

DEVELOPING A STATISTICAL LEARNING ENVIRONMENT: JAPANESE CENSUSATSCHOOL PROJECT

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Statistics Education in Japan is now reaching a great turning point. In the new curriculum which has been already implemented in some part in this year, it has statistical contents more than previous curriculum, especially in secondary school level. While previous curriculum was too much focused on theory-oriented, new one is focused on much more activity. So, we need many data which are useful for students to learn, and can stimulate practical learning. A Special Committee of Statistics Education in Japan's Statistical Society has decided to join the International CensusAtSchool project to provide rich learning environment of statistics for teachers and students. It can enhance statistics lessons in practical way with real data from students themselves. I will report the students' learning of statistics through CensusAtSchool in this article.

INTRODUCTION

In the previous national course of study of Japan, there was no content of statistics in subject Mathematics in lower secondary (junior high) school. This curriculum had decided in the revision of course of study in 1998 (Ministry of Education, 1998). One of the factors of this revision was that it had been needed to reduce curriculum amount at that time. In contrast, importance of statistics education is increasing in today's information-driven society, and curricula in other developed countries have moved to the new direction in which statistics and probability has got more significant position in Mathematics (National Council of Teachers of Mathematics, 1989, 2000; Australian Educational Council, 1991; Department of Education and Employment, 2000). Statistics education in Japan had difficult time with that course of study, because there was no content in lower secondary and contents in upper secondary were very few and elective. In other words, almost of all students learn statistics only in elementary school.

But Statistics education in Japan is now facing a great turning point. Curriculum revision implemented in 2008 shifted to the direction to put more statistical contents in elementary and lower secondary level (Ministry of Education, Culture, Sports, Science and Technology-Japan, 2008a, 2008b, 2009). Remarkable point of the revision in this time, especially in secondary level, is not the revival of previous statistical contents, but new units with different concepts will be established in subject Mathematics. That is reflecting the international movement in statistics education.

A new unit related to statistics in secondary means that all teachers in those schools don't have any experience of teaching, still more they were not trained to teach in undergraduate and do not have any instructions when they were students. It is obvious they need many types of educational support to implement that. A Special Committee of Statistics Education in Japan's Statistical Society has decided to join the International CensusAtSchool project to provide rich learning environment of statistics for teachers and students. We report current situation of Japanese statistics education and progress of Japanese CensusAtSchool project in this article.

OVERVIEW OF STATISTICS EDUCATION IN JAPAN

Table 1 shows statistical contents in previous course of study. There was no statistical content in grade one and two. Students learn very limited graphs (bar, line, and pie/column graph) through grade three to five. In grade six, arithmetical mean was treated without median or mode. This topic did not orient statistical aspect (Watanabe M. et al., 2007). No statistics was taught in lower secondary school. Only in grade eight, small topic related to probability was treated. Statistical contents for upper secondary school were contained in elective subjects. In facts, schools which taught those contents were very few.

Table 1. Statistical Contents in Previous Course of Study

Elementary School	Grade	1	2	3	4	5	6
	Statistics			Bar graph	Line graph	Pie/Column graph	Mean
	Probability						
Lower Secondary School	Grade	7	8	9			
	Statistics						
	Probability		Possible case				

Table 2 shows statistical contents in new course of study revised in 2008 & 2009. This new curriculum will be officially implemented from 2011 for elementary, 2012 for lower secondary, 2013 for upper secondary respectively. Some parts including statistical contents were implemented from 2009, aiming a fluent and quick shift to new paradigm.

Table 2. Statistical Contents in New Course of Study

Elementary School	Grade	1	2	3	4	5	6
	Statistics	Pictograph	Dot plot	Bar graph	Line graph	Pie/Column graph	Mean & Frequency table
	Probability						Possible case
Lower Secondary School	Grade	7	8	9	Upper Secondary School	10	
	Statistics	Mean, Median Mode Frequency table Histogram		Sampling Population		Quartile, Variance Correlation Scatter plot Box-and-whisker plot	
	Probability		Meaning and Calculation of Probability				

New contents are shaded in the table. Statistics education will begin from grade one with basic organizing of small size data and making simple graphical displays. Frequency table is added in grade six. Students are expected to learn basic concept of distribution in this grade. It can make learning of mean more effective than that in the previous curriculum. In the curriculum document for grade six, there is no description of “Histogram”, but it can be treated in this grade connected with Frequency table.

