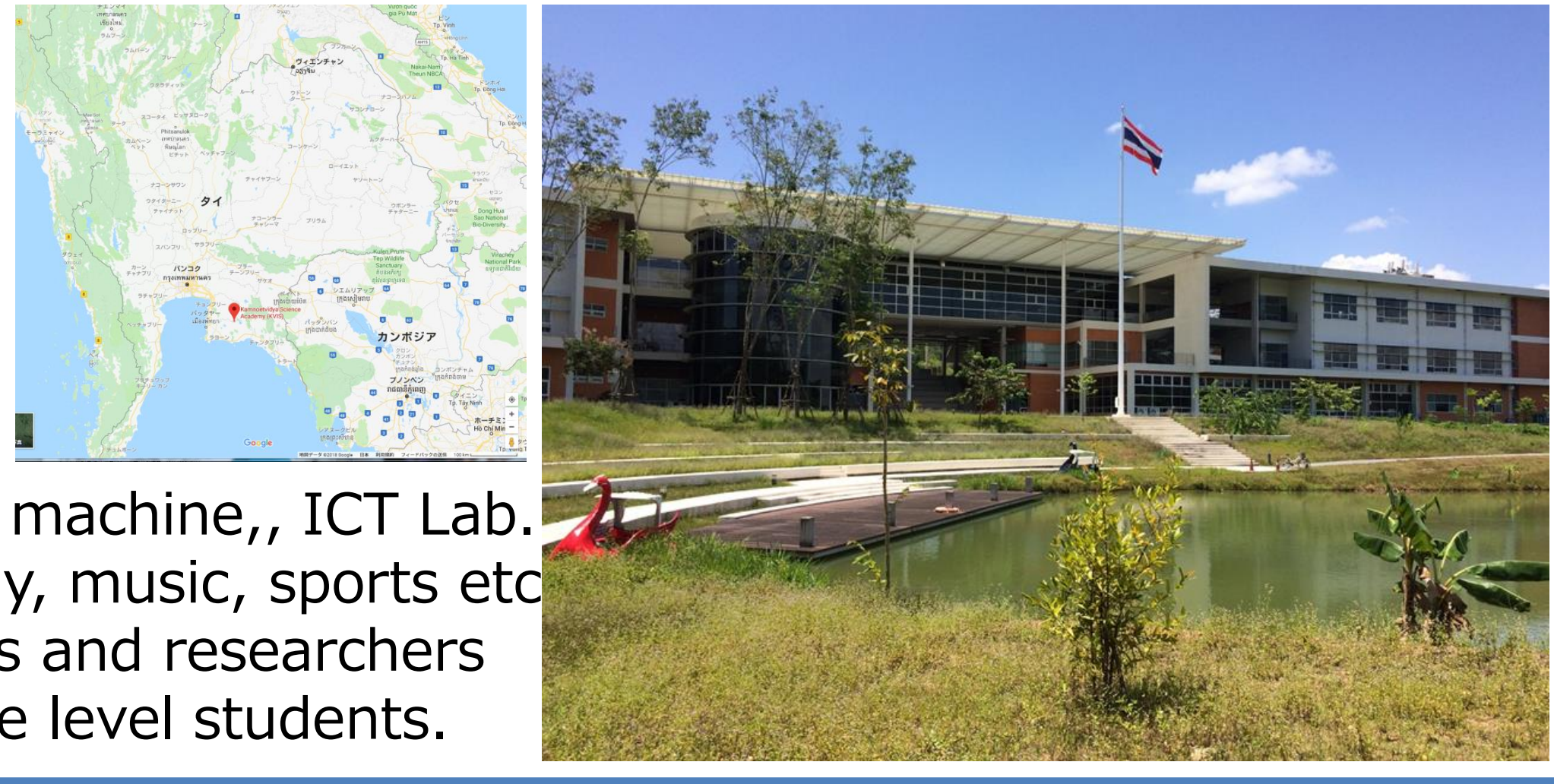


JpGU2018 Spring Meeting at Makuhari Messe, Chiba  
**POSTER PRESENTATION**  
 20th May 2018

