Country Report

Transitions in the Course of Study for Biology Education in Japan Focusing on Lower Secondary Schools

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Ever since the Course of Study (CS) draft in 1947, revision has been carried out about every 10 years. In 1969, the curriculum requirement for lower secondary school students in grades 7 – 9 (3-year timeframe) was 420 periods of science study. In 1977, the requirement was 350 periods; in 1989, it was 315 – 350 periods; and in 1998, it was 290 periods. After this decrease, 2008 has brought a significant increase in requirements. The CS revised in 2008 specifies 385 periods of science as necessary. The new CS for science emphasizes the following aims: to be actively engaged in nature and natural phenomena; to develop the ability to analyze, explain and express the results of observations and experiments; to develop an attitude of respect towards life and contribute to conservation of the natural environment. The CS for science was revised as to the following subject matters. In classification, according to the former CS, we taught Spermatophyta and Vertebrata only, but the newly revised version includes Cryptogamae and Invertebrata. It also reintroduces the study of heredity and evolution, including mention of DNA. Finally, in the unit 'Nature and Humans,' the topic 'conservation of the natural environment and use of scientific technology' is added. Specifically, the new CS calls for the following improvements: to have substantial experience in nature; to regard the connection between scientific study and human society as important; and to develop environmental education.

Key words: Course of Study, lower secondary school biology, periods of science study, science curriculum improvements

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The transitions in the Course of Study in Japan

Although the transitions in the Course of Study (CS) in Japan from 1947 to 1989 were already reported by Katayama (1993, 1998a), I would like to review them further, and present an update.

In 1947, a new mandate for education in Japan began, and a tentative CS was published. Since then, revision has been carried out about every 10 years. Since 1958, there has been a short period of 3 or 4 years between the times of notification and enforcement (Table 1).

Table 2 shows school hours allotted to science per year for each grade in compulsory education schools. In the first and second grades, science has been replaced by life environment studies since 1989.

In Table 3 and the attached graph, totals for school hours allotted to science for elementary

and lower secondary schools are shown. As Katayama (1998a, 1998b) pointed out, the curriculum requirements for compulsory education schools had been decreasing since 1977. After

Table 1 The year of notification and enforcement

ELEMENTARY		LOWER SECONDARY		UPPER SECONDARY	
notification	enforcement	notification	enforcement	notification	enforcement
1947	1947	**1947**	1947	**1947**	1948
1951	1951	**1951**	1951	**1951**	1951
				1955	1956
1958	1961	**1958**	1962	**1960**	1963
1968	1971	**1969**	1972	**1970**	1973
1977	1980	**1977**	1981	**1978**	1982
1989	1992	**1989**	1993	**1989**	1994
1998	2002	**1998**	2002	**1999**	2003
2008	2011	**2008**	2012	**2009**	2013

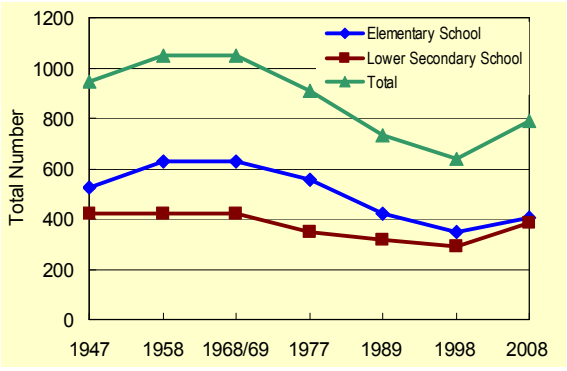
Table 2 School hours for science per year at each grade level in compulsory education schools

	Elementary School *						Lower Secondary School **		
	1	2	3	4	5	6	1	2	3
1947	70	70	70	105	105～140	105～140	140	140	140
1951							105～175	145～175	140～175
1958	68	70	105	105	140	140	140	140	140
1969	68	70	105	105	140	140	140	140	140
1977	68	70	105	105	105	105	105	105	140
1989	LIFE ENVIRON-MENT STUDIES		105	105	105	105	105	105	105～140
1998			70	90	95	95	105	105	80
2008			90	105	105	105	105	140	140

* Elementary school: One unit school hour is a class period of 45 minutes.
** Secondary school: One unit school hour is a class period of 50 minutes.

Table 3 Transition of total number of school hours for science per year in compulsory education schools

	Elementary S.(minimum)	Lower S. S. (minimum)	Total
1947	525	420	945
1958	628	420	1048
1968/69	628	420	1048
1977	558	350	908 ↓
1989	420	315	735 ↓
1998	350	290	640 ↓
2008	405	385	790 ↑



a continuous decrease in the requirements, there was a significant increase in the requirements in 2008.

