The new Course of Study and a prospect of information studies education in Japan

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Abstract. Japan launched the new Course of Study in April 2012, which has been carried out in elementary schools and junior high schools. It will also be implemented in senior high schools from April 2013. This article presents an overview of the information studies education in the new Course of Study for K-12. Besides, the authors point out what role experts of informatics and information studies education should play in the general education centered around information studies that is meant to help people of the nation to lead an active, powerful, and flexible life until the satisfying end.

Keywords: General subject "Information", Course of Study, Scientific understanding of Information, Information Ethics

1 Three objectives of information studies education in primary and secondary education

The information studies education in Japanese primary and secondary education encourages pupils and students to develop their "Practical skills in using information actively", "Scientific understanding of information", and "Positive attitudes towards today's information-laden society".

The three objectives were defined in the first report of "the Researchers Conference for Promotion of K-12 Information Studies Education", in October 1997. Based on them, the previous Course of Study launched its version of information studies education. [1]

The three objectives are defined as follows:

"Practical skills in using information actively": The ability to use information means to collect, evaluate, express, process, and/or create the information needed, and to dispatch and communicate it in consideration of the receiver.

"Scientific understanding of information": Understanding the characteristics of information means to use information actively and to understand basic theories and methods for handling information appropriately and for evaluating and improving one's own use of information.

"Positive attitudes towards today's information-laden society": The positive attitude that should be accompanied by the intention to understand the role and

influence of information in our life, to consider the importance of information ethics and one's own responsibility for information, and to participate actively in creating a desirable society.

2   Information studies education in elementary schools

Elementary schools do not provide any specific subject of information studies but encourages pupils to develop their skills in using information actively by means of information devices like personal computers in class activities centered around the subject "the Period for Integrated Studies."

The new Course of Study for Elementary Schools describes what needs to be taken into account when making teaching plans in its Chapter 1, the general provisions [2]:

> Teaching subjects should be intended to provide pupils with learning activities that help them to get accustomed to information means such as personal computers and the Internet, to acquire the basics of keyboard operation and basic knowledge of information ethics, and to be able to use those means appropriately, and it should further be combined with appropriate active use of teaching and learning materials and tools such as audio-visual apparatus and so on.

What makes a great difference from the previous Course of Study is that the new course states the necessity for the acquisition and active use of "skills like the basics of keyboard operation" and "basic knowledge of information ethics".

Moreover, the new Course states on "the Period for Integrated Studies":

> Information studies should involve learning activities in which pupils can, through attempts at problem solving or investigation, collect, sort, and send information and can consider the influence of information on our life and society.

3   Information studies education in junior high schools

In junior high schools, the subject of Technology and Home Economics generally covers information studies. The new Course of Study classifies the field of Technology as follows [3]:

A Technology of materials and their processing
B Technology of energy conversion
C Technology of animal and plant growth
D Technology of information

The content of D "Technology of information" is defined as:

(1) The Internet and information ethics
(2) The design and creation of digital arts and products
(3) Measurement and control by computer programs

Half of the 175 hours of the subject Technology and Home Economics are allotted to the content of Technology. The learning of information used to take up half the content, but now takes up only a quarter of it. Thus the time period for information studies that formerly reached 44 hours currently amounts to only 22 hours. This means a significant change in quality as well as quantity.

4   Information studies education in senior high schools

In senior high schools, the subject of Information chiefly serves for information studies education. It is comprised of General Information (Information as general subject) and Major Information (Information as major subject).

4.1   The subject General Information

The content of new subjects of information
Emphasizing the necessity for students' proper acquisition of practical skills in actively using information and for their growing awareness of information ethics and caution about security and norms of information, the new Course of Study provides the following two subjects so that students can deepen and broaden their knowledge of scientific and social views or ideas on information and information technology according to the actual conditions of their levels of skills, aptitudes, curiosity, interests, and choices of future careers. [4]

Society and Information

1 Aim
This subject is intended to acquaint students with the characteristics of information and its influence upon our society, to develop their skills in properly using information devices to collect, process, and express information along with their effective communication skills, and to nurture their positive attitudes toward participation in today's information-laden society.

