

The Shift of Informatics Education and analysis of curriculum guidelines in Japan

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Abstract

The purpose of this paper is to obtain suggestions for education by analyzing the contents of the latest Japanese curriculum by Ministry of Education, Culture, Sports, Science and Technology in Japan. Therefore, the content of informatics education was analyzed according to the Japanese curriculum guidelines by the Morphological Analysis (MA). As a result, the contents of the Japanese curriculum were divided into four clusters. " Problem Solving", " Digital skills and Expressions", " Information Society and Data", " Communication and Design".

Keywords: Informatics Education, Japanese curriculum guidelines, Morphological Analysis,

Introduction

Progress of informatization of society in Japan

With the informatization of society, a response to informatization was addressed in the first report of the Ad Hoc Council on Education in 1985 in regard to school education in Japan¹⁾. In the report, a need for a response to informatics was mentioned, as it will be a challenge in the future to have people learn how to make use of information through autonomous decisions while truly making the informatization of society beneficial for improving lives.

In the second report of the following year, information literacy was placed at the basic and fundamental level along with reading, writing, and abacus²⁾. In addition, the report of the Curriculum Council in 1987 suggested cultivating skills necessary for understanding, selecting, organizing, processing, and creating information, as well as the ability and attitude to use information mediums such as computers³⁾.

In response, the Courses of Study, revised in 1989, indicated that computers are to be actively used in education activities, and policies were set for each school level. At the elementary school level⁴⁾, students were shown to be accustomed to computers by using the equipment as an educational tool. At the junior high school level⁵⁾, a foundation on information was established as a new area of choice for technology and home economics, and related content was shown in the subjects of social studies, mathematics, science, and health and physical education.

In general education at the high school level, content on the effective use of computers was added to mathematics, science, and home economics⁶⁾. Based on this implementation, further expansion to informatization was suggested in 1996 in regard to the state of education in Japan, which oversaw the report of the Central Education Council in the 21st century. It showed the need to promote (1) systematic implementation of Informatics Education, (2) qualitative improvement of school education by utilizing information equipment and information communication network, (3) construction of new schools in accordance to an advanced ICT society, and (4) address the flip side of an information society⁷⁾.

Three viewpoints on information literacy

In addition, three viewpoints on information literacy, 1) practical ability in using information 2) scientific understanding of information, and 3) attitude towards participating in an information society, were demonstrated in the first report "On Implementing Systematic Informatics Education" by the Council of Research and Study Collaborators, who promote Informatics Education in elementary and middle schools in accordance to the development of informatization in 1997⁸⁾.

In response to this proposal, the report from the Curriculum Council in 1998 revealed and clarified a response to the globalization and computerization of school education in order to improve the curriculum standards of kindergartens, elementary schools, junior high schools, high schools, blind schools, deaf schools, and schools for the disabled⁹⁾. It suggested the need to develop basic qualities and abilities for allowing the use of information mediums, including computers and ICT networks while focusing on enriching related subjects so that consistent, systematic Informatics Education can be conducted throughout elementary schools, junior high schools, and high schools. The required content is shown at each school level, with an emphasis on acquiring the knowledge and skills to discern and analyze information as appropriate and developing a self-learning attitude towards information while focusing on the use of information mediums. General informatics courses have also been added to high schools and made required courses.

In the Revision of the Courses of Study in 1998, elementary schools were shown to be actively applying the use of information devices in each subject or during comprehensive studies¹⁰⁾, and middle schools were shown to be on track to let students take courses on computers and informatics with content B in the fields of technology and home economics¹¹⁾. In informatics from general courses in high schools, the need to consider that courses can be taken depending the situation of the student was brought up along with promoting the use of computers in each subject on the basis of elementary and middle school learning, with three types of subjects set up and one of Information A, B, and C (2 credits each) being a required course¹²⁾.

Necessity of information ethics education

With the spread of the Internet at home, problems such as cyberbullying and cybercrime began to emerge, with discussions of the need for information ethics education. For this reason, a report from the Central Council for Education in 2009 described the improvement of the learning guidelines for kindergartens, elementary schools, junior high schools, high schools, and special needs schools, with the need to consider how information ethics should be handled based on developmental stages under guidance for elementary schools and to focus on enriching guidance on information ethics while autonomously using computers and ICT networks in middle schools and pragmatically using computers and ICT networks in high schools¹³⁾.

In the High School Courses of Study in 2008, Information A, B, and C were integrated into two subjects, Information Study for Participating Community and Information Study by Scientific Approach (2 credits), as the two became required subjects with options to choose from¹⁴⁾.

Start of programming education

In the Elementary School Courses of Study in 2017, it demonstrated the enrichment of learning activities using computers in each subject, the acquisition of computer typing skills, and the fostering of programming-oriented thinking¹⁵⁾.

In the Middle School Courses of Study in 2017, it demonstrated interactive content programming using a network with Information D in the fields of technology and home economics as content¹⁶⁾. This item corresponds to the new positioning of programming education in elementary schools, and changes the content of the design and production of digital works to what is learned through programming¹⁷⁾.

In the High School Courses of Study in 2018, the Informatics subject was restructured as Information I, which includes content such as the use of data and networks with programming and information security, was added and made a required course¹⁸⁾.

