

Report

on the

Professional Development Grant

*Reforming Math Education in the US: Ideas  
from the Japanese System*

By

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I am indebted to Dr. Tom Limperis, former Head of the Department of Mathematics, Dr. Jeff Robertson, Dean of the College of Natural and Health Sciences, and the Academic Affairs Office for their support of this endeavor. I also appreciate the Faculty Professional Development Grant Committee for recommending this project be partially funded as requested.

I arrived in Tokyo on **Sunday, July 24, 2016**. On **Monday**, I met with my primary contact in Japan, Amya Miller, to discuss my plans for this project and to thank her for her help in arranging for me to meet with key people. At this meeting we made plans to visit a certain high school to observe the facilities in mathematics classrooms. Unfortunately, the day before this visit was to occur, she had a sudden loss of a close friend and had to cancel in order to attend the funeral. Therefore, I was not able to visit a high school. Additionally on Monday, I made a “dry run” to the place I was to meet my translator, Ellie Thang, and Kenichiro Sakamoto, Editor and Senior Staff Writer for the JIJI Press Publication Services, Inc. in Tokyo. It was Mr. Sakamoto who arranged for me to meet with the Director of the Japan Textbook Research Center (JTRC).

Based on my previous investigation of the education system in Japan, I had reached the conclusion that *“The one thing which we could do and, I believe, would have a positive effect is to radically change our textbooks. It has been said that our curriculum is “a mile wide and an inch deep”. We cover too much material in very little depth. Our textbooks perpetuate this.”* Having learned that Japan supports a textbook research center, I formulated the idea of interviewing its director and touring the facility as the next stage in my investigation. Through email correspondence with Mr. Sakamoto during the first two months of 2016, a meeting with the director was arranged.

As an aside, I should mention that during the past 12 months I have had meetings with two very high level people in Japan about the education system in Japan. In addition to this meeting with the JTRC Director, last September Mr. Sakamoto arranged a meeting with Atsushi Nagao, School Inspector in the Elementary and Secondary Education Bureau of the Ministry of Education, Culture, Sports, Science and Technology, as I reported following completion of my research grant last fall. These meetings would not have been possible, nor would I have been so well received, had it not been for the English language camps that Arkansas Tech has conducted for the past four years in the tsunami devastated towns of Ofunato and Rikuzentakata in the Iwate Prefecture. Mr. Sakamoto is well aware of this and he makes it known when he requests these meetings for me. The Japanese people are deeply appreciative of those who participate in activities related to the recovery efforts from the emotional and physical devastation that occurred on March 11, 2011.

On **Tuesday, July 26** I met Ms. Thang and Mr. Sakamoto for a planning lunch prior to the meeting at JTRC.



Following lunch we went by train and taxi to the JTRC where we met with Mr. Yuichi Tatsuno, Executive Director of the Textbook Library, and Ms. Izumi Matsuda, Chief Researcher of the JTRC. The following is taken from the website of the JTRC:

“The Center aims to do basic and general research on textbooks and other related materials, to offer the results of its research to membership publishers of textbooks, and to help any organizations or people who are now making or want to make surveys about textbooks. The Center also aims at contributing to the progress of school education and academic activity by improving and substantiating the quality of textbooks and other related materials while promoting research and study of the same.



In advance, I had submitted the following questions to guide our discussion and it was obvious that Mr. Tatsuno and Ms. Matsuda had given them considerable thought prior to the meeting.

1. Is the activity of the Center directed towards all levels of education in Japan, including University level?
2. What does the Center's research reveal about the "desirable form" of a textbook?
3. Mathematics textbooks at the University level in America typically come out in a new edition every 3-5 years. Is this true in Japan?
4. Also, over a 10-20 year period, if the textbook survives, it may double in size. Do you see this happening in Japan?
5. Has technology, particularly graphing scientific calculators, been incorporated into math textbooks?
6. In other areas of study, how has technology influenced textbooks?
7. What is the process for developing a textbook in Japan? (from simply an idea in someone's mind to a published book ready for adoption)
8. Is there a process in Japan for determining whether a textbook is suitable and should continue to be published?
9. Does the Center have research findings related to mathematics textbooks which would be of interest to mathematics educators in America?
10. How would you characterize the "role" of textbooks in the Japanese education system? In particular, is the textbook generally just a reference for the teacher or is it indispensable, to be followed exactly?
11. The Center aims at contributing to school education and improving the quality of textbooks. Do you have a process to determine how successful the Center is in accomplishing this goal?
12. Is the textbook industry in Japan better characterized as a service industry or a money making industry? (is the focus more on the best education possible or highest profit possible)
13. I am interested in having a particular mathematics textbook translated into English. What advice do you have for attaining this goal?
14. Is there any additional information/advice you have for improving the educational system in America?
15. I am not aware of a national center in the US comparable to this Center. Do you know if there is a similar Center in the US?

