NISE Bulletin, 10, 1-11, 2010

Current Status and Difficulties in the Production of Barrier-free Teaching Materials for Low Vision Children: "Large-printed Textbooks"

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Abstract: "Large-printed textbooks" are useful teaching materials for children with low vision. The preparation of these books by volunteers and the relatively few specialist publishers in Japan involves enlarging and editing the text and pictorial cuts in original government authorized textbooks so that children with low vision can readily access these materials. The National Institute of Special Needs Education (NISE) has been conducting research and providing information on editing and preparing Large-printed textbooks taking into consideration the characteristics of the vision of individual children. This paper provides an overview of the outcomes and problems encountered, reviews the changes in social conditions and educational environment of Large-printed textbooks, and makes suggestions for future research to address these problems and to understand the special educational needs of low vision children.

Key Words: Large-printed textbook, Large-printed manuscript volunteer, Large-printed textbook drafting manual, Charge-free distribution, Universal design

I. Introduction

The fundamental philosophy of special needs education is "to provide appropriate instruction and necessary support suitable to cater to/ meet the education needs of each and every disabled infant, child and student." This is also true for the education of low vision children, and it is important in the provision of an easily accessible visual environment for low vision children. Based on this philosophy, in the future, it will become increasingly necessary to develop easily viewable and user-friendly textbooks based on the concept of "universal design," and suitable to meet the educational needs of disabled children.

For some low vision children/students with limited visual acuity, currently distributed texts and the pictorial cuts of authorized textbooks are too small and difficult to see. In this context, low vision children/students use Large-printed textbooks with enlarged texts and pictorial cuts.

The current research project is part of a larger-scale NISE research initiative. Previous completed research studies include, "*Survey Research on Large-printed Teaching Materials Suitable to Visual Characteristics of Low vision Children: Development and Support on Drafting Large-printed Textbooks for Low vision Children*" (Financial Year - FY2002-03), and, "*[An] Empirical Study on Developing Large-printed Textbook Drafting System and its Impacts on Education*" (FY2004-06). This research initiative has resulted in the accumulation of much information and understanding of easily viewable text size for low vision children/students as well as on text/picture enlargement/ optimization strategies. The results have been published in research reports and in a monograph entitled, "*Large-printed Textbook Drafting Manual*," published by The Earth Kyoikushinsha Co., Ltd.[5]. Concurrently, NISE has engaged in empirical research on Large-printed textbook drafting systems and their impact on education, in information services, and the diffusion of textbook barrier-free textbooks with the aim of establishing a barrier-free learning environment to ease the current restrictions on low vision students and other disabled students as much as possible.

Over the past few years, there have been significant developments in the editing and effective-use of Large-printed textbooks—such as the amendment to the Copyright Act—or in the method of distribution of free-of-charge textbooks. According to a report of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), "*Elementary/Secondary Education News No. 38,*" *in FY2005, 9,000* Large-printed textbooks were distributed free-of-charge to 600 children/students nationwide. This distribution program provides textbooks to visually disabled children/students who local education boards deem appropriate to use Large-printed textbooks in the classroom.

In this case, the relevant school or municipal education board is required to take predetermined procedures, and then, the prefectural education board is required to act as a coordinator and report to MEXT.

On the other hand, low vision students and volunteer groups have been recently calling for the drafting of several versions of Large-printed textbooks suitable for individual low vision children/students. In addition, some volunteer groups engaged in the preparation of Large-printed textbooks have approached textbook publishers to provide authorized textbook digital data. As a teaching material, textbooks should be easily understandable for as many children/students as possible. However, currently authorized textbooks are not necessarily, "easily viewable and understandable," for low vision children/students with wide eyesight gap. In fact, they often present a significant barrier to learning.

This paper describes the historical background of Large-printed textbooks for low vision children/students in Japan as well as the background information on the drafting of Large-printed textbooks. In addition, it highlights the practical problems of developing and using Large-printed textbooks, and discusses the "universal design" of textbooks suitable for use in the education of low vision children/students.

II. Historical Background of Large-printed Textbooks

1. Large-printed Teaching Materials (Large-printed Textbooks)

(1) Commencement of education for low vision children

In Japan, education for low vision children began in December 1933 when Nanzan Elementary School in Asouku, Tokyo City established a "low vision class." Since at that time, education for low vision children was provided to protect and preserve eyesight, after a brief period, the class was renamed, the "Eyesight Preservation Class." The history of education for low vision children at Nanzan Elementary School was less than 12 years because the class was closed in April 1945 due to the Great Tokyo Air Raids, but it played a pioneering role in establishing an appropriate learning environment for low vision children in Japan.

For example, the classroom had (a) white ceilings, (b) white upper, cream-colored middle, and faint-green lower wall sections, (c) eleven 100-watt bulbs with white shades, (d) green boards at the front and back of the room, (e) single-person-use inclined desks with bookstands (i.e., the upper desk board inclined), (f) various magnifying lenses, and (g) custom-made teaching materials and notebooks. Today, these facilities are a model for classrooms for low vision children as illustrated by the simple replacement of lighting equipment with fluorescent lamps.

On the other hand, teachers at that time understood the necessity for Large-printed textbooks, but they used the same textbooks as ordinary classes because using larger Chinese characters would cause printing costs to escalate, and would pose many other difficulties. [4)]

(2) Education for low vision children and national language teaching aids in the elementary division of schools for the blind

In June 1953, MEXT circulated the decree, "*Criterion for Identifying Children/Students Requiring Special Education Attention*" (MEXT Vice Ministerial Notice). This promulgation defined low vision students as, "persons who are generally unsuitable for using ordinary child-use textbooks without modification and who are deemed as requiring other methods than visually-impaired person's education." This notice indicated the decision-making criteria for defining children with low vision, and the most appropriate action. MEXT had been providing administrative guidance that low vision students should be educated at schools for the blind or in special classes for low vision children/students, depending on the degree of their eyesight.

Schools for the Blind that mainly used Braille began to establish classrooms for low vision children/students. For example, since 1952, the Osaka Prefectural School for the Blind has been preparing Large-printed textbooks by handwriting textbooks with writing brushes and making the necessary copies of these. Similarly, other schools for the blind started to separate low vision students from visually impaired students.

In this context, since teachers felt the need for print textbooks with the same contents as Braille textbooks, in March 1963, "National Language Teaching Aids of Elementary Division in Schools for the Blind" (six books for each grade) were developed. Since April 1963, for a period of six years, teachers used Gothic font-based (First Class Gothic or Class 1 Gothic) textbooks for elementary school seventh graders and Class 2 Mincho font-based textbooks for second graders or older students. Although not textbooks for use by low vision students, they were of great significance as the first Large-printed teaching materials in Japan.

(3) Using the electronic magnifying copier "Elefax"

Following the development of the electronic magnifying copier, "Elefax," in 1962, teachers started using the copier to prepare Large-printed teaching materials for low vision students. In 1964, Hokkaido Prefectural Asahikawa School for Blind also introduced the "Elefax," and in the following year, teachers started using it for magnifying textbooks for some subjects. Five schools for the blind are reported to have used Large-printed textbooks improving outcomes for

education for low vision children. Based on this, MEXT attempted to introduce electronic magnifying copiers and offset printers at schools for the blind nationwide in a three-year plan commencing in FY1967. In FY1973, the Ministry also decided to introduce electronic magnifying copiers at low vision special classes (hereinafter, "low vision classes") as well. Following the introduction of commercially available enlargement/reduction copiers in 1985, teachers stopped using electronic magnifying copiers.

（4）Activities of Large-printed manuscript volunteers

The period 1965-67 saw the establishment of low vision classes, and subsequently, the demand for Large-printed textbooks for low vision children/students grew. Increasingly, in this period, volunteer groups began to prepare "Large-printed manuscripts" by rewriting texts in easily readable size for elderly people and visually impaired persons who used local libraries in the local community. In the 1975-1985, the Large-printed manuscript volunteer groups also started preparing Large-printed manuscripts of ordinary books and textbooks for low vision children/students nationwide.

The groups also prepared Large-printed manuscripts of textbooks on a voluntary basis for low vision children/students. However, as the demand grew, in the period 1985-89, analysts started to argue the necessity for "Large-printed textbooks" for low vision children/students that were usable nationwide. Some volunteer groups, such as the Large-printed manuscript volunteer group in Fukuoka, made enlarged copies of textbooks and donated them to schools for the blind and low vision classes across the country.

