Recent Trends in Statistics Education in Japan

Kensei Araya, *Fukushima College, Miyashiro, Fukushima, 960-0181, Japan*
Masakatsu Murakami, *Institute of Statistical Mathematics, Minatoku, Tokyo, 106-8569, Japan*
Koji Kurihara, *Okayama University, Tsushimanaka, Okayama, 700-0082, Japan*
Jim Ming-Zhe, *Sapporo Gakuin University, Bunkyodai, Ebetsu, 069-0833, Japan*

1. Long-Term Characteristics of Statistics Education

Statistics education was first offered as a formal part of the university curriculum in Japan in the 1930s, but the study of inferential statistics was only introduced in the 1950s. Initially it was taught simultaneously by industry, government, and schools. Industry focused on Deming's quality control methods, government focused on establishing guidelines grounded for maintaining neutrality in statistical theory, and schools initially treated statistics as a sub-field of mathematics. Amidst the economic growth that spanned the following 30 years, there was a shift in the industrial sector toward total quality control. The importance of quantitative measurements gradually weakened, and there was a shift instead to its use in specialized fields such as the medical industry. However, the importance of statistics education as a basic tool for economic planning by the government rose and peaked in the 1970s as it began to be applied to the study of econometrics. Statistics education in schools was incorporated into the education of mathematics down to high school level, and was taught at relatively low levels due to the decreased requirements for mathematics education instituted by the Ministry of Education's guidelines. By the mid-1970s, the importance of university-level statistics education in the process of economic growth was recognized, but the unavoidable systemic effects of the decreased requirements of the Ministry of Education were ultimately reflected in the fact that a university level statistics department still had yet to be established.

2. Changes in the 1990s

It is well known that the growing importance of information and globalization in the 1990s produced great changes in industry, government, and school education. Product development in the industrial sector has shifted to a system that relies on large quantities of data regarding the consumers need for smaller volumes of more diverse products, and the distribution industry is actively handling large quantities of data using POS systems. These examples are representative of the emergence of data mining methods that go beyond statistical and conventional methods of data management. In the world of finance and economics, a new field called financial engineering has been the target of enormous inflows of international money, and probability theory has come into the limelight due to an increased interest in risk management. Government statistics also reflect local decentralization centered around issues of welfare and long-term health care necessitated by the aging population. The governmental need for micro-statistics has increased as Japan's larger role in international affairs has created a greater need for comparative statistics.

In the realm of education, the problems of securing new labor by re-educating seniors and offering lifelong learning programs that suit people's intellectual interests are being addressed nationwide through computer training grounded in information technology promotion policies. Rapid technological innovations are leading towards the certification of various vocational schools, such as computer software schools aimed at developing the technical adaptability of young people.

Efforts by the Ministry of Education, Culture, Sports, Science and Technology to implement a more relaxed educational curriculum, especially at elementary and junior high school levels, are resulting in reduced classroom hours and reductions in the course content of mathematics and statistics classes. In advanced education, large numbers of universities were established in the 1990s in fields aimed at using statistics, such as international affairs, information technology, health and welfare, and local development.

Even amidst this series of changes, the importance of statistics education remains high. It is being strengthened as a part of education in the field of information processing, and the number of fields in which it can be applied is growing.

3. Incentives for Developing a New Statistics Education

The following are some new approaches to statistics education in light of the above changes, from reports and papers presented at the Statistics Education Committee of the Japan Statistical Society. Numbers (1) to (3) are challenges to institute a new statistical education by individual researchers; (4) to (6) are efforts by educational institutions; and (7) to (9) are sample developments in the industrial sector.

(1) Seeing the World Through Math.....Yoshizawa
(2) The Relationship Between Computer Education and Statistics Education Naoichi Ueda
(3) Using Computers to Identify Authors .....Murakami
(4) Playing in a Random World.....The Institute of Statistical Mathematics
(5) Statistics in High School Education.....Keio University Shonan Campus
(6) New Syllabus for Environmental Mathematics.....Okayama University
(7) The Use of Statistical Data in Nonlife Insurance.....Tokio Marine Research Institute
(8) Data Mining and Its Applications .....Hitachi, Ltd.

4. Outlook for the Future of Statistics Education

Let us now examine government-related statistics education. Statistical data is often used in policy explanations provided in classes offered to the general public at community centers and in sources such as municipal newsletters, and they are often used to support a particular argument. In these cases, the person controlling this information needs to be aware of how the data can be manipulated to explain an opposing viewpoint. Increasing people's understanding of regional micro-statistics is also important in terms of the responsibility that the government has to devise and explain policies. The demand for this kind of knowledge is going to continue to rise as the public becomes increasingly interested in statistical and mathematical perspectives on the cost-effect analysis of public works projects and in the relationship between the health care and fiscal policies of their local governments.

Various kinds of statistical processing is being used, especially in the industrial sector in computer systems processing and Internet usage. However, results are often displayed automatically, with the source data and calculation processes being treated as a "black box." The company departments in charge of this information need to offer educational activities that explain the underlying structures of that black box. In terms of corporate governance, improvements seem to have been achieved in raising managerial quality due to the increasingly widespread implementation of ISO standards, but weaker small and medium-sized businesses need to take a simpler approach, and business organizations need to promote education on topics such as the seven new tools of quality control.

School education, especially at the high school level and below, offers an interdisciplinary statistics education in that it teaches ways of looking at and thinking about data, as well as methods for metrically analyzing that data. Given the importance of information and globalization in society today, we need to instill in young people a sense of statistics so they can understand graphs and charts and learn how information is expressed and communicated using computer graphics. In today's environment, it is completely inappropriate to try to deal with statistics as a single chapter subsumed in the teaching of mathematics. We need to implement a statistics education that takes into account its relationship with other disciplines. Statistics education at university level needs to be applied to interdisciplinary study, and also needs to be studied more fully as an independent discipline. However, a forum for discussing recent problems involving student evaluations of class improvements needs to be established.

MAIN REFERENCES

Ministry of Education University Council, "How to Handle Advanced Education in an Era of Globalization" (November 2001).
Ministry of Education Middle Educational Materials, "The Use of Multimedia in Education" (July 1995).