

## 1. National Research Coordinator's Comments (English)

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### **General Comments on Japanese Math Education**

In Japanese junior high schools, mathematics is a mandatory subject and all students are supposed to study the same content. This content is regulated by the *Guidelines for the Course of Study* issued by the Ministry of Education, Culture, Sports, Science and Technology. In the curriculum designed by the Ministry, there are no additional math courses where students might be grouped in accordance with their abilities, nor on their orientation towards their future academic majors, such as can be found in other countries.

Guidelines for the Course of Study is revised every 10 years. The Japanese lessons that we analyzed were videotaped from 1994 to 1995. However, current math lessons in Japan are based on the *New Guidelines for Course of Study*, which were issued in 2002. In the *New Guidelines for Course of Study*, the Ministry has inserted the phrase "enjoyment of mathematical activities" as their goal, and while they tried to achieve math learning in which students "find the task by themselves, learn by themselves, and solve the problems by themselves," they also reduced the instruction time from four hours per week to three hours per week and restricted the teaching content. At the time of videotaping, the contents which were taught in the eighth grade, but deleted in current curriculum include: "approximate value", "binary scale", and "flow chart". The content which is now taught in the higher grades includes: "similar figures", which was moved to the ninth grade; and "linear inequality with one unknown", "centroid of a triangle", and "organizing data" all moved to high school Math I. The content which was moved down from ninth grade to eighth grade includes a discussion of "probability".

Textbooks for junior high school math are published by six publishing companies, and all are examined by the Ministry of Education, Culture, Sports, Science and Technology. There are minor differences among the textbooks regarding how to present a given topic. However, the arrangement of chapters, et cetera, are all more or less similar. All schools plan their educational curriculum based on the Guidelines for the Course of Study and the textbooks. Therefore, it is possible to say that in Japan, more or less the same content is taught throughout the entire school system at any given time of the year.

Ninety-four percent of Japanese students attend public school. The other six percent attend a private or a National school.

The basic teaching style is whole-class instruction, but lately some schools have started incorporating "TT" (team teaching) by several teachers as well as group study. Starting in 2002, there's an increasing number of ability-grouped classes (class based on students' degree of mastery of the subject).

Many teachers value "*kikan-shido*" - i.e., strolling among students' desks while checking the students' rates of progress during deskwork - and while they personally assist individual students with the problems they are working on, such teachers often give a hint to the whole class in order to help the students' developing their thinking and increase their motivation. Moreover, many teachers stroll among students thinking about who should present the ideas, or in which order the ideas should be taken up, and this leads to a good whole-class interaction.

Thus, many teachers make the most of the students' opinions and individual thinking. However, we also observed many teacher-fronted classes. This tendency becomes stronger as grade levels become higher.

Also, according to the 1999 TIMSS data, in Japan, the ratio of math teachers who received their teaching certificates in mathematics or mathematics education is very high, and 93% of the students are instructed by such teachers (as compared with the international average, which is 73% (TIMSS 1999 International Mathematics Reports, Boston College).

#### [00:04:32](#) **About the problem**

This problem of "parallel lines and angles" is dealt with in all the textbooks (published by six different publishers) at the time of videotaping (1994), as well as in the year 2002. Reasons given for the inclusion of the problem include: "students should be able to solve this problem utilizing the already studied material;" "it has potential to develop related skills;" "there are many different ways to think about it;" and "almost all the teachers deal with this problem in their lessons." It appears often in quizzes and entrance exams. It is one of the typical problems in geometry.

#### [00:08:22](#) **Various ways of thinking - auxiliary line**

In this lesson, the teachers bring up three different ways of thinking. Especially in the geometry lessons, teachers present various ways of thinking and share their methods with the class. Also, in this lesson, they recognize the value of different ways of thinking about drawing auxiliary lines.

#### [00:10:36](#) **Problem creating**

A lesson in which students create problems, change the conditions, introduce them to each other and solve them, is called "a lesson to create problems." The purpose of such lessons is to increase students' creativity. "Lessons to create problems" are conducted sometimes at the end of a theme, or at the end of the semester. They are also conducted in "target study" (*kagai-gakushu*) and in "mathematics as an elective subject" (*sentakukyoka toshitenno suugaku*) in which they were placed as of 1989's *Guidelines for the Course of Study*. They are not necessarily conducted on a daily basis.

#### [00:13:55](#) **"Kikan-shido" (literally: between-desk-instruction)**

Strolling among students' desks, checking their rates of progress during deskwork or assessing their progress during seat work, "*jiriki-kaiketsu*" to solve one on your own.

In this lesson, students spend a fair amount of time in creating their own problems. In Japanese mathematics lessons, there is an increasing tendency to value time for "*jiriki kaiketsu*" ("learn to solve on your own"). However, it is rare that so much time is spent on this, as is done in this particular lesson. Even in a typical "creating problems" lesson, not this much time is spent on "learning to solve on your own". In addition, there are generally many teachers who use this between-desk-instruction time to think about which students to select, or the order of questions and responses to deal with, while they stroll among the students' desks and this leads to a good whole-class instruction. In this lesson, the teacher does not take up the students' ideas, but simply allows them sufficient time to solve the problems themselves and then to move on to the group study.

### [00:23:24](#) **Group Study**

There are cases where the students work in groups during the math lesson, as in this lesson. However, many times the students bring their desks back to the position facing the front again and come back to the whole-class instruction. Also in Japanese classes, often times students are assigned to a "daily activity group" (such as bringing lunch or cleaning blackboards) and students may work within that group during the lesson. Other times, a special group for just the math lesson is assigned as well.

### [00:49:10](#) **Pattern of a "creating problems" lesson**

In this lesson, the teacher ends the current lesson by letting the students raise their hands in order to confirm which groups have solved the problems. In general, during a "creating problems" lesson, the whole class often will try to solve some of the problems that their classmates have created, and discuss the similarities and differences among the problems and their solutions during the lesson.