In this context, in 1997, Large-printed manuscript volunteer groups nationwide merged to form a Large-printed textbook network, called the "*National Large-printed Teaching Materials Production Council*," with the aim of preparing Large-printed textbooks suitable to meet the learning needs of every low vision pupil/student. At the time of the inauguration of the Council, there were 43 member groups, but as of September 2007, this number had risen to 63.

（5）The Japanese Association of Education for Low Vision

As teachers at schools for the blind and low vision classes called for Large-printed textbooks usable on a nationwide scale, in 1991, the Japanese Association of Education for Low Vision established a "*Large-printed Teaching Materials Taskforce*," to explore how to prepare Large-printed textbooks. On request from MEXT, in FY1991-92, the Taskforce" enlarged and edited authorized original textbooks for schools for the blind on behalf of low vision children/students. Edited versions of Large-printed textbooks for elementary school-level children published were (a) national language textbooks for 2nd to 6th grades, (b) junior high school level national language textbooks for 7th to 9th grades, (c) elementary school-level math textbooks for 3rd to 6th grades, and (d) junior high school level mathematics textbooks for 7th to 9th grades. Teachers have been using these national language and mathematics textbooks at schools for the blind and low vision classes since FY1992 at the elementary school level, and since FY1993 at the junior high school level.

2. Basic Perspectives on Large-printed Textbooks

（1）Providing a better learning environment for low vision children/students

An important and basic aspect of education for low vision children is how teachers can provide an easily visual learning environment. As basic approaches to improve visibility for low vision children/students and to foster their ability to see and skillful way of looking at things, teachers have been traditionally using the following methods:

1) Showing things widely and clearly (expanding retinal images)
2) Carefully comparing objects (improving visual awareness)
3) Coordinating eye and hand function (improving visual/physical coordination)
4) Adjusting light intensity through illumination or light interception
5) Enhancing/reversing/adjusting the contrast between pictures and background

There are several ways of providing an "easily viewable" environment. The expansion of retinal images—as mentioned in Item (1) above—is the most common approach. When using this, teaching methods include: (a) asking children/students to come closer, (b) expanding visual materials (i.e., enlarged copies and Large-printed

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Note 1) Electronic magnifying copier "Elefax"

It is a magnifying/reducing copier introduced for education for low vision children in order to prepare Large-printed teaching materials in 1965-1975 (Copier size: Approximately 1.4 meter high, approximately 1 meter wide and approximately 1.5 meter long). It works in the same manner as camera zoom. By adjusting lens distance, users are able to alter the magnification ratio seamlessly from 0.7 times to 1.4 times. This copier takes two steps for making copies. First, the copier sends out a duplicate with toner unfixed. At this stage, users are able to easily remove dirt, waste or unnecessary portions. After these modifications, it finishes off making a copy by fixing toner with thermal treatment.

textbooks), (c) using amblyopic lenses, (d) using low vision-use large image TVs (i.e., magnified reading devices, etc.), and (e) using other optical aids.

(2) Effective use of optical aids and Large-printed teaching materials for learning purposes

The use of magnifying lens for low vision persons is a typical optical aid—lenses optically enlarge retinal images. Various types of magnifying lenses are available dependent on intended usage. Commercially available loupes, monocles, and telescopes are also usable as low vision-use magnifying lenses and it is possible to select a magnification ratio suitable for the eyesight of each low vision pupil/student. However, low vision persons usually need high-power magnifying lenses. Higher-power magnifying lenses usually limit text/picture information in the effective visual field of the lens and require a certain amount of training on focus adjustment. In this context, as skills and motivation to use these lenses are required, low vision persons should be given adequate training to ensure their effective use.

In the case of magnifying TV-type reading devices, users are able to change the enlargement factor seamlessly and display on a color screen. In addition, users are also capable of reversing black/white presentations and adjusting contrasts through negative/positive selection. Since this device provides large magnifications of 20-fold or stronger, it is a very effective tool for very low vision persons who suffer difficulty in the use of low vision-use lenses (This device is covered with the visual disability-related daily tool subsidy program from FY1993, and the government offers a maximum subsidy of ¥198,000). As with the effective use of low vision-use lenses, training in the use of low vision-use magnifying TV is also required.

As Large-printed textbook show enlarged texts and pictures widely and clearly, children/students are able to detect these features, see the entire view from a comfortable distance, and analyze it by coming closer as necessary. In particular, Large-printed textbooks are important for young children and elementary school children because they are able to pick it up, obtain definite images and concepts, and feel no resistance to looking at things at an early stage in their lives.

III. Recent History of Large-printed Textbooks

1. Contribution of NISE

(1) Basic perspectives on editing/preparing Large-printed textbooks

As for education for visually impaired children/students, it is important to evaluate the difference in vision of each child/student from an educational perspective, and utilize teaching materials and educational tools suitable to their level of vision. In other words, it is important to provide and utilize Large-printed textbooks and optical aids in an appropriate manner.

Over the two-year period (FY2002-03), the Department of Research and Development at NISE has prepared and edited computer based Large-printed textbooks in the fields of social studies and science based on the recommendations of the "Large-printed Teaching Materials Taskforce" mentioned above. NISE has engaged in this work and associated research activities using the following premises:[1)]

1) From the very beginning of education for low vision children in Japan, teachers used Large-printed teaching materials recognizing that these teaching materials played an important role in determining education outcomes. Even today, this recognition remains unchanged.
2) Low vision children/students have different levels of eyesight. In addition, even if they have the same eyesight, they have differences in vision, depending on the nature of their ophthalmic disease. For this reason, it is necessary to prepare Large-printed textbooks suitable to meet the needs arising from these individual differences. However, it is difficult to prepare the variety and range of sizes of Large-printed textbooks necessary to that address all these needs on a nationwide-scale.
3) In this context of preparing Large-printed textbooks usable for as many low vision children/students as possible, NISE established a standard of appropriate text sizes, based on the assumption of a person with 0.1 vision on the Japanese eyesight scale (or 20/48 vision on the U.S.A eyesight scale) [1) 5)]. This standard emerged from the results of a quinquennial project conducted by Tsukuba University and NISE; the study by Tsukba University was entitled, "*Survey Research on Causes of Visual Disabilities of Children/Students at Schools for the Blind and Elementary/Lower Secondary-Level Low Vision Classes in Japan*,"[2) 3)] and the NISE survey was entitled, "*[A] Fact-Finding Survey on Elementary/Junior High-Level Low Vision Special Classes and Low Vision Resource Room Classes in Japan*." [6) 7) 8)]
4) However, a single version of Large-printed textbooks is inadequate to meet all needs of low vision children/students in Japan. For this reason, the special education needs of students having difficulties in using these Large-printed textbooks is required to be met from private sources, such as those of the Large-printed manuscript volunteer groups.
5) When editing/preparing Large-printed textbooks, NISE uses OCR devices to scan the original textbooks and store electronic data to edit and prepare the textbooks in a PC environment. By doing so, NISE is able to smoothly edit and prepare full-color textbooks

and publish Large-printed textbooks in color. NISE decided to employ this on-demand printing approach because it quickly addresses the needs of children/students requiring these textbooks and because not many children/students need this resource.

6) In the past, the preparation of Large-printed textbooks required permission from copyright holders and, therefore, posed a significant obstacle. However, due to the partial amendment of the Copyright Act in June 2003, it is now possible to prepare Large-printed textbooks by simply making contact with textbook publishers without obtaining approval from individual copyright holders (the amended Copyright Act came into effect on 1 January, 2004).
7) Nevertheless, the copyright problem remains when converting data into digital format. It is necessary to store digital data and edit the data without damaging the original textbook source.
8) When using Large-printed textbooks, low vision students and teachers should improve education outcomes by skillfully using appropriate tools suitable to individual needs, grade needs, and student characteristics, such as effectively utilizing optical instruments and visual aids, including the use of low vision lenses.

（2）Editing and publishing Large-printed textbooks

In the period FY2002-03, schools for the blind and low vision classes adopted as “Article 107 books,” Large-printed textbooks prepared and edited by NISE. In addition, since FY2004, these Large-printed textbooks have been distributed free-of-charge to low vision children/students in ordinary classes.