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## About KVIS

**KVIS (Kamnoetvidya Science Academy) Rayong, Thailand** (right : map and photo)  
**Purpose:** Nurturing a new generation of scientist and researchers  
**Open:** August 2015, Princess Sirindhorn graced  
**Organization:** RASA Foundation (PTT Group) **Principal:** Dr. Thongchai Cheprecha  
**Full Scholarships:** including all meals and accommodation  
**Students:** 18 students × 4 classes × 3 grades **Teachers:** about 40 (Foreign 10+)  
**Official Language:** English (except Thai subject)  
**Facilities:** IT black-board, SEM, UV-VIS spectrometer, 3D printer, NC milling & lathe machine,, ICT Lab.  
**Feature:** Experiments and observations based class, study projects, cultural act.(play, music, sports etc)  
**Misc:** A half of teachers has Ph.D, Paper & practice based entrance exam. Top score level students.



## About Earth Science (ERS) at KVIS

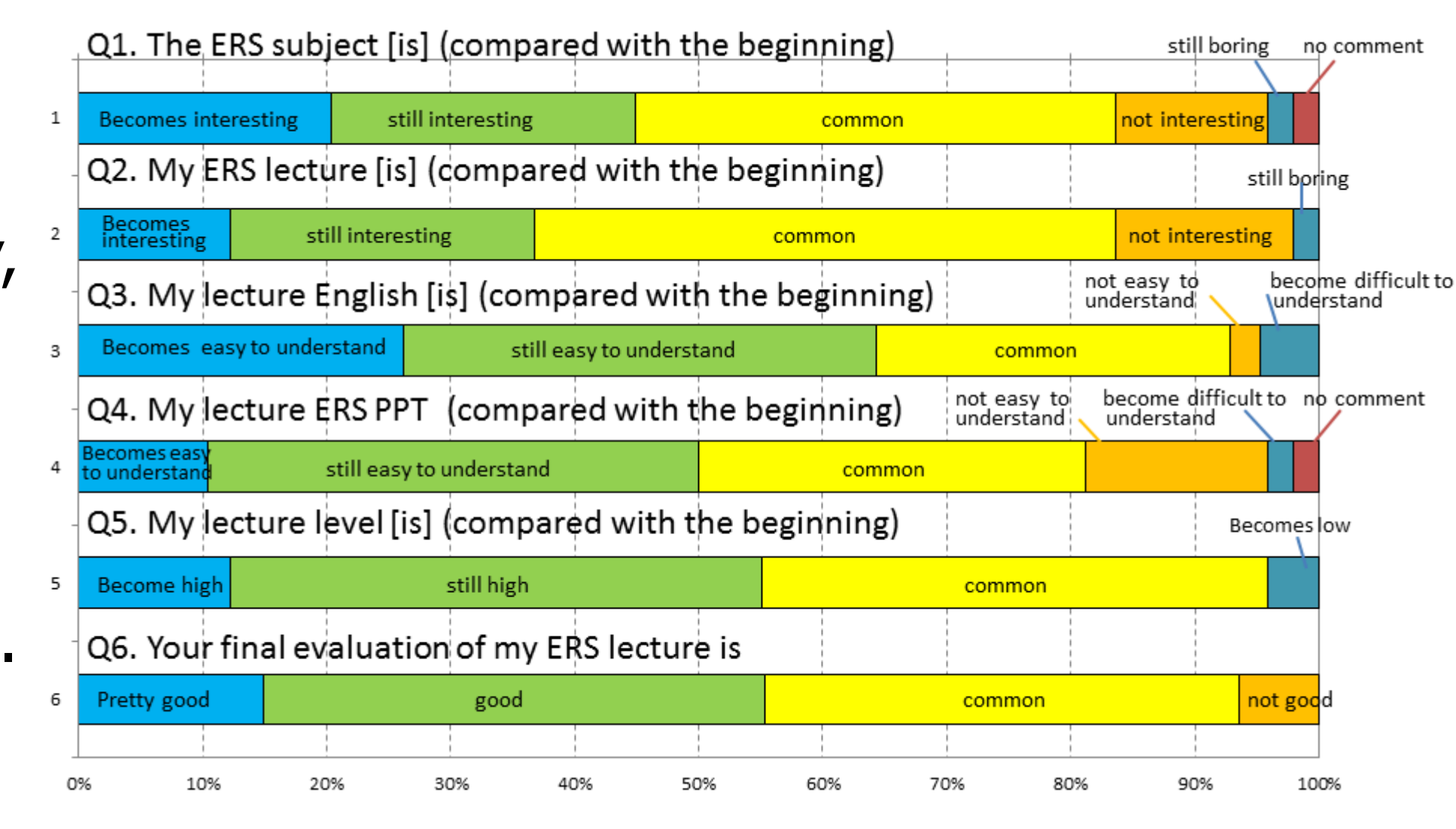
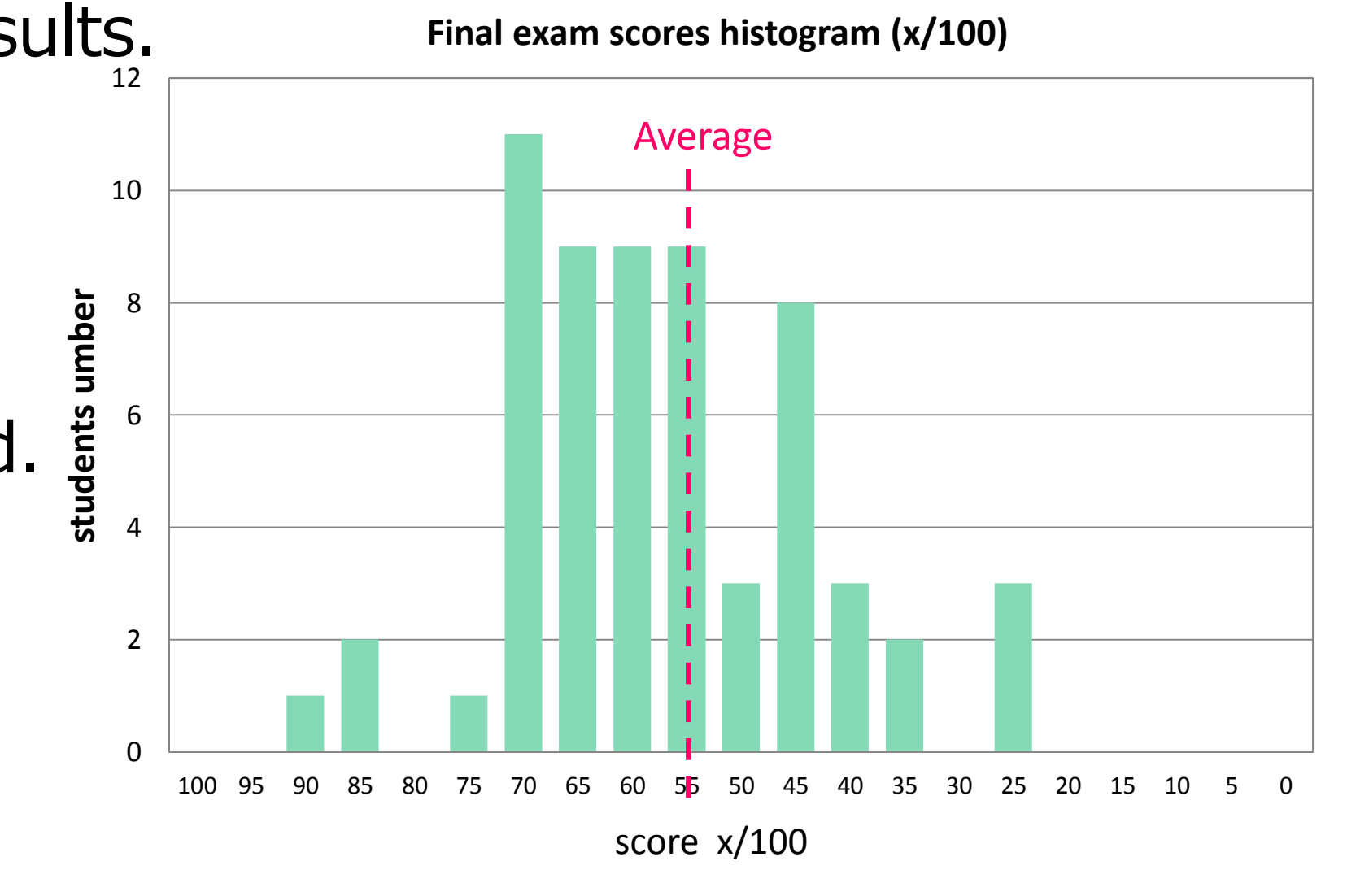
**Background:** A minor subject at senior high school level, also even at junior high level.  
**Issue:** Focus on two months; only target on SOLID EARTH (Meteorology and Astronomy are omitted)  
**Contents:** Minerals, Rocks, Geology, Earthquakes & Volcanoes to Plate tectonics, Geo-history  
**Basic course (August) + Advanced course (September):** The latter treats high level contents.  
**Purpose:** To give the philosophy of Earth Science to the Thai students who will become scientist.  
**Features:** Thailand lacks earthquakes and volcanoes except severe floods. However, we introduced earthquakes and volcanic eruptions (Japan and the world) to talk global tectonics and geo-history.  
**Point:** Showing real rocks and fossils, experiments, observations and excises based.  
**Co-operation:** Thai chemistry teacher, Dr. Janjira Maneesan, as a counterpart (CP) of the author, attended class all time, helped me and took videos (The left side women in the right photo).  
**Earth Science Olympiad:** Mr. Kanathip Tan Jongmekwamsuk (M6 student) got the silver medal 2017.  
**About Author:** Recruited by KVIS at TJ-SIF2016 accidentally. The first time to lecture foreign students in English!



