

OFFICIAL STATISTICS FOR EDUCATION – ADVOCATING STATISTICS EDUCATION FOR OFFICIAL STATISTICS AS PUBLIC GOODS

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Bearing in mind that official statistics are public goods, it is important to raise awareness about such data. In particular, the Ministry of Internal Affairs and Communications put emphasis on statistics education to enlighten children for a better statistical survey environment for the future. One of the significant examples is the Statistics Poster Competition which has been conducted annually for over sixty years. It attracts more than twenty thousand applications from many pupils, students nationwide, and the best works are awarded by Ministers at the National Statistics Convention. In recent years, the MIC has published practical textbooks which were compiled in collaboration with educators. To effectively utilize the textbooks, seminars for statistics instructors are organized where knowhow and experience are exchanged between teachers and official statisticians.

INTRODUCTION

In 2009, the Statistics Act was revised and "official statistics are crucial information for the citizens in their reasonable decision making" was newly stipulated as the purpose of the law. Also, the concept of official statistics turned from "Statistics for government" to "Statistics as the information infrastructure of society".

In the Master Plan concerning the Development of Official Statistics, decided by the Cabinet on March 25, 2014, in order to raise awareness of cooperation for statistical surveys, at each stage from primary education to higher education, statistical education that emphasizes statistical literacy, which is the ability to understand the usefulness of statistics and utilize statistical data, is considered important. In fact, on March 31, 2016, the Ministry of Education, Culture, Sports, Science and Technology revised its Curriculum Guidelines. Collecting and analyzing necessary data and using it as a basis for problem solving, especially in elementary and junior high school, is considered as a point of the revision for the enhancement of statistical education.

In recent years, there is an increasing need for human resources capable of analyzing data and creating new value in society, as Google's chief economist, Dr. Hull Varian, said "I keep saying the sexy job in the next ten years will be statisticians." In April 2017, Shiga University opened the first full-scale faculty of statistics in Japan, the Department of Data Science. Among job market in Japan, data scientists job seekers seem to be increasing.

Statistical literacy has been sought by society, and the administration has been making efforts to deal with it. Although the interest in statistical education is rising at the educational site, teachers have difficulties implementing guidance methods, and it is necessary to create practical teaching materials, provide information, and improve training for teachers.

Under such circumstances, the MIC's Director General for Policy Planning (Statistical Standards) has developed teaching materials for junior high school students, high school students and their teachers, which let them grasp how to solve a problem on familiar topics and social issues through statistical exploratory process. In addition, we hold instructor seminars every year for teachers, and we are making efforts to improve the quality of statistical education. This paper presents these efforts.

STATISTICS EDUCATION PROMOTED BY STATISTICS ADMINISTRATION

Awareness Raising

In recent years, the environment surrounding statistical surveys has been getting severe due to increased privacy awareness and other factors. While the importance of Evidence-Based Policymaking (EBPM), which administrative organizations and others use to make policy based on data like statistics etc., attracts much attention, such severity of the survey environment affects the accuracy of statistics. It can also cause policy to lose effectiveness.

It is a very important task to raise understanding of statistical surveys through dissemination and awareness raising activities in the DGPP, MIC.

In particular, in Japan, October 18th is “Statistics Day”, and every year around this day events such as awarding persons of statistics merits and exhibitions such as statistical graphs etc. are held nationwide for awareness raising. One of these events is the National Statistics Graph Competition.

The National Statistics Graph Competition

The National Statistics Graph Competition began in 1953 with the objective of contributing to the dissemination of statistical knowledge and development of statistical presentation techniques. The competition in 2017 marks 65th anniversary.

The entry qualification is divided into six categories. Part 1, Part 2 and Part 3 are for elementary school pupils, Part 4 is for junior high school students, Part 5 is for high school students and above. The PC graph section is for elementary school students and above. Applicants in Part 1 and Part 2 collect the findings of observations or investigations themselves on a statistical graph and prepare a poster. Applicants from Part 3 to the PC graph section select the findings of observations or investigations conducted by themselves and various statistical materials and compile them in statistical graphs (Table 1). Applicants below junior high school account for over 80% of the total, and students are the majority. Many schools assign the creation of statistical graphs as summer homework, and a great number of students submit their works each year (Table 2). This effort enables students who are, in the future, supposed to cooperate statistical surveys to work on issues related to statistics, to learn the usefulness of statistics and to deepen understanding of statistical surveys. This is very important for a better environment of statistical surveys.