With amendments to textbooks, revised elementary school-level textbooks were adopted in FY2005. Schools at the junior high level adopted revised textbooks in FY2006. In this context, it became necessary to prepare new Large-printed textbooks and to research appropriate editing/preparing approaches capable of efficiently preparing textbooks to address the educational needs of a range of low vision children/students. To achieve this, NISE engaged in a three-year research project (FY2004-06) entitled, “*Empirical Study on Developing Large-printed Textbook Drafting System and its Impacts on Education.*”[1)]

In FY2004, NISE edited and prepared Large-printed versions of social studies and science textbooks for elementary schools, and in FY2005, NISE also edited and prepared Large-printed versions of social studies and science textbooks for junior high schools scheduled for use from FY2006. In this process, based on the research findings on the preparation and development of Large-printed textbooks, NISE has conducted research on appropriate Large-printed textbook preparation and digitalization methods capable of providing easily understandable textbooks and efficiently enlarging/editing textbooks.

In FY2005, schoolteachers in elementary and junior high schools used 1,250 Large-printed textbooks in the fields of social studies and science that had been edited/prepared by NISE. These were published by the Cues Corporation. As of FY2006, Large-printed textbook publishers provide a range of Large-printed textbooks (Table 1). [1)] Further, Table 2 shows the number of elementary/junior high school-level Large-printed textbooks used by teachers at each grade level in the fields of social studies and science that have been edited by NISE and published by the Cues Corporation. The number of copies is 1,822; Junior High Science 1 (Part 1) = 75 books, and Junior High Science 2 (Part 2) = 26 books. The textbooks actually used vary widely, but on average there are 52 textbooks for each subject area. In addition, teachers use 968 mathematics textbooks published by Daikatsuji Co., Ltd. [1)]

2. Activities of Large-printed Drafting Volunteers and Low Vision People

（1）The “National Large-printed Teaching Materials Production Council”

The “National Large-printed Teaching Materials Production Council” was established in October 1997 as a national network of volunteers producing Large-printed textbooks. As of September 2007, the council had a membership of 63 volunteer groups.

The council serves as a point-of-contact for Large-printed manuscript volunteers in Japan who prepare Large-printed textbooks on a voluntary basis for low vision children/students needing these resources. While there are currently some textbook publishers and Large-printed textbook publishers who provide these resources, in most cases, they are provided by the volunteers.

（2）The “Low Vision People Affairs Study Group”

To realize a society more friendly to low vision persons, in 1977 low vision people established the “Low Vision People Affairs Study Group.” Since its foundation, the study group has been working on various issues, such as employment opportunities, and barrier-free educational environment for low vision persons. From an educational environment perspective, it investigates career choice and school-life problems for low vision children. In terms of Large-printed textbooks, the study group also conducts various activities, such as submitting requests to MEXT to initiate a stable program to provide Large-printed textbooks from the elementary school to the high school levels.

3. The MEXT

As mentioned previously, Large-printed textbooks have

Table 1 List of "Large-printed textbooks" published by Large-printed textbook publishers

		Large-printed textbook					Original textbook (Publisher)
	Subject	Textbook title	Number of textbooks	Font size	Font	Publisher, point of contact	
Elementary school	National Language	National Language 2nd grade (Part 1) Tanpopo, (Part 2) Akatonbo	2	26P	Gothic	Mitsumura Tosho Tel: 03-3493-2111	National Language 2nd grade (Part 1), (Part 2) (Mitsumura Tosho)
		National Language 3rd grade (Part 1) Wakaba, (Part 2) Aozora	2	22P	Gothic	Mitsumura Tosho Tel: 03-3493-2111	National Language 3rd grade Part 1, Part 2 (Mitsumura Tosho)
		National Language 4th grade (Part 1) Kagayaki, (Part 2) Habataki	2	22P	Gothic	Mitsumura Tosho Tel: 03-3493-2111	National Language 4th grade Part 1, Part 2 (Mitsumura Tosho)
		National Language 5th grade (Part 1) Ginga, (Part 2) Daichi	2	22P	Gothic	Mitsumura Tosho Tel: 03-3493-2111	National Language 5th grade Part 1, Part 2 (Mitsumura Tosho)
		National Language 6th grade (Part 1) Souzou, (Part 2) Kibou	2	22P	Gothic	Mitsumura Tosho Tel: 03-3493-2111	National Language 6th grade Part 1, Part 2 (Mitsumura Tosho)
	Math	New Math 3 Part 1, 3 Part 2	2	18, 22 or 26P	Round Gothic	Daikatsuji Tel: 03-5282-4361	New Math 3 Part 1, 3 Part 2 (Tokyo Shoseki)
		New Math 4 Part 1, 4 Part 2	2	18, 22 or 26P	Round Gothic	Daikatsuji Tel: 03-5282-4361	New Math 4 Part 1, 4 Part 2 (Tokyo Shoseki)
		New Math 5 Part 1, 5 Part 2	2	18, 22 or 26P	Round Gothic	Daikatsuji Tel: 03-5282-4361	New Math 5 Part 1, 5 Part 2 (Tokyo Shoseki)
		New Math 6 Part 1, 6 Part 2	2	18, 22 or 26P	Round Gothic	Daikatsuji Tel: 03-5282-4361	New Math 6 Part 1, 6 Part 2 (Tokyo Shoseki)
	Social Studies	New Social Studies 3/4 Part 1, 3/4 Part 2	2	26P	Round Gothic	Cues Tel: 03-3358-1049	New Social Studies 3/4 Part 1 3/4 Part 2 (Tokyo Shoseki)
		New Social Studies 5 Part 1, 5 Part 2	2	22P	Round Gothic	Cues Tel: 03-3358-1049	New Social Studies 5 Part 1, 5 Part 2 (Tokyo Shoseki)
		New Social Studies 6 Part 1, 6 Part 2	2	22P	Round Gothic	Cues Tel:03-3358-1049	New Social Studies 6 Part 1, 6 Part 2 (Tokyo Shoseki)
	Science	New Science 3rd grade	1	26P	Round Gothic	Cues Tel: 03-3358-1049	New Science 3rd grade (Tokyo Shoseki)
		New Science 4th grade Part 1, 4th grade Part 2	2	22P	Round Gothic	Cues Tel: 03-3358-1049	New Science 4th grade Part 1, 4th grade Part 2 (Tokyo Shoseki)
		New Science 5th grade Part 1, 5th grade Part 2	2	22P	Round Gothic	Cues Tel: 03-3358-1049	New Science 5th grade Part 1, 5th grade Part 2 (Tokyo Shoseki)
		New Science 6th grade Part 1, 6th grade Part 2	2	22P	Round Gothic	Cues Tel: 03-3358-1049	New Science 6th grade Part 1, 6th grade Part 2 (Tokyo Shoseki)
	National Language	National Language 7th grade-1, 7th grade-2, 7th grade-3	3	22P	Gothic	Mitsumura Tosho Tel: 03-3493-2111	National Language 7th grade (Mitsumura Tosho)
		National Language 8th grade-1, 8th grade-2, 8th grade-3	3	22P	Gothic	Mitsumura Tosho Tel: 03-3493-2111	National Language 8th grade (Mitsumura Tosho)
		National Language 9th grade-1, 9th grade-2, 9th grade-3	3	22P	Gothic	Mitsumura Tosho Tel: 03-3493-2111	National Language 9th grade (Mitsumura Tosho)
Junior high school	Math	New Math 1-1, 1-2	2	18, 22 or 26P	Gothic	Daikatsuji Tel: 03-5282-4361	New Math 1 (Tokyo Shoseki)
		New Math 2-1, 2-2	2	22P	Gothic	Daikatsuji Tel: 03-5282-4361	New Math 2 (Tokyo Shoseki)
		New Math 3-1, 3-2	2	22P	Gothic	Daikatsuji Tel: 03-5282-4361	New Math 3 (Tokyo Shoseki)
	English	NEW HORIZON English Course 1 Part 1, 1 Part 2	2	18, 22 or 26P	Gothic aria1	Daikatsuji Tel: 03-5282-4361	NEW HORIZON English Course 1(Tokyo Shoseki)
		NEW HORIZON English Course 2 Part 1, 2 Part 2	2	18, 22 or 26P	Gothic aria1	Daikatsuji Tel: 03-5282-4361	NEW HORIZON English Course 2(Tokyo Shoseki)
		NEW HORIZON English Course 3 Part 1, 3 Part 2	2	18, 22 or 26P	Gothic aria1	Daikatsuji Tel:03-5282-4361	NEW HORIZON English Course 3(Tokyo Shoseki)
	Science 1st Category	New Science 1st Category Part 1-1, -2, -3, 1st Category Part 2-1, -2	5	22P	Round Gothic	Cues Tel: 03-3358-1049	New Science 1st Category (Tokyo Shoseki)
	Science 2nd Category	New Science 2nd Category Part 1-1, -2, -3, 2nd Category Part 2-1, -2	5	22P	Round Gothic	Cues Tel: 03-3358-1049	New Science 2nd Category (Tokyo Shoseki)
	History	New Social Studies: History 1, 2, 3	3	19P	Round Gothic	Cues Tel: 03-3358-1049	New Social Studies: History (Tokyo Shoseki)
	Geography	New Social Studies: Geography 1, 2, 3,4	4	19P	Round Gothic	Cues Tel: 03-3358-1049	New Social Studies: Geography (Tokyo Shoseki)
	Civics	New Social Studies: Civics 1, 2, 3	3	19P	Round Gothic	Cues Tel: 03-3358-1049	New Social Studies: Civics (Tokyo Shoseki)

