to separate into two groups (Sakai & Ishizaka visited school D and Ozawa, Kano & Tamura visited school E).

Fly back to Japan.

4. Reports on Activities

In this section, I will report on parts that I (Tamura) have attended and kept some records of observation and conversation. As a result, report on School D, which I did not visit on the last day, is not included in this report.

4.1. Day 1 (July 31, 2016)

After arriving at the Changi Airport in Singapore, we contacted professors at NIE and confirmed about our visiting schedules. We then visited POPULAR Bookstore¹ at Bras Basah Complex (POP@Central) in downtown Singapore. There, we bought some primary Science and Math textbooks and activity books, Characteristics and Citizenship Education textbooks & activity books as well as some Social Study textbook for junior high/secondary school. We also bought some books on Primary School Leaving Exam (PSLE). This shopping complex also has some used book store that helps to collect all books we need if the POP@Central did not have books for all grades (since the new school year has already started and students already bought their books).

4.2. Day 2 (August 1, 2016), Primary School A

We learned some of the science classes at the primary school A is conducted under the theme of “Do and Discover”. In the classes, contents are taught basically as hands-on demonstrations and experiments by teachers and students. According to the head of science teacher, some lessons are even conducted together with a nearby Science Center. These classes are conducted with so called 5E model, which represents ‘Engage’, ‘Explore’, ‘Explanation’, ‘Elaborate’ and ‘Evaluate’. Science teaching and learning kits (educational material packet) used is selected to increase pupils’ interest/curiosity, skills, and let them apply the concepts they have learned in previous classes. Also at this school, scientific experiments are basically de-

signed by students themselves under supervision of science teacher.

As a content of scientific observation/experiments, pupils are assigned different topics. In grade 3, pupils observe a life cycle of a mealworm. In grade 4, they observe life cycle of lady’s finger plant. In grade 5, they conduct aeroponics, and in grade 6 they learn and create a new hybrid of orchid.

Through the science lessons, students use the See-Think-Wonder (STW) approach. In the ‘See’ section, pupils are asked “what do you see?”. In the ‘Think’ section, they are asked “what do you think about that?”. And in the ‘Wonder’ section, they are asked “what does it make you wonder”. Each pupils keep record of answers to these three questions in their notebook. By doing so, they can make their thinking visible to others as well as to themselves. Here it is important for pupils to go through the process of “I used to think. . . , and now I think . . .”. Presenting in this way makes pupils follow their changing ideas and deepen their understanding of scientific concepts.

4.3. Day 2 (August 1, 2016), Primary School B

In the school B, we observed a science lab on electric circuits. The class started with a review of what pupils know about electricity and circuits. Teacher asked to draw a concept map about it as in Figure 1. From there, teacher handed out today’s worksheet about circuit tester—to check whether circuit is connected or not—and a circuit card with 8 connectors and random connections inside that is invisible from outside (Figure 2).

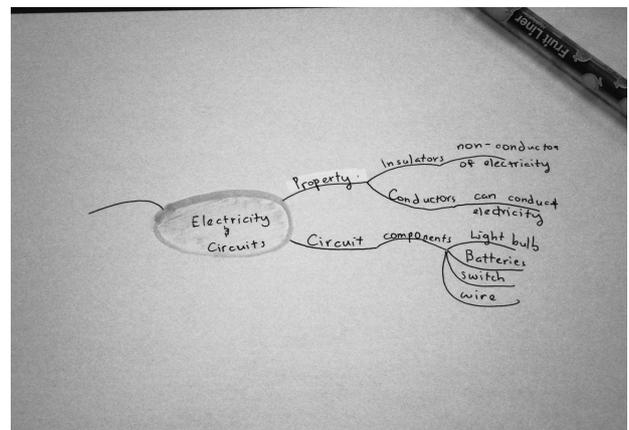


Fig 1. Concept map a pupil draw about electricity and circuits. This was still incomplete and the map had expanded to the left side as well as to the right as shown.