Table 1. Categories of the Statistics poster competition

Category	Eligible for	Theme
1	1st and 2nd grades pupils of elementary school	Statistics graph of original data observed or surveyed by pupils
2	3rd and 4th grades pupils of elementary school	
3	5th and 6th grades pupils of elementary school	Statistics graph of published statistical data / original data observed or surveyed
4	Junior high school students	
5	High school students and adults	
PC graph	All ages including adults	

Table 2. Number of Submitted works

Category	Number of submitted works
1	2,037
2	4,441
3	5,368
4	9,816
5	764
PC graph	4,021
TOTAL	26,447

Selection of works for the National Statistics Graph Competition is divided into three stages. As a first step, excellent works are selected by each prefecture. In the second stage, statisticians of DGPP, Statistics Bureau, and Statistics Center conduct a screening process, and in the final stage 3, screening will be conducted by academics and experts, etc. Finally, awards such as Minister of Internal Affairs and Communications Award are conferred.

In the 2017 National Statistics Graph Competition, the work that won the Minister of Internal Affairs and Communications Award is shown in Figure 1. Under the title of "Contribution to Society I Can Do", the winner got inspiration from the experiences the author raised in early childhood, examining statistics and public opinion polls on the amount of monetary donation and awareness regarding fund raising in Japan. Furthermore, differences between donation in Japan and overseas are summarized well in the statistical graph (Figure 1). The examination criteria of the Minister of Internal Affairs and Communications Awards are the appropriateness of expressions for statistical graphs, readability and how well statistical views and ideas are represented.

For those who have won a prize such as the Minister of Internal Affairs and Communications Awards, the awards ceremony are held at the National Statistical Assembly to be held in November every year and the winning works are exhibited. In 2017, the exhibition was held at National Olympic Center on 13th November.

Figure 1: A poster which won the Minister of Internal Affairs and Communications Special Award in 2017 National Statistics Graph Competition



Developing Teaching Materials

In order to promote statistics education at schools, DGPP, MIC, has developed two Teaching Materials: "Statistics Application for Students – Basic Level" for junior high school students and "Utilize statistics and data science from high school leading to learning at university – Advanced Level". In addition, we also developed teaching materials for instructors.

As for its structure, it makes possible to learn how to utilize statistical materials on daily life topics and the idea of statistical search process with easy cases. The cases are composed by a P (problem consciousness), P (plan / experimental research design), D (data collection), A (data analysis), C (conclusion) cycle. Reference information, such as points of guidance and information sources of reference materials, are disseminated through the teaching materials for the instructors.

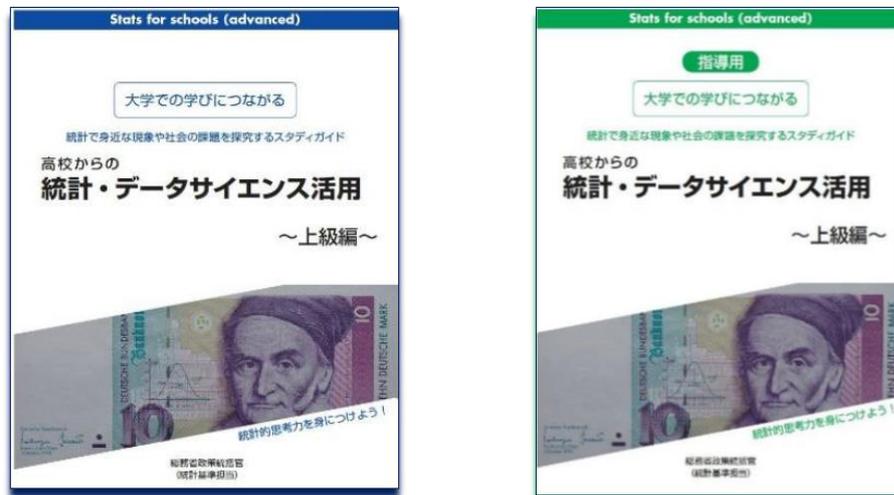
For example, as one of the contents of the basic level Teaching Materials, there appears a subject on Mt. Fuji, registered as a World Heritage site in 2013, but we build a hypothesis predicting how the circumstances surrounding Mt. Fuji changed due to this site registration and what kind of impact was made, we then think, what kind of data is actually needed, collect and analyze it for solving the problem.