Table 2 Number of “Large-printed Textbooks” on Social Studies and Sciences actually used in FY2006

Elementary school	
Elementary School New Social Studies 3/4 Part 1	49
Elementary School New Social Studies 3/4 Part 2	49
Elementary School New Social Studies 5 Part 1	51
Elementary School New Social Studies 5 Part 2	51
Elementary School New Social Studies 6 Part 1	56
Elementary School New Social Studies 6 Part 2	56
Elementary School New Science 3	41
Elementary School New Science 4 Part 1	39
Elementary School New Science 4 Part 2	39
Elementary School New Science 5 Part 1	53
Elementary School New Science 5 Part 2	53
Elementary School New Science 6 Part 1	47
Elementary School New Science 6 Part 2	46
Junior high school	
(New edition) New Social Studies Geography-1	66
(New edition) New Social Studies: Geography-2	66
(New edition) New Social Studies: Geography-3	66
(New edition) New Social Studies: Geography-4	66
(New edition) New Social Studies: History-1	63
(New edition) New Social Studies: History-2	63
(New edition) New Social Studies: History-3	63
(New edition) New Social Studies: Civics-1	62
(New edition) New Social Studies: Civics-2	62
(New edition) New Social Studies: Civics-3	62
(New Edition) New Science 1st Category Part 1-1	75
(New Edition) New Science 1st Category Part 1-2	75
(New Edition) New Science 1st Category Part 1-3	75
(New Edition) New Science 1st Category Part 2-1	27
(New Edition) New Science 1st Category Part 2-2	27
(New Edition) New Science 2nd Category Part 1-1	74
(New Edition) New Science 2nd Category Part 1-2	74
(New Edition) New Science 2nd Category Part 1-3	74
(New Edition) New Science 2nd Category Part 2-1	26
(New Edition) New Science 2nd Category Part 2-2	26
Total:	1,822 textbooks

been distributed to low vision children/students at schools for the blind and low vision classes as "Article 107 books," but in FY2004, MEXT commenced a free-of-charge Large-printed textbooks distribution program (doc. No.: MEXT No.46, April 1, 2004) for low vision children/students in ordinary elementary and junior high schools.

This free-of-charge-free distribution program provides textbooks to visually disabled children/students who local education boards deem have educational needs requiring the use of Large-printed textbooks. In this case, the school or municipal education board is required to take predetermined procedures, and then prefectural education board, as the coordinating authority, reports to MEXT (see Figure 1). However, MEXT does not necessarily provide education boards and teachers with sufficient information on this program, and often fails to achieve their necessary understanding. For this reason, MEXT is making an effort to enhance the understanding of education board members and teachers about the use of Large-printed textbooks. Concurrently, the Ministry has requested prefectural education boards to establish "Large-printed Textbooks Counseling Desks," to provide information and counseling services for children/students needing these specialized textbooks, the parents of these children with special needs, and Large-printed textbook drafting volunteers (doc. No.: Primary Education No.16, August 2006). In this context, additionally MEXT has advised that "Braille Textbook Counseling Desks" need to be established.

On the other hand, schools for the blind are also playing a role as a local support center for visually impaired children/students. In FY2005, a "Large-printed Textbook Network," was established as a subordinate organization of the National Association of Visually-Impaired School's Principals. This network provides information on Large-printed textbooks and serves as a point-of-contact, together with the "National Large-printed Teaching Materials Production Council," which consists of volunteer groups.

IV. Dissemination of Large-printed Textbooks

1. Changes in social condition/environment of Large-printed textbooks

There have been significant changes over the past few years in the editing and use of Large-printed textbooks for low vision children/students, such as the amendment to the Copyright Act and the distribution of free-of-charge-free Large-printed textbooks.

(1) Free-of-Charge distribution to low vision children/students

In the past, if Large-printed textbooks have been adopted for use by schools for special needs education (e.g., schools for the blind, etc.), or special classes (e.g., low vision classes) as "Article 107 books," they have usually been distributed through the textbook free-of-charge distribution system as a substitute for authorized textbooks. Since FY2004, however, Large-printed textbooks have been available for low vision children/students in ordinary classes of elementary or junior high schools if the appropriate school authorities approve such usage.

As discussed in the "Introduction" section of this paper, according to a report of MEXT (Elementary/Secondary Education News, No.38), as of FY2005, approximately 9,000 Large-printed textbooks have been distributed free to approximately 600 children/students nationwide.

(2) Copyright exemption

Textbook copyright has previously caused problems in the preparation of Large-printed textbooks. However, since the partial amendment to the Copyright Act in June 2003—the Amended Copyright Act came into effect on 1 January 2004—publishers are now able to prepare Large-printed textbooks without obtaining an individual author's approval (i.e., in the same manner as used with authorized textbooks). This has enabled Large-printed textbook drafting volunteers to start textbook production by simply sending a facsimile letter to the Textbook Publishers Association of Japan (TPAJ) without obtaining prior approval from authors. In the case of publishers, they have to pay royalties designated by the Commissioner of the Cultural Affairs Agency, but they are also exempt from obtaining author approval.

2. Requirements made of Textbook Publishers

(1) MEXT and TPAJ (Textbook Publishers Association of Japan)

In the 164th Diet session, Commission Members of the House of Representatives and the House of Councillors discussed a "*Bill for Partially Amending the School Education Act.*" The lawmakers noted that, "There is only a limited range of Large-printed textbooks available from textbook publishers and Large-printed teaching materials publishers, so it is necessary to change the current situation in which Large-printed textbooks are produced mainly by voluntary groups." Further, they noted that, "They (the publishers) provide only limited types of digital data, and the content is inadequate, as well." When voting on the Bill at the committee stage, lawmakers put forward the collateral resolution: "Efforts should be made for improving and diffusing Large-printed textbooks for visually-impaired persons."

Following this, on 22 July 2006, the Minister for Education, Mr. Kenji Kosaka, sent a letter to representatives of textbook publishers, stating, "I would like you to examine publishing Large-printed textbooks. If you don't do so, I would be grateful if you could make (your) best efforts, such as actively providing digital data." In addition,