Therefore, The purpose of this paper is to obtain suggestions for education by analyzing the contents of the latest Japanese curriculum by Ministry of Education, Culture, Sports, Science and Technology in Japan.

Methodology

Data

The analysis uses data from Ministry of Education, Culture, Sports, Science and Technology (2019), High School Study Guideline "Informatics" ¹⁸⁾ in Japan.

Analysis method

We use Morphological Analysis (MA) with the free software "KH coder"¹⁹⁾. MA is a method for identifying, structuring and investigating the total set of possible relationships contained in a given multidimensional problem complex. We chose Term Extract to detect compound words and thought that it was best to create with minimum weight. We chose the Kruskal method and the Jaccard coefficient for the distance.

The larger the Jaccard coefficient in the number of documents containing include "word A" and "word B", the more documents appeared in common, the two words are judged to be "close". In addition to, analysis was performed by multidimensional scaling (MDS).

Results

Figure 1 shows the analysis diagram by the multidimensional scale analysis method. The contents of the Japanese curriculum were divided into four clusters.

Four clusters:

01: Problem Solving

02: Digital skills and Expressions

03: Information Society and Data

04: Communication and Design

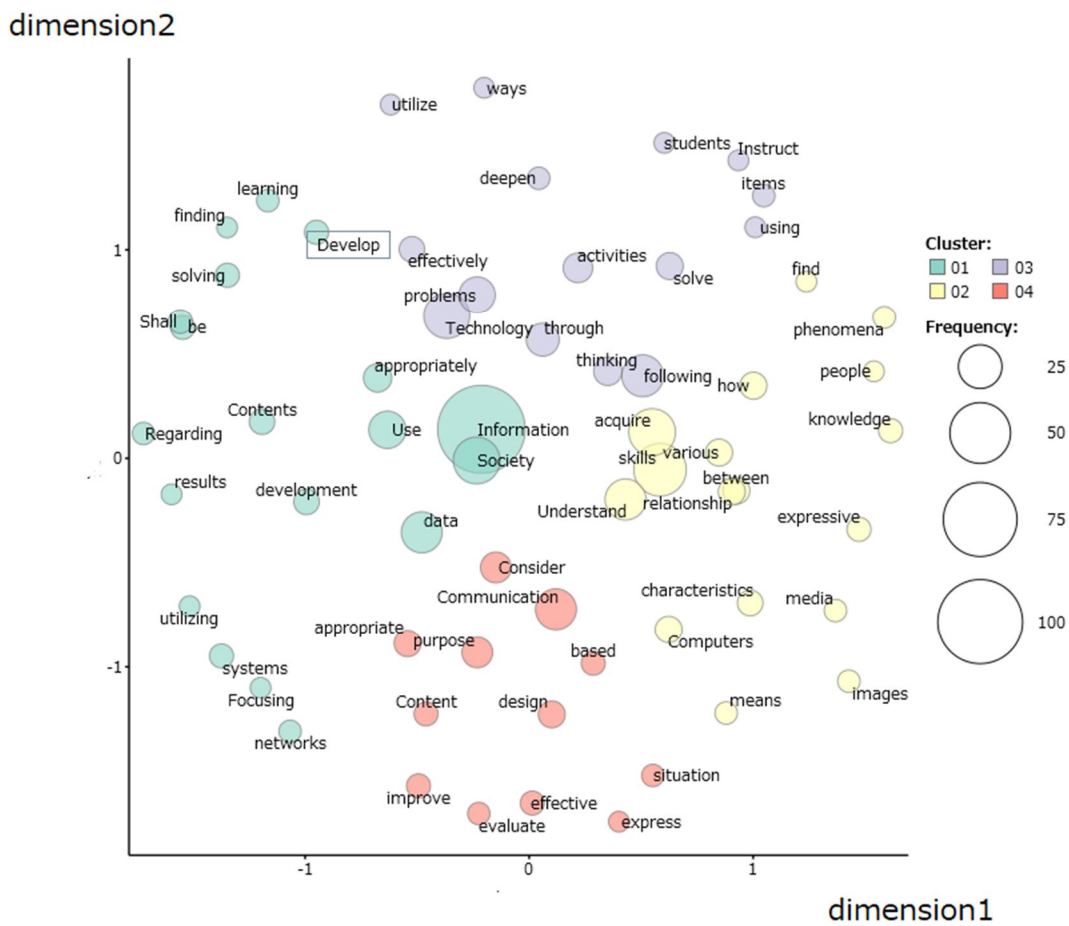


Figure 1: The analysis diagram by the multidimensional scale analysis method

Conclusion

In Japan, [Informatics] is implemented as an independent subject only for high school students. Therefore, in this paper, we conducted a morphological analysis on the curriculum guidelines for high school [Informatics]. The contents of the Japanese curriculum were divided into four clusters. " Problem Solving", " : Digital skills and Expressions", " Information Society and Data", " Communication and Design". All four are important contents. The spread of AI and robots has been pointed out in various parts of the world, however, there did not include any content about them.

The future task is compare to the curriculum guidelines other than Japan and investigating how to taught the content corresponding to AI and robots.

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