I learned the following in my interview of Mr. Tatsuno:

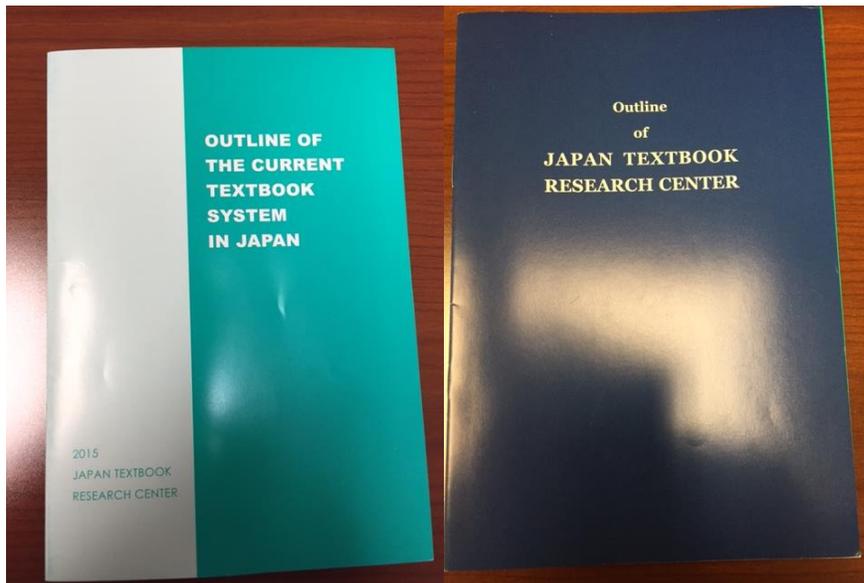
In 1971 the Japanese government began gathering funds to establish the JTRC. It was established a few years later and will soon celebrate its 40<sup>th</sup> anniversary. Its role can be broadly defined in the following three areas:

1. Holistic research into textbooks and providing the results to textbook publishers.
2. Promotion of constant improvement of texts.
3. Serving as a library and chronology of Japanese textbooks since WWII.



The JTRC, 9-28 Sengoku 1-chome, Koto-ku, Tokyo, 135-0015 Japan

Its role is more fully explained in the publications shown below, which are available in my office



The JTRC provides research regarding grade school, middle school, and high school texts, but not for post-secondary education. Since 1963 textbooks in Japan have been provided to children free of charge, equally and uniformly throughout the country regardless of family income. The children keep the text – it is theirs and they are free to scribble in it. In fact, the texts have significant blank spaces to encourage the students to write in them. In 2015 the Japanese government budget for the free distribution of textbooks was approximately 41.2 billion yen (about 410 million USD).

Textbook publishers in Japan must conform to certain guidelines in the size of textbooks. Mr. Tatsuno observed that in the US the tendency is for texts to become thicker and larger. Children take textbooks home each day; thus the need to keep texts small.

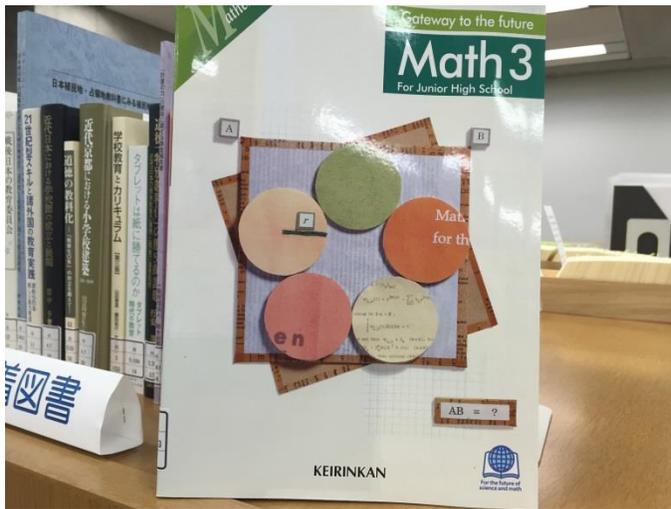
Textbooks follow a 4 year cycle in regards to development/new editions as explained in the *Outline of the Current Textbook System in Japan* pamphlet. The process is not affected by market trends! The process is driven by producing educationally effective texts, not by profit margins. The JTRC serves as a

bridge between educators and publishers. It recently added 10 more researchers, increasing the number of researchers at the JTRC from 20 to 30.