## Evaluation & Discussions

Our ERS class was finally evaluated by the exam scores and the questionnaire results.  
 (Recovery rate of questionnaire: 69%)  
 The final exam level: Same as a Japanese SSH level (choice 60% describe 40%)  
 The final exam score histogram (right upper figure, 100 points conversion):  
 -> Seems to be a similar distribution in my SSH in Japan.  
 The final questionnaire results (right lower figure), the 1st Qst results are omitted.  
 Free described: Most impressive topic? (fields, number)

Earthquakes related	14
Dinosaurs and fossils (including Paleontology)	8
Climate change (including "snowball earth")	7
Rocks and minerals	6
Mathematical models	3
Volcanoes and eruptions	2



The student reaction seems to be positive for our ERS class as a whole.  
 The volcanic eruption and related fields does not inspire Thai students strongly, although the spending much video watching or detailed explanations.  
 On the other hand, the interest for earthquakes was still high level.  
 This is because, a lack of active volcanos in Thailand, we only used videos, while with many exercises, as earthquake related materials our own made.  
 Also, we had a special lecture about 1995 Kobe and 2011 Tohoku earthquakes.  
 The further study will treat severe floods or tsunamis common in Thailand.

## Lecture Topics & Assignments

**Target:** M6 students; 4 periods/week x 4 classes = 16 ps/w  
**Contents** Left Table: Basic course Right Table: Advanced course  
 All 32Topics, Purple: Exercises, Red: Reports & Exam.  
**Room:** Classrooms instead of science labs.  
**Lecture:** PPTs and resources **Textbook:** In the library  
**Exp. & Obs.:** Earthquake epicenter, magnitude, G-R law, Fault exp., Basalt NRM, etc. (see right photos)  
**Controversy titles:** Earthquake prediction, Dinosaur extinction, Climate changes  
**Reports:** 3 times reports (right table)  
**Final score:** exam.(70)+attendance(10)+reports(20)[%]: Completed by CP teacher