2 Content
  (1) Active use of information and its expression
       Characteristics of information and media
       Digitization of information
       Expression of information and communication
  (2) The Internet and communication
       Information means and their development
       The Internet and its mechanism
       Active use of the Internet and communication
  (3) Issues of today's information-laden society and information ethics
       The influence of information on our society and its problems

Ensuring information security
Laws and individual responsibilities in today's information-laden society
(4) Construction of desirable information societies
Social information systems
Information systems and humans
Problem solving in today's information society

Science of Information

1 Aim
This subject is intended to make students understand the role of information technology and its influences on today's information-laden society, to give them scientific ways of thinking necessary for actively using information and information technology to find and solve relevant problems, and to foster their ability to participate in and contribute to the development of today's information-laden society.

2 Content
(1) Personal computers and the Internet
Personal computers and information processing
Mechanisms of the Internet
Operation of information systems and services provided
(2) Problem solving and effective use of personal computers
Basic approaches to problem solving
Problem solving and computer programming
Modeling and simulation
(3) Information management and problem solving
The Internet and problem solving
Accumulation and management of information and database
Evaluation and improvement of problem solving
(4) Progress of information technology and information ethics
Informatization of societies and humans
Security of information-laden society and information technology
Development of informatized societies and information technology

The Characteristics of the new subjects of information
The new subjects of information are marked with keywords such as "Information and communication network", "Information-laden society", and "Information ethics". "Society and Information" consists of "Media" and "Communication", and "Science of Information" is built on "Problem solving".

4.2   The subject Major Information

Current situation
Alongside of "General Information", the previous Course of Study provided 11 subjects of Major Information for senior high schools.

However, only a very small number of schools teach subjects of Major Information. Japan does not have more than 20 senior high schools that offer the course Major Information.

Aim of the new subjects
While the aim of "General Information" does not differ between the previous and the new Course of Study, that of "Major Information" is enriched with keywords like "Ethical views" and "Information industry":

> The subjects are intended to make students acquire primary and basic knowledge of and skills in different fields of information, make them understand what significance and role information has in the present society, and to develop their creative and practical ability to solve social problems in positive, rational, and ethical attitudes and to endeavor to develop information industry and societies.

New subjects of Major Information and their characteristics
The new Course of Study reorganizes subjects of Major Information by introducing some new subjects as well as revising the overall content of all subjects, which is expected to help foster qualified young people who have acquired the capability of creativity, thought, problem solving and understanding occupational ethics.

The new Course of Study reorganizes the subjects of Major Information into 13 in conformity with those characteristics. (Table 1)

Table 1. New subjects of Major Information

• Basic subjects
— Information Industry and Society, Expression of Information and Its Management, Information and Problem Solving, Information Technology
• System design and management subjects
— Algorithm and Computer Program, Network System, Database, Information System Practices
• Creation and production of information content subjects
— Information Media, Information Design, Edition of Expressive Media and Expression, Information Content Practices
• Synthetic subject
— Project Study

4.3 Other subjects of information in high schools of industry and commerce

The Course of Study notified in 1979 provided some major subjects of industry and commerce which were concerned with information studies. Subsequently, Japan established the course of information technology in high schools of industry and that of information processing in high schools of commerce, which have played a central role of information studies education in the nation.

Likewise, the new Course of Study provides "Basic Information Technology", "Electronic Information Technology", "Programming Technology", "Hardware Technology", "Software Technology" and "Computer Systems Technology" for high schools of industry and "Information Processing", "Business Information", "Electronic Commerce", "Programming", and "Business Information Management" for high schools of commerce.

Other specialized high schools teach some other subjects of information: "Agricultural Information Processing" in agricultural schools, "Maritime Information Technology" in fishery schools, and "Effective Use of Nursing Information" in nursing schools. The subjects are learned by a lot of students in these specialized High Schools.

4.4 Current Problems

In the new Course of Study, where the three subjects "Information A, B, and C" are reorganized into the two "Society and Information" and "Science of Information", these are still supposed to be designated by schools, not chosen by students themselves, and, what is more, the great majority of high schools plan to teach only "Society and Information".