"Utilizing statistics and data science from high school leading to learning at university – Advanced Level" is a teaching material for improving statistical literacy using more sophisticated mathematics (Figure 2).

For example, students conduct a questionnaire survey about ramen noodle, which is very popular among students, to find out which one of the four tastes of ramen noodle (soy sauce, miso, salt, pig bones) is the most preferred in the area where they live. Evaluation of sampling errors is used for examining whether the investigation result is significant or not. As a cautionary point

when actually conducting surveys, it is noted out that sampling must be designed so that there is no bias in gender, age, etc. that may affect the survey results. In addition, methods to deal with data loss due to non-response etc., are also discussed. In other words, it is composed by very practical contents.

Figure 2. Advance level Teaching Materials
(Left: Textbook for high school students, Right: Instructional book for teachers)



Statistics Leaders Training Course

The DGPP, Ministry of Internal Affairs and Communications has been providing every year since 1991 Statistics Leaders Training Courses for the acquisition of practical teaching methods using statistical data to teachers who teach statistical education. In 2017, it was held for two days on July 31 and August 1, and 73 people, including teachers of elementary and junior high school and high school, took part on it.

Attributes of participants were 38.4% for elementary school teachers, 35.6% for junior high school teachers, and 11.0% for high school teachers. The subjects they teach were mathematics 54.8%, society 19.2% and science 2.7%.

Divided in a group by group basis, each group debated and made propositions for an educational guidance proposal for the use of statistical data as part of a research of concrete examples of use of data in the class room, while introducing practical examples of statistics use in the class room and sharing useful information to teachers and instructors from local public bodies.

Later on, a lecture on the aim and contents of the Teaching Materials was given by Prof. Michiko Watanabe, Keio University Graduate School who had led Working Group of developing teaching materials. In the questionnaire survey conducted after the instructor training session, participating teachers mentioned how the training course was meaningful to them, such as wanting to take and share useful information gained at the statistics leaders training session back to the prefecture, or how fulfilling it was listening to efforts of other schools.

CONCLUSION

Statistical education is very important in promoting official statistics as public goods. In recent years, society demands data scientists to solve problems with statistical thinking. Although the interest in statistical education is rising at the educational site, we have difficulties implementing guidance methods, and it is necessary to create practical teaching materials, provide information, and improve training for teacher. In order to bridge the gap, DGPP, the Ministry of Internal Affairs and Communications developed useful teaching materials for teachers involved in statistical education. Daily life topics are used so that students can more easily deal with them.

Based on the "Final Report on Statistical Reform Promotion Council" decided in May 2017, the Statistics Committee in December 2017 issued a report on the change of the "basic plan concerning maintenance of public statistics", in collaboration with relevant ministries and agencies,

promoting collaboration and cooperation with responding educational institutions, promoting lectures for university students and business persons, and dispatching lecturers to professional graduate schools and the like. In order to further promote statistical education etc. by local governments, the Ministry of Internal Affairs and Communications has been trying to share information on efforts relating to statistical education etc. of national and local governments, and has already conducted studies in some prefectures, since they are not only aimed at securing and growing statistical enumerators but also at improving statistical literacy by experiencing the firsthand work of statistical survey and at the same time, in order to further promote these efforts, cooperating with local universities.

Statistical education in Japan still has many more problems to address, but we will continue to actively exchange opinions through statistics leaders training sessions and other activities of this kind. Also, the two Teaching Materials will be further brushed up, and we will continue to make efforts to develop human resources with statistical literacy as well as statistical education development.

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