Measures of central tendency, Frequency table, and Histogram will be learned in grade seven, and sampling and population will be learned in grade nine. Probabilistic content in grade six

was moved from grade eight in the previous one. Instead of that, other probabilistic contents are treated in grade eight in this curriculum.

In grade 10, Quartile, Interquartile range, and Box-and-whisker plot are contained in non-elective subject. This change has important double meaning for Japanese Statistics education. The first is that this is the first attempt to teach Quartile, Interquartile, and Box-and-whisker plot in school curriculum in Japan. The second is that these contents are contained in non-elective subjects. In other words, every student in grade 10 should learn these new statistical contents in whole Japan area. It can be said this is a big shift of statistics education in Japan.

On the other hand, teachers of secondary schools have big anxious to teach new contents. Main reason is that they did not learn new concept, especially Quartile, Interquartile range, and Box-and-whisker plot, when they were students. Most of them heard such words for the first time in this curriculum revision. It will become a big burden for such teachers.

CENSUSATSCHOOL PROJECT IN JAPAN

To start the new type of statistics education in Japan, rich educational resources are needed. Those are helpful for instruction itself, and also for teachers to learn what kind of knowledge and approach will be needed for implementation. Unfortunately, there are very few resources which were developed and used in Japanese statistics education. Some section of Ministry of Education and academic societies are now trying to develop educational resources or e-learning site. Special Committee of Statistics Education in Japan's Statistical Society is also trying to start CensusAtSchool project in Japan to provide rich learning environment of statistics for teachers and students. Many features of the International CensusAtSchool project are suitable for the situation of Japan. The first is that project can give opportunities for students to deal their own dataset. The second is that rich and real data can be provide thorough that project. The third is that teachers can access useful teaching plans and worksheet in the site.

Constitution and system of Japanese CensusAtSchool site

Figure 1 shows the top page of CensusAtSchool site of Japan. There are four areas in this site: Basic information of the project including personal information protection and how to join, Teacher page including sample data (domestic and international) and teaching resources, Students page including answering page and data sample (domestic and international), Related site to introduce useful information and site for users. Members of special committee translate teaching materials in other countries joined International CensusAtSchool project.



Figure 1. CansusAtSchool site in Japan

Almost system of Japanese CensusAtSchool site was given by Australian Bureau of Statistics which implements the Australian CensusAtSchool project. We adopt the same certification procedure to join the project: It requires the registration of school first, filling the

registration sheet including the signature of principal. Then the “School Participation Number (SPN)” is issued. Teacher who wants to join this project can make his “teacher account” (figure 2) with “SPN”. After that, teacher can issue “Student access number (SAN)” through his teacher account. Although these procedures are a little complicated and may become an obstacle to broaden this project, we decided to use this from a perspective of personal information protection.



Figure 2. Window for making Teacher account

Unlike registration procedure to join the project, anyone can get random sample data of students and teaching resources from the site (figure 3). Users can decide the size of sample what he need up to 200. Required size of random sample will be displayed and can be downloaded in CSV format.



Figure 3. Download of sample data

Pilot implementation and unique question in Japanese CensusAtSchool

Japanese CensusAtSchool site has opened in December 2008 as a pilot running, while official start of the site was in November 2009. 615 data were gathered through pilot running from elementary, lower secondary, upper secondary, and University students. There are some professors to use CensusAtSchool in their lectures to teach statistics for undergraduate students.

International common questions from CensusAtSchool are adopted in the Japanese implementation of the project. However, there are questions that will be uniquely Japanese. One example relates to each student’s “Blood type”. We will simply ask “What is your blood type?” with the choice being made from one of four types (A, B, O, or AB). Knowing blood type is very common in Japanese culture: almost all people know their own blood type and often relate them to human characteristics. For example, blood type A people are usually well-organized and nervous. Also, fortune-telling from blood types are given air-time on many TV programs every morning. Students of all ages enjoy this kind of discussion and it will provide motivation to investigate differences between each blood type for themselves and their peers.