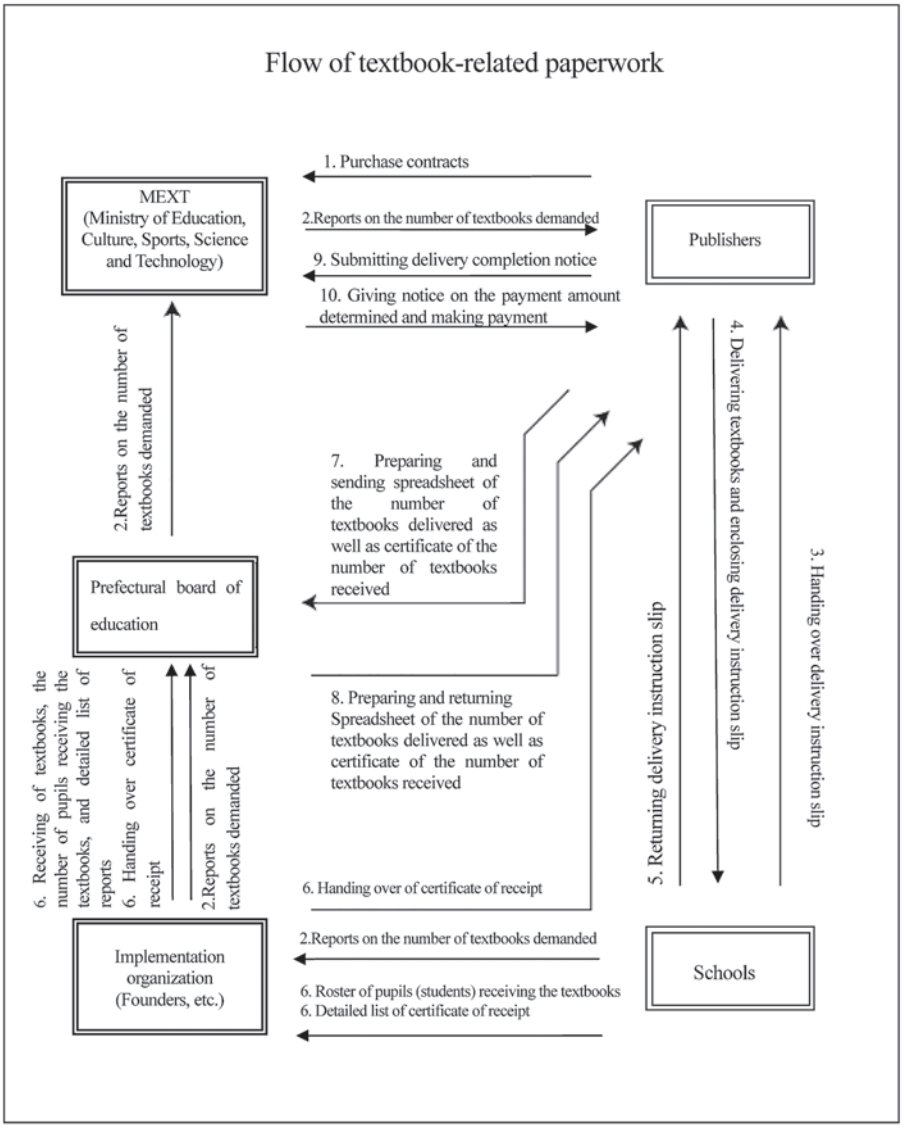

Figure 1　Flow of paperwork on application for Large-printed textbooks

on 3 August 2006, Mr. Zeniya, the Director-General of the Elementary and Secondary Education Bureau, fowarded a notice entitled, “Publishing Large-printed Textbooks and Providing Textbook Digital Data (Notice)” to TPAJ. In support of Minister Kosaka’s letter, the Director-General's notice also requested textbook publishers to make their best efforts, specifically examining the provision of digital data, as investigated by the TPAJ “Copyright Taskforce,” and examining publishing Large-printed versions of current published textbooks, as investigated by the TPAJ “Large-printed Textbook Working Group.”

In April 2007, TPAJ established a new unit entitled, the “Large-printed Textbook Investigative Meeting” to start examining possible approaches for providing digital data for textbooks and publishing Large-printed versions of currently available textbooks.

（2）Efforts of textbook publishers

To date, the “Mitsumura Tosho Publishing Co., Ltd.” has been preparing/publishing Large-printed versions of its own textbooks. Mitsumura publishes elementary- and junior high school-level national language textbooks in 22-26 point Gothic font (Table 1). In addition, in FY2007, the textbook publisher, “Gakko Tosho Co., Ltd.,” published a Large-printed version of the Junior High National Language 1 textbook. In the production of the Large-printed version, Gakko Tosho enlarged the A5-sized paper authorized for textbooks to A4 size (i.e., a 1.4 times larger version). The font size used was 14-18 points, which is smaller than Large-printed textbooks published so far. This Large-printed version simply looks like a 1.4 times larger version of the authorized textbooks. However, as pictures and photos are enlarged with the text, Gakko Tosho uses a new typesetting when preparing these Large-printed textbooks.

Best practice is for publishers to prepare and publish Large-printed versions of their own textbooks. However, Large-printed textbooks are not the same as authorized textbooks. In addition, as texts and pictorial cuts are enlarged, royalties must be paid to copyright holders. In this sense, even if a publisher expands or produces textbooks, there are problems. Consideration on these issues will be necessary in the future.

In this context, it is an important that textbook publishers have begun to publish Large-printed versions of their textbooks. Nevertheless, authors are expecting to prepare and publish more Large-printed textbooks in the future. In this way, the publishing environment of Large-printed textbooks in Japan has made significant advances.

V. The universal design of textbooks

To create Large-printed textbooks suitable for low vision children/students, it is necessary to lie out texts, pictorial cuts, and photos in an easily identifiable manner by using a text size recognizable by everyone. However, as low vision children/students view objects idiosyncratically, there is no "one fit for all" Large-printed textbook.

Low vision students and volunteer groups have been requesting the drafting of several types of Large-printed textbooks suitable for every low vision child/student. In addition, some volunteer groups that prepare Large-printed textbooks are calling for textbook publishers to provide the digital data for authorized textbooks.

As a teaching material, textbooks should be easily understandable for a wide range of children/students. However, many currently authorized textbooks are not necessarily "easily viewable and understandable" for low vision children/students who have gaps in vision. In fact, they erect significant barriers to learning.

Large-printed textbooks have been designed to carry enlarged and easily viewable texts, pictorial cuts, and illustrations of ordinary authorized textbooks for low vision children/students with weaker eyesight. Materials that are easily viewable and understandable for low vision persons should also be easily viewable and understandable for ordinary children/students. This also holds true for children with other diseases.

Through preparing and utilizing Large-printed textbooks, it is necessary to work on and suggest possible universal design of textbooks suitable for education for visually disabled students.

VI. Future Challenges

Social conditions and the education environment in which Large-printed textbooks are used has seen significant change in the past few years. MEXT commenced a new program to provide Large-printed textbooks for low vision children/students free-of-charge. Copyright restrictions on the publication of Large-printed textbooks have also been relaxed. In this sense, the education environment of low vision children/students has improved.

However, to address the educational needs of all the low vision children/students, there are social problems remaining that need mitigation and solution. For example, it is necessary to address the demand-supply imbalance between the number of Large-printed textbooks currently available and that of children/students need for such textbooks. With the exception of Large-printed textbooks published by a limited number of Large-printed textbook publishers, such demand has been met solely by the efforts of Large-printed textbook drafting volunteers. The focus of this initiative is the "National Large-printed Teaching Materials Production Council." However, since low vision children/students require various types of Large-printed textbooks, private services from Large-printed textbook drafting volunteers do not sometimes satisfy the needs of low vision children/students. For this reason, it takes a longer time to prepare the necessary volume of Large-printed textbooks.

In addition, low vision students and volunteer groups have been calling for the drafting of several types of Large-printed textbooks suitable for each low vision children/student. In addition, some volunteer groups that prepare Large-printed textbooks are requesting textbook publishers to provide the digital data of authorized textbooks. MEXT encourages textbook publishers to roll out Large-printed textbooks and provide the supporting digital data. In response to this request, TPAJ is currently examining possible approaches for providing digital data and publishing Large-printed versions of their textbooks. In this process, TPAJ commenced its efforts to provide text data on some elementary- and junior high school-level textbooks on social studies and science for FY2008.

To address these challenges, the central government should improve Large-printed textbook distribution programs and textbook publishers should actively engage in the production and publishing of Large-printed versions of their current textbooks.

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- Received September 10, 2007; Accepted December 7, 2007 -

*** Endnote**

This paper is English translation of a paper in published in the Bulleitn of The National Institute of Special Needs Education Vol. 35 (March 2008), the National Institute of Special Needs Education (NISE). For this reason, this paper describes the situation as of August 2007.

NISE has been working on “A Series of Studies on Preparation of Large-printed Textbooks and Educational Support (2002-2007)” to date. In addition, social conditions have also been changing, such as adopting the “Convention on the Rights of Persons with Disabilities (adopted in 2006).” In this context, the Japanese government has been reviewing its education programs for disabled persons, in particular its policies on low-vision pupils/students.

After that, on June 10, 2008, Japanese lawmakers passed an “Act on Promotion of Distribution of Specified Books, etc. Used as Textbooks for Disabled Children and Students” in the Diet, which became effective on 17 September, 2008. In line with the principle of equal educational opportunity, this legislation is intended to encourage dissemination of specified books used as textbooks for disabled pupils/students so that they will able to receive sufficient education, regardless of their disabilities or other characteristic traits.

As this legislation has come into effect, in terms of encouraging the dissemination of Large-printed textbooks, MEXT is supposed to develop and publicly announce the standard guidelines on Large-printed textbooks, while textbook publishers are supposed to make best efforts to publish standard Large-printed textbooks in line with the minister’s guidelines.