As can be seen from Fig. 1 and Fig. 2, "Society and Information" barely deals with scientific understanding of information and is almost void of such contents as information technology and problem solving that make up the fundamentals of Information Studies. [5]
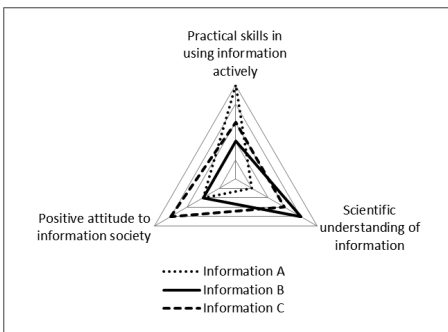

Fig. 1. Previous subjects and gravity of 3 objectives (the authors' subjective judgment)
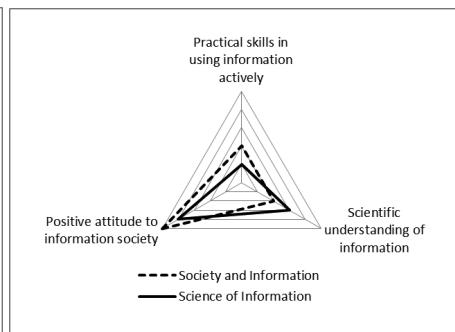
Fig. 2. New subjects and gravity of 3 objectives (the authors' subjective judgment)

What is even worse is that most teachers of Information Studies obtained a teacher's certificate of the subject by fifteen-day training some ten years ago. Since 2003, when the subject "Information" was introduced in schools, about half of the prefectures have not conducted an entrance examination for teachers of Information Studies, and no more than 20 % of prefectural or municipal boards of education have employed teachers of the subject continuously. Moreover, such teachers are required to have a certificate of a second subject in many of the prefectures and cities, which is not a required qualification for teachers of other subjects. [6]

5   Some suggestions for information studies education in Japan

Information studies education in the new Course of Study can be summarized with respect to the three objectives and school types/levels as in Table 2.

Table 2. The three objectives of information studies education and their practice at different school levels (the authors' subjective judgment)

	elementary school	junior high school	senior high school
practical skills in actively using information	***	**	**
positive attitude toward participation in today's information-laden society	**	**	***
scientific understanding of information	——	*	*

The number of asterisks in the table indicates that the objective is pursued actively (***), moderately (**), barely (*), or not at all (——).

Table 3. The three objectives of information studies education and their idealized practice at different school levels

	elementary school	junior high school	senior high school
practical skills in actively using information	***	**	*
positive attitude toward participation in today's information-laden society	**	**	**
scientific understanding of information	*	**	***

Elementary and junior high schools put more weight on "practical skills in actively using information" than senior high schools. On the other hand, "positive attitude toward participation in today's information-laden society" is first dealt with in elementary schools but is more emphasized in junior and senior high schools. "Scientific understanding of information" is, by contrast, only touched on in some junior-high

subjects of Technology and Home Economics as well as in some senior-high subjects of Information.

The authors propose an ideal way of scheduling and practicing the subjects of information within the new Course of Study in Table 3. One cannot know the essential qualities of information without basic scientific understanding of its mechanism and operation. Moreover, the senior-high subject of Information needs more teachers and a wider range of subject choice as well as a more supportive infrastructure. It is urgent that the nation should foster skilled and knowledgeable teachers who understand well the essential nature of information studies and can command and display their skills and knowledge in classes. It is more desirable for every high school to teach both subjects "Society and Information" and "Science of Information" so that their students can choose between them according to their curiosity, interest and preferred future careers. For further studies, more senior high schools can ideally open subjects of Major Information.

Finally, scholars engaged in information science teaching including the authors need to know more about the current situation of and problems with, information studies education in primary and secondary schools. In today's information-laden fast-paced society, people are encouraged to achieve the ability to lead an active, powerful and flexible life, coping with different problems and inconveniences all through their lives. Although Information studies are indispensable for achieving these objectives, their importance is currently extremely undervalued. We should exert ourselves to convince people in MEXT and boards of education, as well as learners and teachers at school, of the importance and attractiveness of "Scientific understanding of information". The authors believe that it is our imperative duty to develop supporting tools needed in classes of information studies at school and to contribute to information studies education through research we are engaged in.

Acknowledgment

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