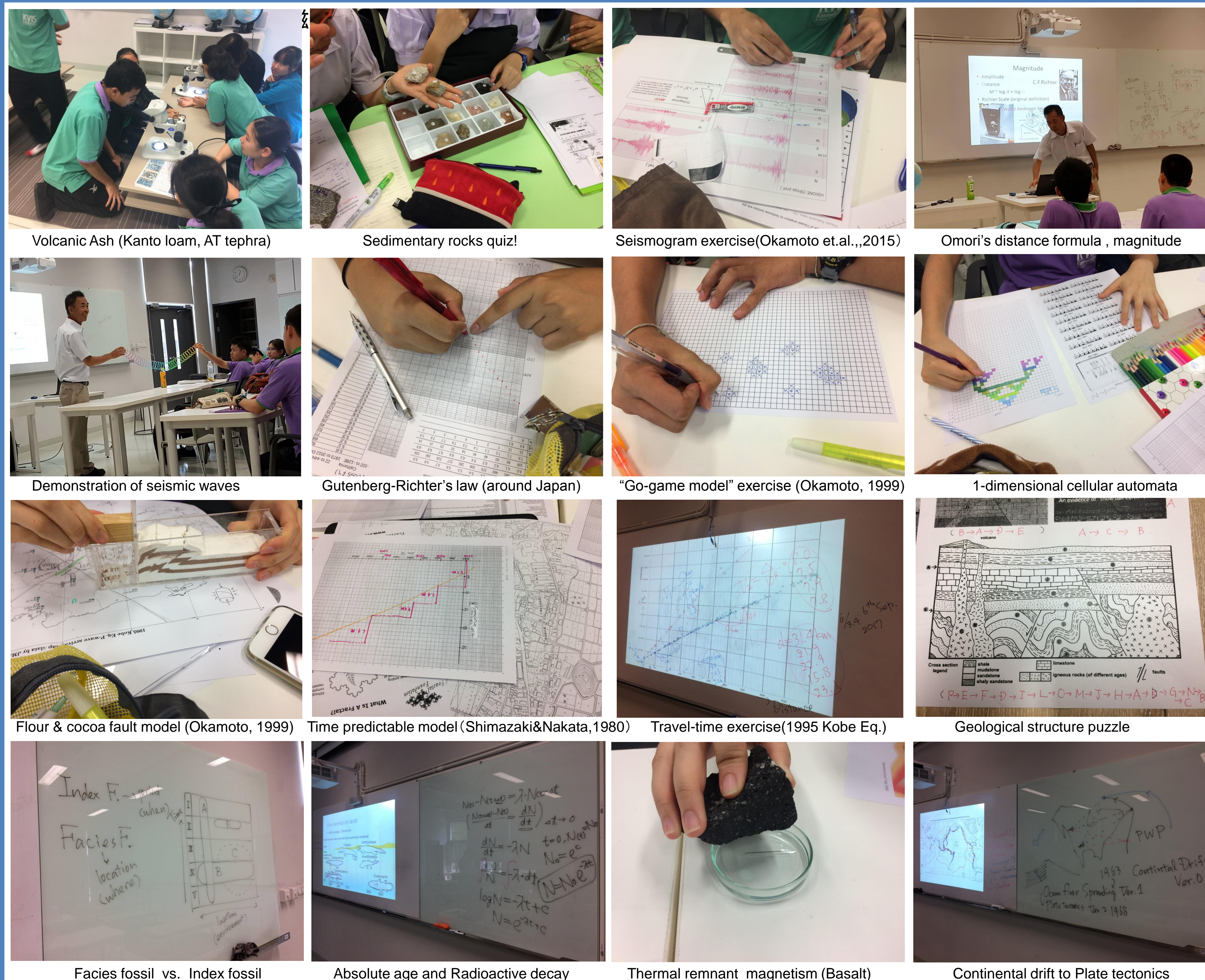
<1st Report>  
 About the Tohoku2011 and the 1995Kobe earthquakes  
 <2nd Report>  
 About the Zip's law or power laws  
 <Final Report>  
 About Our existence—chance (randomness, accidentally) or necessity (lawful consistency)? (Any format is welcome, short story, SF, animation or something else)

