

Quality Assessment of Statistical Education by Japan Statistical Society

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1. Introduction

- To assess the outcome of statistical education and provide recognized statistical qualifications, Examinations for Japan Statistical Society Certificate (JSSC) was initiated in 2011.
- JSSC began with 5 categories, and two higher categories were added in 2012, now providing 7 categories.
- JSSC aims to contribute to improving statistical education, enhancing students' statistical thinking, and improving capabilities of society at large to produce and use statistics.
- This presentation will give:
 2. Background of JSSC
 3. Structure and Results of JSSC
 4. Conclusion - Future of JSSC



2. Background of JSSC

Four main driving factors for initiating JSSC

- (1) Movement of statistical community to enhance statistical education
- (2) Collaboration of the government and academia to assure quality of higher education
- (3) New official guidelines for high school curricula
- (4) Increasing demand for statistical skills in society





2. (1) Movement of statistical community to improve statistical education

- Since early 1990's, JSS Special Committee of Statistical Education undertook researches on improvement of statistical education.
- In 2005, six academic societies specialized in statistics jointly set up JFSSA (Japanese Federation of Statistical Science Association) to facilitate better collaboration.
- JSS and JFSSA members occasionally made public proposals for improving statistical education in Japan.
- Such activities laid ground to higher public awareness of importance of statistical thinking



2. (2)-1 Quality assurance in higher education

- In 2008, Ministry of Education (MEXT) proposed to initiate Quality Assurance Framework for Higher Education.
- MEXT requested Science Council of Japan (SCJ) to help establish Subject Benchmark Statements Framework.
- SCJ responded by providing the Framework, and requested academic societies to develop Subject Benchmark Statements for major fields of sciences.
- In 2010, JFSSA developed Standard Reference for Statistical Education in response to SCJ's request.



2. (2)-2 Quality assurance in higher education

- The establishment of JFSSA in 2005 was quite timely, because it provided a common ground for collaboration among statisticians working in different fields.
- In Japan, no university has a department of statistics, because statistics has been treated broadly in various departments, such as math, economics, etc.
- Development of Standard Reference for Statistical Education helped gather momentum for promoting statistical education and external assessment, as it involved many government and academic institutions as well as members of JFSSA and JSS.



2. (3) Revision of official guidelines for high school curricula

- In parallel with higher education, MEXT revised the official guidelines for high school curricula to take effect since 2012.
- In this revision, teaching of statistical thinking and data analysis at high school level has been enhanced for entry-level mathematics.
- The revision was motivated by a concern about the gradual decline in international ranking of Japanese students in performance in numerical thinking.
- In consequence, assessment of outcomes of teaching statistics became more strongly felt.

2. (4) Growing demand for statistical skills in society

- With increase of contracted researches, research companies have been in need of means for assessing and proving the quality of their statistical staff.
- Since early 2000's, the government began outsourcing operations statistical surveys to private sector, making it necessary for private contractors to prove their quality level.
- In the absence of a commonly accepted system for assessing statistical skills by an independent body, a new system of examinations and qualifications in statistics became necessary.



3. Structure and Results of JSSC Examinations

- JSSC began with 5 categories of qualifications, and was expanded to 7 categories in 2012.
- Examinations currently available are as follows:
 - Grades 1 – 4
 - Professional Survey Statistician
 - Survey Statistician
 - RSS/JSS Joint Exam (Higher Certificate)
- In 2011, 1210 persons applied, and 546 persons passed the Exams.
- In 2012, 2692 persons applied, and 1033 persons passed the Exams.





3. (1)-1 Structure of JSSC Examinations

- Grade 1 Examination covers following broad areas of application.
 - Humanities
 - Natural Science & Engineering
 - Social Sciences
 - Medicine and Biosciences
- This Exam consists of two modules: “Mathematical Statistics” & “Applied Statistics”, to be solved in 120 minutes in total.
- Typical college students majoring in sciences can pass this Exam only after having studied a few statistics courses and acquired sufficient experience of data analyses in their major fields.



3. (1)-2 Structure of JSSC Examinations

- Grade 2 is designed to meet the needs of all college students who are interested.
- Typical college students majoring in sciences can pass this Exam, if they take and study intermediate statistics course.
- For those students majoring in humanities or social sciences, this Exam requires reasonable amount of effort.
- This exam is 90 minutes long.