The characteristics of each Course of Study

✧ *The 1947 version*: this tentative CS was based on practical matters in daily life. For example:

- What roles do animals play for people, and what is the purpose of breeding animals?
- Investigation of harmful animals. Discussion of ways to protect oneself from harmful animals.
- What is the biological composition of our clothes? (The characteristics of plant fibers, animal fibers, etc.)

✧ *The 1958 version*: much more time was allotted to science subjects, and the Two-field System* was introduced into lower secondary school science. A systematic approach to biology was adopted. For example:

- Classification of Vertebrata,
- Structure of animal bodies,
- Function of animal organs, etc.

✧ *The 1968 version*: the key characteristic of the revised CS was learning scientific methods through the process of inquiry. Yet, at the same time, emphasis was placed on achieving high levels of technological proficiency. Thus, much additional content was included.

These conflicting pressures and the added study burden resulted in a greater number of students who disliked science. Also, more problems of students' behavior surfaced and came to be recognized as a social issue. Out of that, study for realizing the preciousness of life, and pressure-free education came to be proposed.

✧ *The 1977 version*: the revised CS included a policy of education that was "rich in humanity" and free of pressure. Excess content which seemed to overly burden students was eliminated by careful selection, and learning through direct experience was emphasized. There was also a reduction in school hours.

✧ *The 1989 version*: the revised CS called for "education to develop students' individual personalities". Thus, many electives were offered to match students' individual interests and abilities (Katayama, 1998a).

For elementary schools, a new subject 'Life Environment Studies' was introduced into the first and second grades, and the study of science started from the third grade.

In addition, a five-day school week system was introduced for every other week in 1995. School hours continued to be reduced.

✧ *The 1998 version*: the new CS extended the five-day school week system to include every week from 2002. Major emphasis was on fostering "zest for living (IKIRU-CHIKARA, in Japanese)" in children (Ministry of Education, Science, Sports and Culture, 1998a, 1998b).

The following description is given on the MEXT (Ministry of Education, Culture, Sports, Science and Technology) website: http://www.mext.go.jp/english/org/struct/014.htm,

"The CS seeks to foster the qualities and abilities necessary to acquire steadily the rudimentary basics of education, such as reading, writing and arithmetic, and to learn, think and act for oneself, as well as, develop problem-solving skills. Specifically, by carefully selecting educational contents, the MEXT is working to ensure that children can actively engage in educational activities that offer individual instruction, review instruction, and hands-on, problem-solving learning, and is making other improvements including the creation of the Periods for Integrated Study and the expansion of elective learning."

Also, in the CS for lower secondary schools,

the content, "heredity and evolution" was deleted, and it was shifted to upper secondary school biology (Katayama *et al*., 2004).

The results of some investigations

The academic ability of Japanese children is in a declining trend. Table 4 shows a comparison of the results of PISA 2003 and PISA 2006 by OECD. The results for Japan show that reading performance dropped from the 14th to the 15th place. Science performance dropped from the 2nd to the 6th place, and math performance dropped from the 6th to the 10th place (Table 4).

Analyses of PISA and TIMSS by IEA also show the following difficulties of Japanese students:

- Scientific interpretation and essay test-taking.
- Answering questions related to daily life.
- Learning motivation and study habits.

Another interesting finding was obtained from the school curriculum enforcement situation survey which was conducted by NIER (National Institute for Educational Policy Research) in 2003. This survey showed that there were many more students who like to study science than those who like to study other subjects. But, science was considered less important than the other subjects listed (Fig. 1).

The characteristics of the new Course of Study

Based on the results of such analyses and survey, the MEXT decided to implement policies to improve school education as a whole. However, the aim of fostering "zest for living" in children has been continued from the previous CS. In addition, the newly revised CS includes the following ideas in order to emphasize "zest for living".

Table 4 Comparison of the results of PISA 2006 and PISA 2003

Reading Performance			Science performance			Mathematics Performance		
ranking	2006	2003	ranking	2006	2003	ranking	2006	2003
Korea	1	2	Finland	1	1	Chinese Taipei	1	
Finland	2	1	Hong Kong	2	3	Finland	2	2
Hong Kong	3	10	Canada	3	11	Hong Kong	3	1
Canada	4	3	Chinese Taipei	4		Korea	4	3
New Zealand	5	6	Estonia	5		Netherlands	5	4
Ireland	6	7	Japan	6	2	Switzerland	6	10
Australia	7	4	New Zealand	7	10	Canada	7	7
Liechtenstein	8	5	Australia	8	6	Macao-China	8	9
Poland	9	16	Netherlands	9	8	Liechtenstein	9	5
Sweden	10	8	Liechtenstein	10	5	Japan	10	6
Netherlands	11	9	Korea	11	4	New Zealand	11	12
Belgium	12	11	Slovenia	12		Belgium	12	8
Estonia	13		Germany	13	18	Australia	13	11
Switzerland	14	13	United Kingdom	14		Estonia	14	
Japan	15	14	Czech Republic	15	9	Denmark	15	15

(Source: PISA 2006 Science Competencies for Tomorrow's World)

- Improvement of humanity through cooperation with others and self-control.
- Improvement of health and physical vigor.