In addition, by obliging textbook publishers to provide their textbook digital data to MEXT, etc. Japan has established the framework for smoothly providing the textbook data to Large-printed textbook creation volunteers.

In the wake of this legislation, MEXT developed the standard guidelines on Large-printed textbooks at the compulsory education level (elementary and junior high school levels) in December 2008 and started providing textbook digital data to volunteer groups in February 2009.

In January 2010, the Ministry also developed standard guidelines on Large-printed textbooks at the high school level, thereby expanding the Large-printed textbook distribution program to the high school level.

(NISE Bulletin Editorial Committee)

NISE Bulletin, 10, 13-28, 2010

Tactile Graphics in Braille Textbooks: The Development of a Tactile Graphics Creation Manual

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Abstract: This paper presents practical guidelines for making Braille dots drawings in Japanese Braille textbooks. Braille textbooks prepared in line with ordinary textbooks include not only edited Braille texts but also pictorial cuts converted to tactile drawings. In the conversion, focus should be on the variety of pictorial cuts and development of tactually understandable drawings. Tactile drawings made by Braille dots account for a high percentage of tactile drawings used in Japanese Braille textbooks. The paper discusses the underlying theoretical principles and provides practical guidelines with examples for the production of these drawings. There are five principles as follows.

1) Selection criteria should be developed to choose appropriate pictorial cuts from original ordinary textbooks for the conversion to tactile drawings. Then, as for pictorial cuts not converted to tactile drawings, strategies should be considered such as the replacement of them with suitable text, and so on. 2) The restraints on preparation of Braille dots drawings, such as line type or length, should be considered. 3) As specific features of tactile and visual perception differ, it is necessary to establish criteria for making Braille dots drawings, such as determining the appropriate distance between components, and the number of components per unit area. 4) Braille dots drawings should be prepared, taking into consideration types of pictorial cuts in the textbook, particularly in terms of their shape. 5) Braille dots drawings should also be accompanied by detailed explanatory notes in Braille so that children/students will easily understand the tactile drawings.

Key Words: Tactile drawing, Braille dots drawings, practical guidelines, Braille textbooks, visual impairments

I. Introduction

Braille textbooks authored by the Ministry of Education, Culture, Sports, Science and Technology, in Japan (MEXT) and used in schools for the visually impaired are edited and translated into Braille based on original authorized textbooks. These textbooks include Braille texts translated from original textbooks as well as pictorial cuts converted to Braille dots drawings (Endnote 1) or vacuum-formed graphics (Endnote 2). In the classroom, children/students read Braille text and touch tactile drawings.

Our nationwide survey of how much tactile teaching materials are used in schools for the visually impaired[14], showed approximately 40-50% of respondent schools use almost all tactile drawings in Japanese language, social studies, mathematics, and science textbooks. If schools using two thirds or more of tactile drawings in textbooks are considered, about 50-60% of respondent schools may then be estimated to use tactile drawings in textbooks. The percentage is lower for tactile drawings in Japanese language, social studies, mathematics, and science textbooks at the junior high and high school levels, but about 30-50% of respondent schools use two thirds or more of the tactile drawings in textbooks.

On the other hand, since original pictorial cuts are designed to be visually understandable, simply converting these pictorial cuts to tactual drawings in convexed format, in most cases will not bring about tactilely understandable pictorial cuts because of the nature of tactile perception. In addition, since original pictorial cuts are various, it is necessary to convert them to appropriate tactile drawings while adapting them to a tactile medium to ensure effective learning occurs. Furthermore, as most of the drawings in textbooks are Braille dots drawings that fundamentally only consist of dots, the conversion of pictorial cuts to tactile drawings, should take into consideration this nature of Braille dots drawings.

In addition, if children/students using Braille use textbooks other than Braille textbooks authored by MEXT, they need to be translated into Braille, and their pictorial cuts need to be converted to tactile drawings in an appropriate manner. Hence, as it is common to ask volunteer groups to translate Braille texts or tactile drawings, the most effective approach is to develop practical guidelines for the production of tactile drawings. In this case, the practical

guidelines should assume that any output is produced from Braille printers, rather than zinc plate-based printing (Endnote 3) used by Braille publishers.

Considering these problems, this paper aims to describe realistic and practical guidelines for the conversion of original pictorial cuts in ordinary textbooks to tactile drawings, in particular Braille dots drawings, which account for majority of these tactical drawings. In addition, the paper aims to identify the basic principles for preparing a more detailed new "*Manual for Making Tactile Graphics*" to address the issue of tactical drawings other than Braille dots drawings.

II. Overview

1. Guidelines for Conversion to Braille Dot Drawings

Braille drawings in MEXT authored Japanese language, social studies, mathematics, science, and English textbooks used at the elementary and junior high school levels are edited by several editorial board members in respective field/subject areas. How the editing process is done is disclosed in the "Braille Textbooks Editorial Guidelines" [8) 9)]. The guidelines also describe the principles applied in the editing of pictorial cuts in the original textbooks. In addition to these editorial guidelines, a range of documents from both Japan and overseas describing practical guidelines for tactile drawings are available [1) 2) 4) 7) 8) 9) 11) 12) 15) 16)].

Relevant to the main theme of the paper, some of these guidelines mention important strategies for converting pictorial cuts to tactile drawings, while other do not describe such guidelines. As this paper aims to propose practical guidelines for converting pictorial cuts to tactile drawings, these need to be as comprehensive as possible, in the context of these documents as well. Some documents enumerate practical guidelines, but it is necessary to sort out problems in converting pictorial cuts of authorized textbooks to tactile drawings and describe a theoretical framework for these guidelines, rather than simply listing guidelines. By placing practical guidelines in a theoretical framework, it is possible to prevent overlooking important guidelines. In addition, for stakeholders directly engaging in conversion to tactile drawings, such as tactile drawing volunteers, it is necessary to suggest specific examples consistent with these practical guidelines.

In this context, the paper proposes some basic principles as the theoretical basis for converting textbook pictorial cuts to Braille dots drawings and explains the practical guidelines for producing Braille dots drawings within such a theoretical framework. In addition, by selecting actual pictorial cuts in original textbooks, the paper makes it possible to provide examples of 'best practice' approaches for conversion to Braille drawings. By doing so, the authors believe we will able to obtain basic knowledge for the preparation of a "*Manual for Making Tactile Graphics*," as mentioned previously.

2. Basic Principles for Conversion to Braille Dot Drawings

In this paper, five basic principles are proposed:

1)Selection of pictorial cuts converted to tactile drawings: Since conversion of all pictorial cuts in original textbooks to tactile drawings is unnecessary or difficult, it is necessary to select only pictorial cuts considered necessary to convert to tactile drawings. In addition, those pictorial cuts not converted to tactile drawings should also be handled in an appropriate manner.

2) Restraints on conversion to Braille drawings: When tactile drawings are made in the form of Braille dots drawings that basically consist of dots only, there are some constrains in their creation to which editors should pay due attention.

3) Criteria for preparing Braille dots drawings: Based on the nature of tactile perception, Braille dots drawings should satisfy certain criteria, such as the degree of distance between components and the number of components per unit area. The nature of tactile perception also relates to the simplification of Braille dot drawings.

4) Creation of Braille dots drawings suitable to types of pictorial cuts: As pictorial cuts have various characteristics, this principle relates to how appropriate Braille dots drawings should be prepared to satisfy each of these various characteristics of pictorial cuts. Rather than suggesting guidelines for each of the various pictorial cuts, this paper advises that at first, pictorial cuts be sorted out based on the simplification of Braille dots drawings and the essential information that Braille dots drawings should deliver to readers.

5) Addition of detailed text information: In addition to ingenuity in preparing Braille dots drawings, this principle calls for the addition of detailed text information so readers will easily understand the drawings.

Based on the five principles outlined above, this paper now describes realistic and practical guidelines for the preparation of Braille dots drawings.

III. Guidelines for Making Braille Dots Drawings

1. Selection of pictorial cuts converted to tactile drawings

Some pictorial cuts from original textbooks do not include important information for readers simply because they form backdrops to the textbook or they are ornamental pictures, or photos.

In this context, rather than converting all pictorial cuts in the original textbooks, it is suggested to avoid converting pictorial cuts with less important information.