Title	Aim	Contents	Tools/materials	Exercises
1 Rock Minerals I	Definition of SiO <sub>2</sub> families	quartz, feldspar, mica, etc	Mineral samples and photos	Observation of samples
2 Rock Minerals II	Identification of SiO <sub>2</sub> families	Metal ions, solid solution	Minerals Rock samples	Mineral quiz
3 Igneous Rocks I	Definition of igneous rocks	Table: felsic, mafic, volcanic, plutonic	Polished igneous rock samples	Igneous rock quiz
4 Igneous Rocks II	Occurrence of igneous rocks	Dikes, sheet, batholiths, xenolith	Igneous rock samples, photos	quiz
5 Volcanoes and eruptions I	Classification relation with igneous rocks	volcano classification table and protactor	National geographic videos, and protactor	Mt. Fuji summit angle measurement
6 Volcanoes and eruptions II	Eruption types and volcano disasters	Hawaiian, Strombolian, Vulcanian, Plinian, Hawaiian, Plinian	Volcanic ash samples (Kanto room, AT ash)	Microscope observation of volcanic ashes
7 Earthquake I	How to read seismograms	Seismograms, magnitude (Richter)	Original seismograms	Original seismograms exercise
8 Earthquake II	How to study the mechanism of earthquake	P-initial time and phase map of 1995 Kobe earthquake	National geographic videos, and protactor	Epi center, P-arrival map exercise.
9 Earthquake and fault	Relation with fault	Fault mechanism and earthquake	Fault experiment	Flour fault experiment
10 Special lecture to all KVIS members at the auditorium	Lessons from 2011 Tohoku, 1995Kobe	Disasters and human beings, Japanese cases	PPT lecture	Own-made tsunami simulations
11 Continental drift	Theory birth and development	Evidences and drawings	Photos and maps	Continental drift
12 Sedimentary rocks	Classification	Particle sizes, compositions	Photos and samples	Sedimentary rock quiz
13 Sedimentary structures	Characteristics	Turbidite, laminae, ripple marks, convolution, etc.	Photos and samples	Exercise on sedimentary structures
14 Geological structures	Characteristics	Unconformity, intrusion, faults	Photos and maps	Observation of photos
15 Geological principles	How to read geological profiles	Law of super position, cross-cutting relationship	Photos and maps	Geological map quiz
16 Geo history I	Fossils and Paleozoic era	Fossils and Paleozoic era	Photos and Fossilina trilobite samples	Observation of fossil samples
17 Geo history II	Fossils II, Mesozoic and Cenozoic era	Radioisotopic dating, Mesozoic and Cenozoic fauna and flora	Ammonite samples, Exponential graphs	Observation of fossil samples, Graph sheet
18 Geo history III	Cenozoic era and ice ages	Human fossils, ice age remnants, Milankovitch cycle	South Africa trip photos and video	Watching videos and photos