3. (1)-3 Structure of JSSC Examinations

- Grade 2 Exam covers following fields:
 - i) Collection and Compilation of Data
 - ii) Analysis and Presentation of Data

Descriptive techniques

Introductory probability theory

Random variables, expectation, distribution of some statistics

Scatter plot, correlation, simple regression

Statistical inference : interval estimation

Statistical inference : testing hypotheses

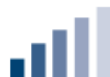
Statistical inference : regression analysis, analysis of variance





3. (1)-4 Structure of JSSC Examinations

- Grades 3 & 4 Exams cover the same fields as Official Curriculum Guidelines of MEXT, i.e. curriculum for high school students since 2012.
- Grade 3 Exam covers Data Analysis.
 - Basic concepts of statistics (Statistical Literacy)
 - Interpretation and relationship (Statistical Inference)
 - Utilization of statistical observations (Statistical Thinking)
- Grade 4 Exam covers Use of Statistical Data
 - Basic descriptive statistics
 - Elementary probability
 - Making use of statistical data





3. (1)-5 Structure of JSSC Examinations

- The Exam for Survey Statisticians is designed mainly for current or prospective survey enumerators to promote their better understanding of data collection process, especially from the viewpoint of official statistics.
- Topics of questions:
 - Role of Statistics System of official statistics
 - Statistics Act
 - Data collection process
 - Use of statistical output
- The Exam focus on Japanese economic statistics and situation of official statistics due to its nature.





3. (1)-6 Structure of JSSC Examinations

- The Exam for Professional Survey Statisticians is designed to certify their level of statistical knowledge needed for managers of statistical surveys in planning and managing survey operations.
- This qualification will be useful for differentiating the skill levels among survey and research companies: companies having more qualified survey statisticians can be more competitive in bidding for contracts.
- Japan Marketing Research Association expressed great interest in this exam.





3. (1)-7 Structure of JSSC Examinations

- RSS/JSS Joint Exam is conducted under a contract between Royal Statistical Society (RSS) and JSS.
- This Exam is the same as RSS Higher Certificate (HC) . The papers are marked using the same standard that RSS has been applying.
- The Exam consists of 8 modules, each with four questions to be answered in 90 minutes.
- Applicants who pass in 6 modules are awarded HS.





3. (2)-1 Applicants of 2011 JSSC Exams

- The First JSSC Exams took place on 20 Nov. 2011 in Tokyo, Osaka and Fukuoka.

Exam	Applicants	Examinee	Passed
Grade 2	396	346	143
Grade 3	226	197	125
Grade 4	27	23	16
Survey Statisticians	296	280	161
Pro Survey Statisticians	265	252	200





3. (2)-2 Applicants of 2012 JSSC Exams

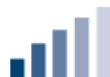
- The Second JSSC Exams took place on 18 Nov. 2012 in 8 cities from Sapporo in north to Fukuoka in south.

Exam	Applicants	Examinee	Passed
Grade 1	228	158	25
Grade 2	1079	840	319
Grade 3	771	658	390
Grade 4	70	62	43
Survey Statisticians	326	302	149
Pro Survey Statisticians	218	205	107



4. Conclusion - Future of JSSC Exams

- JSSC will be expanded to include Graduate Diploma (GD) Exam, above HC, under the contract with RSS. The expanded range of Exams will better serve those who are striving to achieve higher levels in statistics.
- We expect an increase of applicants for JSSC Exams in 2013, as we see increasing interest in statistics among Japanese people.
- Eight universities started to cooperate to enhance statistical education under a project “Japanese Inter-university Network for Statistical Education” (JINSE). Concerted efforts of JSSC and JINSE will promote further development of statistical education.





The End

Thank you for your attention!

Reference

Official Web site of JSSC Exams (in Japanese only) <http://www.toukei-kentei.jp/>

JFSSA, Standard Reference for Statistical Education (in Japanese only)

<http://www.jfssa.jp/ReferenceStandard.pdf>

Ministry of Education, Culture, Sports, Science & Technology (MEXT)

<http://www.mext.go.jp/english/>

<http://www.mext.go.jp/english/highered/1307524.htm>

Science Council of Japan (SCJ)

<http://www.scj.go.jp/en/index.html>

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