This strategy is actually employed when preparing Braille

Figure 1 Original Textbook: New Science 5, Part 1; Tokyo Shoseki; pp.1-3; 2002 edition

textbooks, and is mentioned in Braille textbook editorial guidelines for each subject [8) 9)]. Similar strategies are also mentioned in APH (American Printing House for the Blind) (1997) [1)] and Sheppard, L. et al. (2000) [16)].

On the other hand, even if pictorial cuts such as photos or complicated maps contain important information, in some cases it is difficult to convert them to tactile drawings. In these cases, rather than simply avoiding conversion to tactile drawings, it is suggested they be replaced by text information. This strategy is used in practice for Braille textbooks and a similar strategy is used by the American Printing House for the Blind (APH, 1997).

In addition, according to Braille editorial guidelines, if it is difficult to replace pictorial cuts with text information, teachers are advised to teach using oral explanation, and models or large tactile maps. According to Sheppard et al. (2000) [16)], teachers should demonstrate actual objects rather than tactile drawing, such as coils, if they are easier to comprehend.

Based on the aforementioned perspectives, it is appropriate to adopt the following strategies: (a) editors should avoid converting a pictorial cut to a tactile drawing if it does not include important information; (b) editors should replace a pictorial cut with text information only if it includes important information but is impossible or difficult to convert to a tactile drawing; and (c) if a pictorial cut

includes important information but is impossible to convert to tactile drawing or text information, teachers should teach using oral explanation, models, actual objects, large tactile maps and other teaching materials.

The following supplemental observations on strategies (a-c) are appropriate. Strategy (a) does not mean deleting pictorial cuts from original textbooks as much as possible, but rather calls for the conversion of original textbook's pictorial cuts from original textbooks as much as possible. As mentioned in APH (1997) [1], as the skills of children/students to perceive tactile drawings are enhanced by touching tactile drawings, editors should actively insert tactile drawings into the textbooks of low-grade children to stimulate their perceptual response. In Strategy (b), when replacing pictorial cuts with text information, existing Braille textbooks either do so by taking advantage of texts accompanied with original photos or figure from the original textbook, or insert the information of phots or figures in the text. Concerning Straetgy (c), if models or large tactile maps are unavailable, it is suggested that teachers prepare these resource materials themselves. Even if tactile drawings are available in Braille textbook, teachers should sometimes prepare and use tactile drawings or models to supplement tactile drawings.

In this context, based on existing Braille textbooks and Braille editorial guidelines, the following is an example of the selection of pictorial cuts for conversion to tactile drawings. A further example given is substituting text information for pictorial cuts not converted to tactile drawings. (see Figure 1)

On Pages 1-3 of the elementary school 5th grade science textbook, pictures of three children and a scenic photo (see top of Page 1) in the original textbook, as shown in Figure 1, have not been converted to tactile drawings or replaced with text information. This is because they do not include important information.

The illustration and photo at the bottom of Page 1 do include important information, but have been replaced with the following texts because of the difficulty involved in converting them to tactile drawings.

> John: "From weather forecast on radio or TV program, we are able to know the weather tomorrow."
>
> Mary: "Newspapers have a weather forecast column that includes precipitation probability and weekly forecast."

As for Pages 2-3 of the same textbook, pictorial cuts in the original textbook include important information, but have not been converted to tactile drawings. Instead, the information included in the pictorial cuts is inserted in the text as follows:

> Forecasts of weather changes in newspapers or on TV programs include local weather, the nephogram of a weather satellite, and precipitation information from the AMeDAS.
>
> The nephogram shows cloud images based on data sent from a weather satellite. AMeDAS precipitation information is in a bar chart that shows automatically measured local precipitation on a 4-point scale ("small," "rather small," "rather large," and "large") on a map of the Japanese islands.

Figure 2 shows texts and pictures on Pages 8-9 of the elementary school level 1st Grade National Language textbooks. The text portion is translated to Braille as it is—"Would you read out a story?"— whilst the picture portion is converted to text data as follows:

> Different Kinds of Stories
> The Monkey and the Crab
> Urashima and the Kingdom Beneath the Sea
> Bremen Town Musicians
> Three Little Pigs

Figure 3 shows a photo and the text of Page 4 of the elementary school level 3rd/4th grade Social Studies textbooks. The photo is omitted but is converted to text information, whilst taking advantage of the description in the original textbook that accompanies the photo. That is, "There is the same mark in a lot of different locations, such as a white bus body, a billboard of 'Kobe City Kobe-Eki-Mae Bicycle Parking Lot', and a manhole describing it as 'Kobe Rainwater.' What on earth are these kind of marks?" (Endnote 4)

2. Restraints on conversion to Braille drawings

There are various approaches for preparing tactile drawings, such as Braille dots drawings, vacuum-formed graphics, gluing down tactile materials, Stereo Copying, the raised writer approach, and UV-curable resin ink printing. They also have different and separate characteristics.[6]

Among these approaches, essentially Braille dots drawings only consist of dots; their points, lines, and surfaces are composed only of dots (Endnote 5). This poses some constraints when preparing Braille dots drawings.

This section describes the types of dots actually used for Braille textbooks and Braille printers, and then describes their constraints. It describes the Braille printer, *ESA721 Ver. '95*, which is compatible with all Braille drawing software currently available in Japan, such as EDEL, Tenzu-kun, and BES (Endnote 6).

（1）Dot types

Braille dots drawings use several different kinds of dots. There are five to six dot types for Braille textbooks and one to three dot types for Braille printers (Endnote 7).

As an example of dots used in Braille textbooks, Table 1 shows the dot types and dot sizes used in junior high school

Figure 2 Original Textbook: National Language 1, Part 1; Mitsumura Tosho; pp.8-9; 2002 edition

Figure 3 Original Textbook: New Social Studies 3/4, Part 1; Tokyo Shoseki; (a portion of) pp.4; 2002 edition

level Science (Category 1) textbooks and those available for the Braille printer, *ESA721 Ver. '95*.

When comparing dot types between Braille textbooks and Braille printers, Braille printers do not have the very large and medium-small dots of Braille textbooks. Braille printers have almost the same dot sizes as large, medium and small dots used in Braille textbooks. Medium size dots are the same size as Braille dots used for both Braille textbooks and Braille printers.

（2）Line width available

In the aforementioned example, Braille textbooks have five different dot sizes, while Braille printer *ESA721 Ver.'95* has three different dot sizes.

Table 1 Dot Sizes of Braille Textbooks and Braille Printers

a. Dot Types of Braille Textbooks (Junior High School level Science (Category 1 textbooks)

Dot type*	Dot size Dot base diameter (mm)
Very large	2.7
Large	1.8
Medium	1.5
Medium-small	1.2
Small	0.8

*Unauthorized names applied for convenience by the authors

b. Dot Types for Braille Printer, *ESA721 Ver. '95*

Dot type*	Dot size Dot base diameter (mm)
Large	1.7
Medium	1.5
Small	0.7

*Unauthorized names applied for convenience by the authors

In Braille dots drawings, the expression of dots, lines and surfaces is determined by a range of differing dot sizes.

In Braille dots drawings, lines, the most basic component of a drawing, are also expressed with a series of dots using small intervals in the form of a line. As a result, line width availability also depends on dot sizes. In the aforementioned example, there are five kinds of line width available for Braille textbooks and three types of line width available for the Braille printer, *ESA721 Ver. '95*.

Although five kinds of line width are available for Braille textbooks, it does not mean that all of these line widths are usable in a single drawing. Braille users are able to distinguish different line types by touching on multiple lines at the same time. However, since their tactile field is rather small, Braille users are not necessarily able to touch them at the same time, and in some situations, are unable to distinguish different line types. For this reason, line types in a single drawing should be limited to three or less line types.

（3）How to use dots

In the case of the aforementioned Braille textbooks, it appears that medium and medium to small dots are used for main lines. For example, junior high school level Science (1st Category) Braille textbooks have many examples using two dot types in a single drawing for different purposes. In a single drawing, medium to small dots are used for the vertical and horizontal axes of graphs, medium dots are used for graph lines and ground lines, and medium to small dots are used for people, hand trucks, and other goods.

Large dots are partly used as lines, such as for highlighted arrows, and in most cases very large dots rather than lines are used as points, such as for points on graphs and city locations. If small dots express a line, they are often used as constituting auxiliary lines, such as leader lines. They are also used to form surface patterns, such as marking out a surface. If five dot types are available, editors may use them for different purposes as mentioned above.

On the other hand, only three dot types are available for the Braille printer, *ESA721 Ver. '95*.