The revised CS for elementary schools and lower secondary schools was published in March, 2008 (Ministry of Education, Culture, Sports, Science and Technology, 2008a, 2008b). In July, the teacher manuals were published. School hours allotted to science in elementary schools and in lower secondary schools greatly

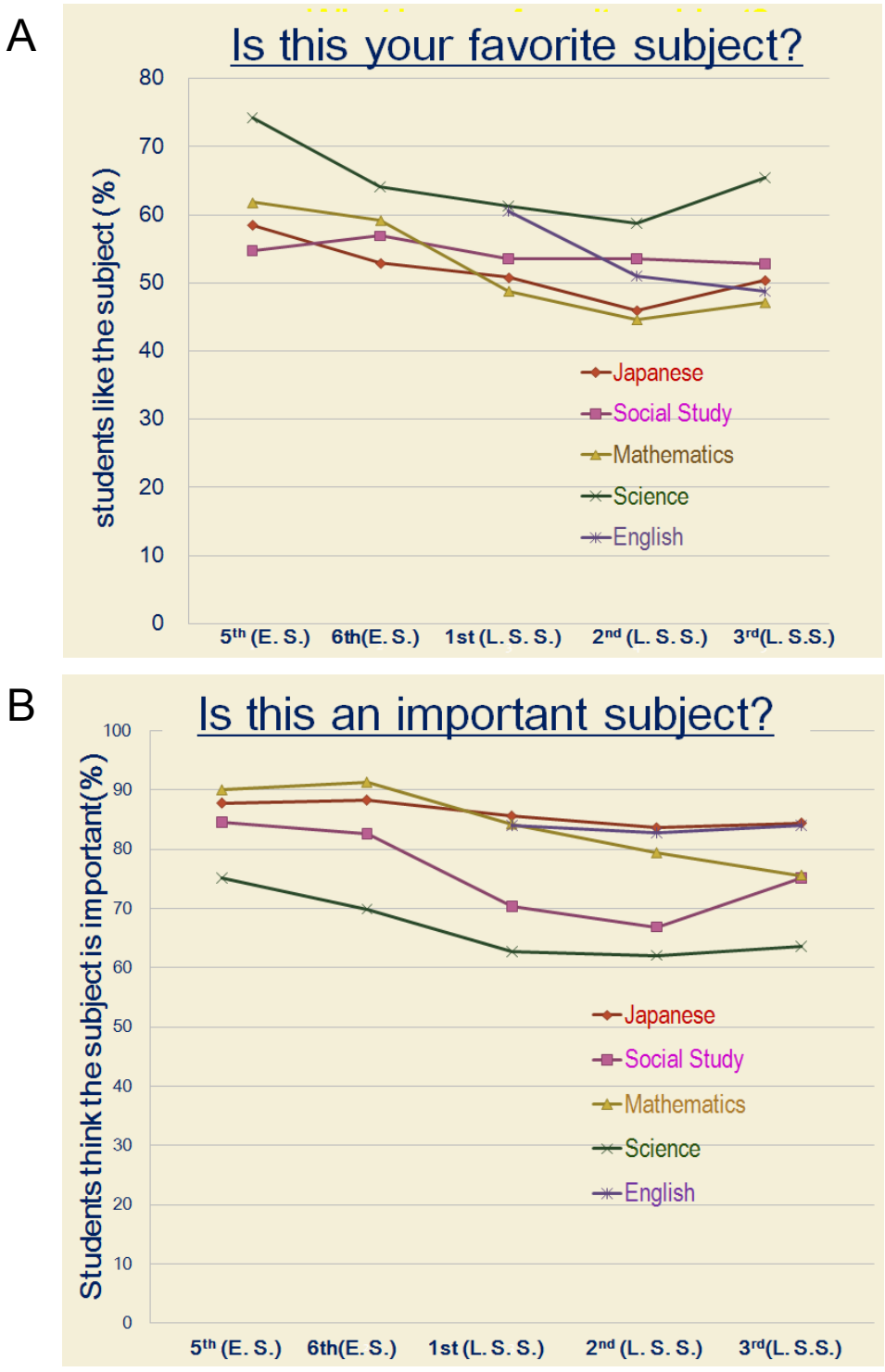


Figure 1 A: The trend in students' favorite subjects; B: The trend in students' idea on subject importance (right). (Source: The 2003 School Curriculum Enforcement Situation Survey)

increase in the revised CS. The basic concepts of the revised CS for lower secondary schools, the production of which I participated in as an advisor, are:

1. To develop the following key concepts: energy, particles, life, and earth.
2. To foster scientific insight and thinking, and comprehensive viewpoints.
3. To develop the ability to analyze and explain results scientifically.
4. To understand the significance and usefulness of studying science, and to take an active interest in it.
5. To have enriched scientific experiences, including those within the natural environment.