¹POPULAR Bookstore: <https://www.popular.com.sg/>

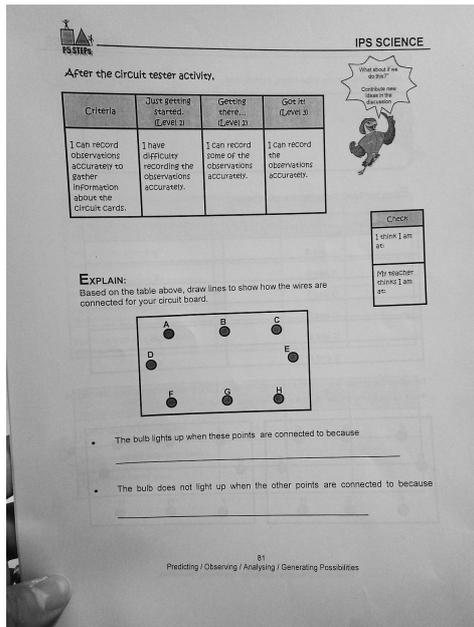


Fig 2. Part of a worksheet distributed. The circuit cards with 8 connectors are indicated at the bottom half of the page. The question below asks the reason why they are connected or not rather than simply which two (or more) are connected.

After the pupils were given some time to explore about handed out circuit cards. They presented their findings and reason why they thought so. At the end of class, teacher went over each circuit card and showed the answer and gave supplemental explanation why some circuits are considered connected even though there is no direct wiring between the two (two points are connected by different wiring that is connected to another connector where two wires meet).

4.4. Day 3 (August 2, 2016), National Institute of Education at Nanyang Technological University

At the NIE, we mostly discussed about the education system of Singapore. Starting from how grades are separated from primary to university and different systems of universities, i.e., diploma (2 years), degree (4 years) and post-diploma in Education (16 months program after diploma).

The most interesting thing that we found out is how schoolteachers were hired in Singapore. In Japan, university students had to take classes and conduct practical lessons while they are at the university level. After completing the degree program, students can obtain a teacher's license. Once they are licensed, then they have to take a municipal (at city or prefecture level) teacher employment exam and pass it to become a schoolteacher. On the other hand, in Singapore, teachers are hired by Ministry of Educa-

tion (MoE) first and then sent to NIE for training or conduct a few months of contract teaching at local school then go to NIE for completion of training. The latter case seems to be becoming more preferred way to become teacher since they can actually experience what a teacher is like before spending a few years of training at the NIE.

Another important findings is the strong connection between individual school and MoE. In Japan, there are Board of Education (BoE) at Prefecture and BoE at City/Town/Village level between individual school and Ministry of Education, Culture, Sports, Science and Technology (MEXT). Therefore it is rare, or very unlikely that individual school is directly connected with MEXT in Japan. As a result of strong connection between MoE and each school, skilled teacher are sent to MoE for several years and so the education policy flows down from MoE to each school much more easier (and stronger) in Singapore than in Japan.

At this visit, we did not got enough information but we also learned that for skilled teachers, they can be a member of Academy of Singapore Teacher. This academy is where the top-ranked teachers (master teacher) can belong and improve their teaching skills. In the future, we are planning to obtain more information about this Academy of Singapore Teacher and hopefully build some friendship with them.

Other than becoming master teacher, which is one of three tracks that teachers can select once they are hired by MoE, there are two other teacher tracks that teachers can select. One is 'Specialist' where teachers are trained to become a curriculum specialist and eventually work at the MoE. The other track is 'Leadership' and teachers selected this track are trained to become school principals.

4.4. Day 4 (August 3, 2016), Primary School C

This school is a private school (still funded by Singapore MoE), but founded by a church. As a result, this school has slightly different characteristics than the two public schools we visited on the second day. One characteristic is that this school also has secondary level, which is a non-public (independent) school. Another is that they have special program (advanced classes) for selected pupils that are focused on strong points of pupils. This school is recently renovated—as a matter of fact, it was still building some facilities

such as new gym and pool—and so the science labs and public spaces are well equipped.

In the math class we observed, lesson has started by watching counting song played on YouTube. After singing altogether, teacher has introduced a story problem about how to accommodate many guests by arranging tables and chairs—those has to be rented at certain cost—so some number of guests can be invited with minimum renting cost. Pupils were using blocks and tiles representing chairs/guests and tables to come up with various answers for lowest cost and the most cost (figure 3).

In the next period, we observed science lab where pupils dyed the stem of celery with blue and red col-



Fig 3. Group of pupils arranging tiles and blocks to see how many tables are needed, and so how much the renting cost is.

Another gadget used at this school was an automatic tracking camera to record teacher's action. To use this device, a special video camera that can rotate 360 degrees has to be placed somewhere in the class; for this class, it was set in front of the class at the corner of teacher's desk. And most importantly, teacher has to wear a transmitting device with which the camera traces location of the teacher while he/she moves around inside a classroom.