Technology is incorporated into texts as needed. The four year reviews address this, as well as ten year holistic reviews.

Mr. Tatsuno does not think there is a comparable center in the US. He said that there are such centers in Korea and Taiwan. It was his opinion that it would greatly benefit education in the US if we had such a center. He was in the US in 1995 and seemed to have substantial knowledge of education here.

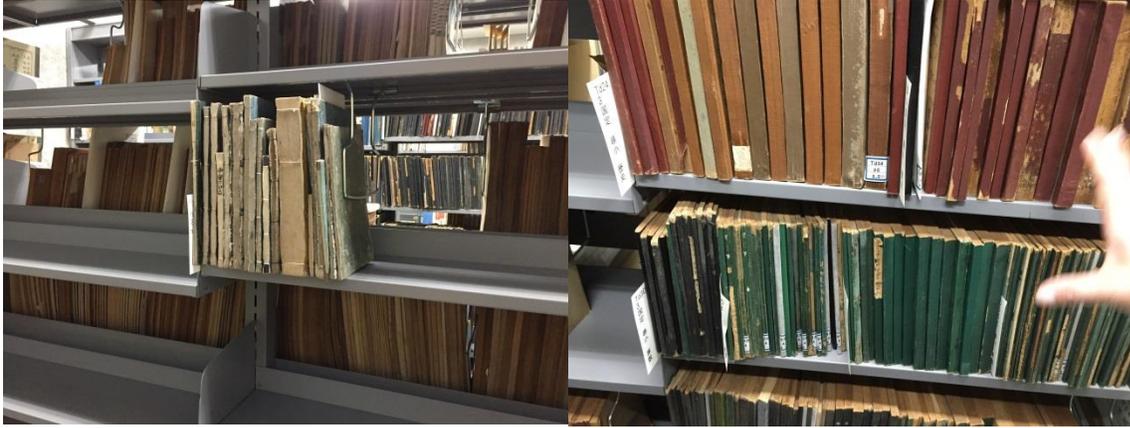
Regarding Japanese mathematics textbooks translated into English, Mr. Tatsuno said that they are available on Amazon, but the only ones I have been able to find are 1995 editions.



English translation of a junior high school text.



Math texts in current use in Japan.



At the end of the interview, Mr. Tatsuno and Ms. Matsuda took us on a tour of the basement of the JTRC where historic textbooks are kept under lock and key. The small collection of texts on the left above is from the Edo period of Japan (1603 – 1868). They are in remarkably good condition with brilliant colors. Mr. Sakamoto and Ms. Thang commented that this was a special treat to be shown these texts. Neither had seen them before nor were they aware of the existence of the texts.

In addition to visiting the JTRC, I had the opportunity to visit two other places to gain information which I plan to use in my Math 1003 classes this fall. The first was the Tsukiji Fish Market where I witnessed the auction of large tuna. I'm considering having my students investigate the world tuna population and the effect of overfishing in light of the growing demand for sushi.



Frozen tuna at the Tsukiji Fish Market waiting to be auctioned.

The second place I visited was the Origami Museum where I saw dozens of amazing examples of origami. I plan to include a lesson on origami in my math 1003 classes. I recently viewed a video on Curiosity Stream about origami techniques which are being used for optimal folding of solar panels on spacecraft.





I am appreciative of all those who made this trip possible. It was beneficial to me professionally and, I believe, will benefit my students in the future.

I plan to continue making presentations about the Japanese education system to local civic groups, at the National Joint Mathematics meeting, and at the Oklahoma-Arkansas MAA Section. In particular, I will continue to promote textbook reform. In the future, I hope to include one or more mathematics education majors in my investigation, perhaps even including them in a trip to Japan.