Accordingly, in the revised CS, the following aims for science are emphasized:

- To encourage students to be actively engaged in nature and natural phenomena.
- To develop the students' ability to analyze, explain and express the results of observations and experiments.
- To foster an attitude of respect for life and the desire to contribute to conservation of the natural environment.'

The CS for lower secondary school science has been revised as to the following subject matters:

- On classification, according to the former CS, we taught Spermatophyta and Vertebrata only, but the revised CS includes Cryptogamae and Invertebrata as well.
- The units of heredity and evolution are restored after an interval of two decades since their removal in 1998, but DNA is described only briefly in these units.
- In the unit 'Nature and Humans', the topic 'conservation of the natural environment and use of scientific technology' is added.

In addition, the revised CS calls for the following improvements:

- To have substantial experience in nature.
- To regard the connection between scientific study and human society as important.
- To develop environmental education.

Common points between the aims of the new Course of Study and AABE22 themes.

I would like to stress one of the aims of the 2008 CS, i.e., "To foster an attitude of respect for life and the desire to contribute to conservation of the natural environment," because this aim is related to what we discussed at the AABE22 conference.

The two sub-themes of the AABE22 conference were similarly stated as "Biology Education for Realizing the Preciousness of Life" and "Biology Education in the UN Decade of Education for Sustainable Development (UNDESD)."

It is very important to make clear the role of biology education in society today. People who are engaged in biology education have the mission of helping others to realize the preciousness of life and to work towards sustainable development. I hope that the fruits of the AABE22 conference will be reflected in future education.

Note

*Two-field System: This term refers to the grouping of physics and chemistry into Science Field 1, and biology and earth science into Science Field 2.

References

Katayama, N. (1993) Algae appearing in Japanese science textbooks at the compulsory level for the last 40 years reflecting changes in the Japanese environment. *In*: Wallis, R. L. and Shi, G. R. (eds.) *Environmental Management in Asia* (*Proceedings of the 14th Biennial Conference of the Asian Association for Biology Education*) pp. 75-85.

Katayama, N. (1998a) Current status of biology education at the primary and secondary levels in Japan. *In*: Sukchotiratana, M. and Kang-

wanpong, D. (eds.) *Excellence in Biology Teaching: Research, Practice and Experience* (*Proceedings of the 16th Biennial Conference of the Asian Association for Biology Education*) pp. 53-68.

Katayama, N. (1998b) Biology education and environmental education in the third millennium in Japanese primary and secondary schools. *In*: Angtuaco, S. P., Lagunzad, C. G. B., Lagunzad, D. A. and Miclat, E. B. (eds.) *Biology Education in the Third Millennium: Focus on Information Technology and Environmental Education* (*Proceedings of the 17th Biennial Conference of the Asian Association for Biology Education*) pp. 43-49.

Katayama, N., Takamori, H. and Kanaizuka, Y. (2004) Crisis of Biology Education in Japan. *Asian Journal of Biology Education* **2**: 75-80.

Ministry of Education, Science, Sports and Culture (1998a) *The Course of Study for Elementary Schools.* Printing Division, Ministry of Finance. (In Japanese)

Ministry of Education, Science, Sports and Culture (1998b) *The Course of Study for Lower Secondary Schools.* Printing Division, Ministry of Finance. (In Japanese)

Ministry of Education, Culture, Sports, Science and Technology (2008a) *The Course of Study for Elementary Schools.* (In Japanese)

Ministry of Education, Culture, Sports, Science and Technology (2008b) *The Course of Study for Lower Secondary Schools.* (In Japanese)

Websites <accessed 20/09/2008>

http://ibuki.ha.shotoku.ac.jp/~ishihara/shidou/shidou_index.html

http://www.mext.go.jp/english/org/struct/014.htm

http://www.mext.go.jp/a_menu/shotou/new-cs/youryou/index.htm

The 2003 School Curriculum Enforcement Situation Survey
http://www.nier.go.jp/kaihatsu/katei_h15/index.htm

PISA 2006 Science Competencies for Tomorrow's World
http://www.oecd.org/document/2/0,3343,en_32252351_32236191_39718850_1_1_1_1,00.html#Vol_1_and_2