Figure 4 shows distribution of each blood type of a sample (n=100) from Japanese CensusAtSchool database. Blood type A is the most common and AB is the lowest rate in this sample. The ratio of type B and O are the same and about 20 %. Distribution of this sample is similar to general population in Japan (A: 40%, B: 20%, O: 30%, AB: 10%), but there is a little differences. Students can explore these differences with other samples.

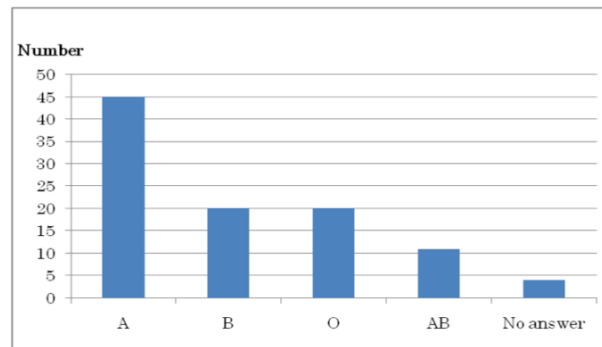


Figure 4. Distribution of each blood type

There is one question which asks about self-analyzed characteristics in Japanese CensusAtSchool project. Figure 5 shows sample responses for that question.

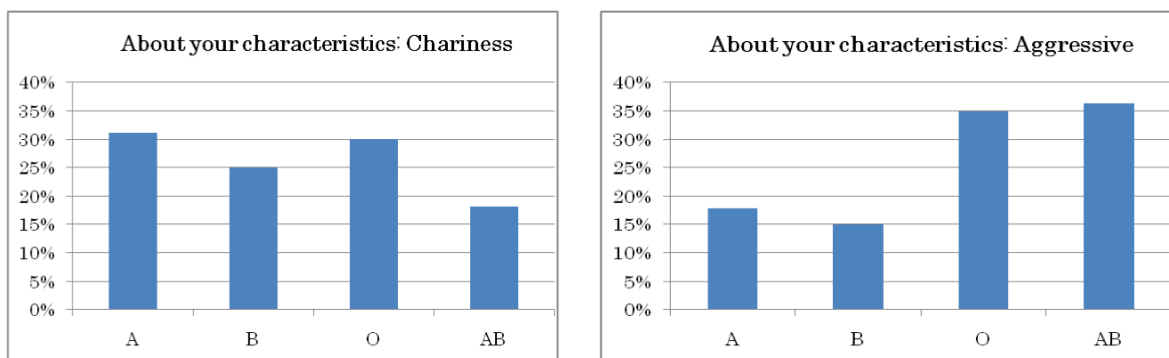


Figure 5. Self-analyzed characteristics from same sample

Although the relationship between blood type and human characteristics are not medically certificated, “Chariness” and “Aggressive” are regarded as typical characteristics of blood type A and B respectively, in Japanese culture. This sample result can become a counter-example of such kind of general understanding.

In addition, this topic can be connected with learning biology or social science, for example, ‘How are blood type genes inherited by next generation?’ There is great potential for international comparisons of distributions of blood type, and so on.

CONCLUSION

Although Japanese CensusAtSchool site is in Japanese for students in Japan, English version of site (figure 6) is developing to collaborate with other countries through International CensusAtSchool project.



Figure 6. CensusatSchool site (in English)

Some staffs of Ministry of Education, academic researchers, and school teachers have strong interests to this project. It should be urgent because statistics education in lower secondary school has already started from the April 2009. Statistics education model for new age should be presented.

Curriculum revision in Japan is decade cycle. After five years implementation, they will review and assess the effect of new curriculum. Those results become resources of the next curriculum revision. If statistics education will be failed in the next five years, those contents will be gone from Japanese curriculum in the worst case. CensusAtSchool is expected to play a critical role for statistics education reform in Japan.

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