At the end of the class, teacher showed an application of what students learned in the lab today. Where teacher shows a picture of colorful rose and an actual flower that teacher prepared in advance (figure 5). By seeing these real world applications, students are clearly motivated to learn more about these technologies.

ored water to observe how water is transported inside. The experiment itself and the method they used were not much different of that of in Japan. However, the way pupils reported and their observation log is collected is significantly different from Japan.

In this class, the Information and Communication Technology was fully utilized. First of all, each group is given a laptop computer to record their observation and submit to the teacher. Once they submit their result, it is immediately sent to teacher's computer (figure 4). By projecting students' answers on screen the entire class can have detailed discussion. Also, teacher can keep track of how students' ideas progressively changed.

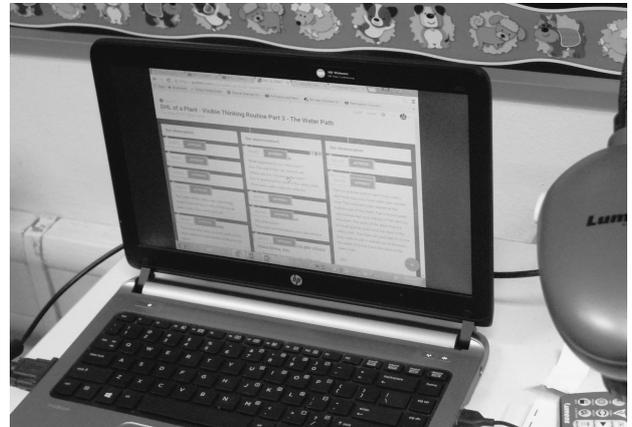


Fig 4. Teacher's laptop computer actively collecting what students has entered to their group's computer.



Fig 5. Teacher showing dyed flower that she prepared with two colors of water. In the background teacher shows colorful rose created using the same technique students had learned in the lab experiment.

4.5. Day 4 (August 3, 2016), Singapore Botanic Gardens

Singapore Botanic Gardens (SBG) can be traced back almost 200 years in history². Yet, it became a United Nations Educational, Scientific, and Cultural Organization (UNESCO) World Heritage Site on July 4, 2015 (just a year before our visit to SBG). In the small and nation of Singapore where everything is keep changing and updating, SBG's long history was valued and became the first world heritage in the nation.

We visited SBG as a part to see how local primary and secondary schools are using SBG in their school curriculum and to see whether SBG has any interest in participating the exchange program conducted by professor Kano and his colleague.

We learned on the first part that most of Singaporean primary schools have a field trip or some kind of short visit to SBG. Also we learned while most schools simply visit SBG, some schools have strong cooperation program with SBG, e.g., making a new hybrid of orchid flower as a part of science project. However, as it just became a world heritage, the program on historical value and Education for Sustainable Development (ESD) is still yet to be developed.

After conversation with educational staff members of SBG, they show interest in the proposed exchange program. Prof. Kano is currently contacting with a few primary schools in Singapore that we visited to further arrange the program.

4.6. Day 5 (August 4, 2016), Primary School E

This school is a private school (still funded by Singapore MoE), but founded by a church as the case for School C. The big difference between this school and school E is that this school has many sister schools all across the world, of which one is in Japan (School F). As for the case of School F³ in Japan this school has not only primary level education but also secondary level schools.

In the math class we observed, as in the other schools, a story was used to introduce mathematical question to the pupils. There, the cost of a table is given and the cost of a stool is given as a ratio to the

table. Then pupils are asked to calculate total cost for two tables and two stools. This is the similar question that is given to pupils at school C.

However, unlike school C, pupils in this school did not use small blocks and tiles to represent stools and tables. Instead, they used small personal whiteboards to write down their calculations and answers (figure 6). After presenting their ideas to the teacher and to whole class, that is when pupils brought out their notebooks and start writing the summarized idea and the answer to the presented question.



Fig 6. Pupils use their own whiteboards to work on the given problem, Some draw the situation on the board to think while others only write calculation. There is no textbook or notebook on top of pupil's desk while they are using whiteboards.