Title	Aim	contents	tools/materials	exercise
19 Earthquake prediction I	Why so difficult? GR law	G-R laws example, simulations of earthquakes	Semi-log and log-log graph papers, PC simulations	"Go game model", "Sand pile model"
20 Earthquake prediction II	Precursors? Characteristic earthquake? Predictable model	Psychological bias, Chikura map and graph sheet.	Psychological bias, Chikura map and graph sheet.	Random test, Time predictable model
21 Complex systems I	What is?	Power laws and Zip's law	Fortune globe 500 table	Zipf's law exercise
22 Complex systems II	Fractals, Chaos, SOC	Cell automaton	Grid sheet, rule table	1-dimensional cellular automata
23 Earth's interior I	Moho	Moho discontinuity, seismic ray theory	1995 Kobe earthquake resources, Travel time data	Vp, Vs crust thickness
24 Earth's interior II	Mantle and Core	P.S shadow zones	Jeffrey's Bullen travel-time curve, seismograms	Fit travel time to seismo-grams
25 Pre-Plate tectonics	Ocean floor spreading, geomagnetic survey	Magnetic polar wandering, and ocean floor geomagnetic anomaly	"Red October" video, Basalts, iron needles, Dikes	Basalt NRM, Ocean floor geomagnie model
26 Plate tectonics	Basics of plate tectonics	Subduction zone, mid-ocean ridge and transform faults	Plate map, original transform fault paper model,	Paper model of transform fault, Zambia trip video
27 Burgess biota	Missing evolution	My Burgess shale trip, and the meanings of Gould's "Wonderful life"	Burgess fauna resources, Canadian life, my trip vid	watching videos -its a wonderful life, my trip vid
28 Mass extinction	P-T and KT mass extinction	KT asteroid impact theory	Alvarez paper (Science, 1980), PPT	Dinosaurs fossil site video
29 Early earth I	Origin of Moon, oceanic crust, life, BIF, Moon and life evolution	South African rocks, Barberton fieldtrip video	South African rocks, Barberton fieldtrip video	Old life sandstone, BIF and gold ore. BIF video
30 Early earth II	Archean era and the Snow Ball Earth	Show ball Earth, what, cause and evidences	Canada/Japan media video, my NY trip video	Watching "snow ball earth video"
31 Climate changes I	Basics of Climate	Climate proxy indexes	Photos and Vostok core data	Coloring graphs
32 Climate changes II	Global warming controversy	Skeptism and IPCC scientific basis	South Africa trip documents for controversy	Checking the both side documents

<Final Exam (90min) & ERSreports>

## ERS Class Photos



## Miscellaneous

**Misc. resources: left: example pages of final exam. Right: A classroom photo in September**

In Thailand, there is the conscription system for male, however if the students take one month military training in high-school for three years, they got their draft exemption. In September 2017, they had school class only morning, in the afternoon, the boys went to military trainings by Bus and the girls took volunteer activities every day.

## Conclusions

1. Quests and exam scores suggest the ERS class at KVIS 2017 was successful as a whole.
2. Especially in the earthquake topic, students' motivation have improved due to practical trainings using various hand-made materials.
3. For the lack of natural disasters, problems still remain on disasters-based ERS teaching.
4. This experience need to be shared both in Thailand and Japan on ERS educational perspective.

## References & Acknowledgements

**Major References:**  
**Okamoto Y. 2011:** New 3Dseismicity maps using chorma-stereoscopy with two alternative freeware, 2011AGU FM Abstract.  
**Okamoto Y. 2006:** Controversy-Based Earthscience, GeoSciEd V at Bayreuth, Germany, Abstract.  
**Okamoto Y. 2003:** A tiny fault model in a slide case using flour and cocoa -Faults or cookies?-, GeoSciEd III Calgary, Canada, **Abstracts All the above resources are in my web site <http://yossi-okamoto.net/>**  
 Some materials are in the Seismological Society of Japan (SSJ) website: [http://www.zisin.jp/publications/document04\\_04.html](http://www.zisin.jp/publications/document04_04.html) (in Japanese). In addition, details my stay at KVIS are also shown at the above author's personal site. (in Japanese)  
**Acknowledgment:**  
 Videos of each lecture were taken by CP Thai chemistry teacher (Dr. Janjira Maneesan), who always attended our class. Check of attendance, exam scoring were all completed by her. Dr. Thanit Penwin of KVIS Senior Adviser supervised the entire course. Dr. Myra Halpin of Senior Adviser of Chemistry checked English of the final exam. Dr. Thongchai Cheprecha, principal of KVIS, gave us extraordinary conveniences working at KVIS. Also, Dr. Norikazu Osumi, Professor Emeritus Kyoto University of Education, who once worked as the first Japanese visiting teacher at KVIS, gave us a lot of advice for teaching from his carrier in Thailand. Special thanks to these people. This study is partly supported by the **Shimonaka Science Fund 2017**. The lecture by the author will continue from August to September in 2018.