At the second part of the class, an application problem was given out as a worksheet to submit at the end of the lesson, which teacher will evaluate pupil's learning. During solving this application problem, pupils were asked to make a group of four and each was given a unique task as in Fig. 7. Four tasks are:

- 1) Material Manager—Collect and return all materials to the appropriate places, and make sure everyone has equal access to the materials/supplies.
- 2) Encourager—Take responsibility for praising other for a job well done, and keep the group focus on positive, no fighings.
- 3) Time Keeper—Hold team stopwatch or watch clock, and keep group on task and remind them about time.

²Singapore Botanic Garden "About Us": https://www.sbg.org.sg/index.php?option=com_k2&view=item&layout=item&id=15&Itemid=9

³School E has only primary and secondary level, but School F also has kindergarten within its campus.

4) Checker—Check to make sure everyone understands, and re-teach to anyone who doesn't understand.

In different periods, pupils take turn to be in different position. To do this school uses a notepad—can be seen at the top of pupil's desk in Fig. 6—with numbers (1-4), colors (4 colors), alphabets (A-D) and some class rules are written in.

In the next period, we observed a science lesson conducted in a regular classroom. There, pupils, as a group, were creating a cool box to keep some ice cream for a few hours. If the group's cool box is well made, then they can eat ice cream for lunch break,



Fig 7. Four roles for group members, students within a group select the number (1 through 4) first and then teacher select which number corresponds to which role.

4.6. Life Skills Education in Singapore

During this visit to Singapore, we learned Singapore does not have a special subject to teach life skill to pupils as in Japanese curriculum. They have Characteristics and Citizenship Education (CCE), but when we bought and briefly analyzed the CCE textbooks, the content of CCE looks like similar to Japanese Moral education. However, we just glanced through the textbooks and did not analyze the textbook and workbook in details. Therefore we need to carefully look into the contents of CCE in future.

However, one thing we noticed when we visited is that various decorations of classroom walls. When watched carefully, it is not simply the artwork that pupils created in their art class but contents are based somewhat on topics of life skills and moral education (figure 9-11).

but if not, then their ice cream will be melted as a vanilla tasted cream.

In the previous lessons, pupils learned what creates a good insulator, and characteristics of various materials including aluminum foil, Styrofoam, bubble wrap, etc. and came up with a blue print of cool box. So in this lesson, pupils actually create their designed cool box to put it into a test (figure 8). Some groups even put shredded papers in the bottom of their cool box to even strengthen the insulation. Pupils seems familiar to work with these materials and various tools, which seems to indicate that pupils have enough opportunities to actually create and conduct experiments in groups.



Fig 8. Pupils, as a group of four, create their own cool box out of Stylofoam, aluminum foil and bubble wrap.

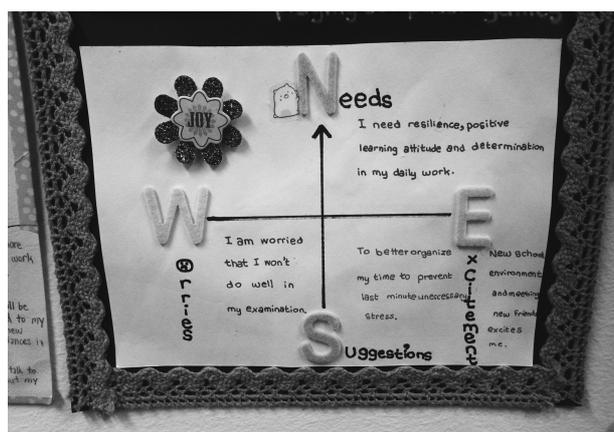


Fig 9. Pupil's artwork posted on the wall of School C. At first, it seems this is some sort of science work due to the NSEW indication. But with a close look we found out that each direction represent Needs, Suggestions, Excitement and Worries of each pupils.



Fig 10. Posters displayed at the library of School C. This tells students what pupils can do to be a good pupil.

5. Future Plan

After the visit to the Singapore, we kept our contacts to some of the schools and SBG for possible future cooperation. Currently, we are trying to invite several teachers to Japan. One school is under scheduling a visit Naruto University of Education in end of November to beginning of December 2016, and another school is planning to see the possibility of visiting next spring/summer.

We also want to learn more about teaching methods and its effectiveness of Singaporean primary



Fig 11. Some key words for life skill and CCE are posted on the wall of School E. Next to it were posters of what pupils like to do and some other artwork posted.

schools to improve our teaching at the University as well as for JICA trainings for various countries.

Through these communications and visiting each country, we would like to improve various educational issues and situation for our future.