In the case of Braille printers, the unavailability of medium to small dots used with medium dots to express a major line in Braille textbooks, poses significant constraints when expressing a line. For example, if attempting to use small dots for surface patterns and two line types for other major lines in a single drawing, editors have no choice but to use medium and large dots to express these two lines. However, large dots are too big to give refined expressions.

In addition, since the very large dots of Braille textbooks are unavailable for Braille printers, if points on a graph or city locations are expressed with a large dot, medium and small dots are only available for expressing lines.

In this way, a smaller range of expressions, such as points, lines, or surfaces, is available for Braille printers than for Braille textbooks. In this sense, editors need to exercise their ingenuity in expressing Braille dots drawings, taking into consideration these constraints.

（4）Line length

As lines are expressed with a series of dots in Braille dot drawings, editors face constraints in terms of line length available.

That is, for Braille textbooks, if taking the minimum length with three points, the distance between the center of the end point is 5mm for large dots, 4mm for medium dots, 3.8mm for medium to small dots, and 3mm for small dots. In contrast, for the Braille printer, *ESA721 Ver. '95* (Endnote 8), it is 5mm for large dots, 4mm for medium dots, and 3mm for small dots.

These facts also pose constraints on the expression of closed graphics. For example, a square requires a side of at least 3-4mm long.

3. Criteria on preparing Braille dots drawings

In general, if tactile drawings, including Braille dots drawings, are expressed by simply convexing the contours or boundaries of original pictorial cuts, in many cases Braille users may not tactilely understand the tactile drawings owing to the nature of tactile perception. Visually recognizable graphics are sometimes not tactilely recognizable because tactile perception has lower spatial acuity and narrower tactile field than visual perception. In

comparison, as the smallest tactile field is only as large as a fingertip, Braille users inevitably pick-up unnecessary information as long as it is located in the fingertip. Due to synergy effect of these factors, tactile perception of graphics is rather difficult.

In this context, all of the editorial guidelines for tactile drawings recommend avoiding complexity and making a graphic as simple as possible.

Then, what degree of complexity or simplicity is appropriate? What kind of criteria is desirable?

How large these numerical values should be for perceptible graphics is explained in terms of the complexity of a graphic from the orientation of two numerical values: (a) the distance between two components; and, (b) the number of components per unit area. In relation to the former numerical value, this section also presents an argument for how large a Braille dots drawing should be.

（1）Distance between components

If a distance between two adjacent components is smaller than a certain value, such a visually recognizable distance is tactilely imperceptible. This is because tactile perception has lower spatial acuity (i.e., lower resolution) than visual perception. The spatial acuity of tactile perception is measured with the value of two-point threshold, which varies among research projects, but stands at 2-3mm in the case of a finger distal pad.[18) 19) 20)]

The following section explores the distance between two components by simplifying the argument as the distance of two parallel lines. In this case, if the distance between the two lines is smaller than a certain value, it is not recognized as two different lines, and Braille users sometimes perceive there to be no space between them. This numerical value ranges from 2 to 6mm, depending on research projects [1) 2) 4) 11) 15) 16)]. Some of these projects discuss the values of the aforementioned two-point threshold on fingertips [2) 11)], while others do not. As these latter projects do not mention specific experiments, they probably argue the empirical values of tactile drawings users who actually touch two lines.

Amongst these projects, research projects that highlight 2mm as the two-point threshold [11) 16)] encourage Braille editors to “create a distance at 2mm or more,”, and “leave space at least 2mm wide,” respectively. Of the three projects calling for a 6mm distance [1) 4) 15)], two [1) 15)] mention that less than a 6mm space between the two lines might lead to “difficulties of recognizing two lines,”, or prevent Braille users from “easily distinguishing the two lines,”. The last project [4)] states that Braille users “tend to recognize them as a bold line.”

In this context, some researchers stress the problems involved. For example, a two-point threshold would have different values due to gaps in the discrimination abilities of examinees as well as in experimental conditions. That is, sometimes different experimental equipment is used, or researchers ask examinees for the specific distance in which they certainly perceive two lines, or for the specific distance in which they perceive something other than one line [5) 17)]. In addition, when measuring two-point thresholds, researchers generally use equipment such as slide gauges or compasses, and place them on the examinees’ fingers. On the other hand, when examinees touch two lines on tactile drawings, they put their fingers on the paper and move their fingers around. In the finger/hand rehabilitation field, the former approach is called “static discrimination,” while the latter is called “moving discrimination”, a procedure in which testing technicians put two points and move on the fingers of examinees [10)]. Some reports argue that examinees are normal if the value of moving discrimination is 2mm. [3)]

In fact, researchers should conduct experiment research by providing two lines with different intervals and asking examinees to detect the distance value in which they clearly identify them as two different lines. However, based on the arguments presented here, the authors tentatively suggest that the distance between two components should be at least 2mm.

（2）Size of Braille dots drawings

If line width is different, the distance between the edges of two lines will also vary, even if the graphic is the same size. This is because, if the distance between the two lines’ centers remains unchanged, the distance between the edges of the two lines is the distance between the centers of the two lines minus the width of the line.

Original textbooks usually utilize lines of 0.2mm wide. Pictorial cuts with a 1mm distance between the edges of two lines of 0.2 mm wide are also frequently seen in original textbooks. In this case, the distance between centers of these two lines is 1.2mm.

If attempting to convert this pictorial cut to a tactile drawing with medium to small dots, the distance between edges of two lines will be zero because the line width is 1.2mm (i.e., 1.2-1.2mm). If this is so, editors are unable to convert the original pictorial cut to tactile drawing at the same size.

If the standard value for the distance between edges of these two lines is 2mm—as mentioned earlier—the distance between the centers of the lines should be a minimum of 3.2mm (i.e., 2mm+1.2mm). For this reason, to convert the original pictorial cut to tactile drawing so that the standard value for the distance between two lines is satisfied, editors need to alter the size of pictorial cut. In this case, they need to expand the original pictorial cut by 2.7 times (i.e. 3.2mm/1.2mm) so that the distance between the line centers is 3.2mm.

In sum, if converting an original pictorial cut to Braille

Figure 4 Japanese atlas in junior high school social studies textbook on geography
(Original Textbook: Junior High Social Studies: Geography; Kyoiku-Shuppan; pp.51; 2002 edition)
(The atlas is enlarged and turned so that it would fit one page of Braille textbook version. The size of one page is marked with dotted lines.)

dots drawing without changing the pictorial cut proportion, editors should identify the shortest distance between two lines on the original pictorial cut, measure the distance between centers of these two lines (a distance referred to as “a”), then calculate the numerical value of the line width of the tactile drawing plus the standard value (i.e., 2mm in this case)—this numerical value is referred to as ‘b’, and finally calculate ‘b’ divided by ‘a’. If the value (b/a) is greater than 1, editors may not convert the original pictorial cut to a Braille dots drawing without changing the graphic size. In this case, the necessary enlargement factor will depend on the numerical value of ‘b/a’.

As a specific example, this section explains how to convert the Japan Atlas used in junior high geography (Figure 4), to Braille dots drawing so that the atlas will fit a single page size in a Braille textbook.

The coastlines of Boso Peninsula, Miura Peninsula, and Izu Peninsula are used for the example (See Figure 6 and Figure 7). First, the lines used in the original atlas's coastlines are approximately 0.2mm in width. If the coastlines of Boso, Miura, and Izu Peninsulas are converted to Braille dots drawings with 1.2mm-wide lines, Miura Peninsula will touch Boso Peninsula (Figure 5) and Tokyo Bay will no longer look like a bay. In fact, the shortest distance between the coastlines of Miura and Boso Peninsulas on the original atlas is 1.2 mm between the line centers. If 1.2mm-wide lines were used, the distance between the two lines would be zero. That is, without changing the atlas size, it is impossible to convert Boso, Miura and Izu Peninsulas to a Braille dots drawing in the same proportion as the original atlas.

As stated earlier, if the standard value for the distance between these two lines is 2mm, editors must enlarge the atlas by at least 2.7 times to express these three peninsulas in the same proportion as the original atlas by using 1.2mm lines.

If the original atlas shown in Figure 5 is enlarged 3.0 times, which is slightly larger than the 2.7 times, the resultant Braille dots drawing atlas is as shown in Figure 6.

If there is an upper limit for the graphic size of Braille dot drawings, and the necessary enlargement factor is unavailable, editors need to simplify or deform the original

Figure 5 Braille drawings of three peninsulas (in full-size drav

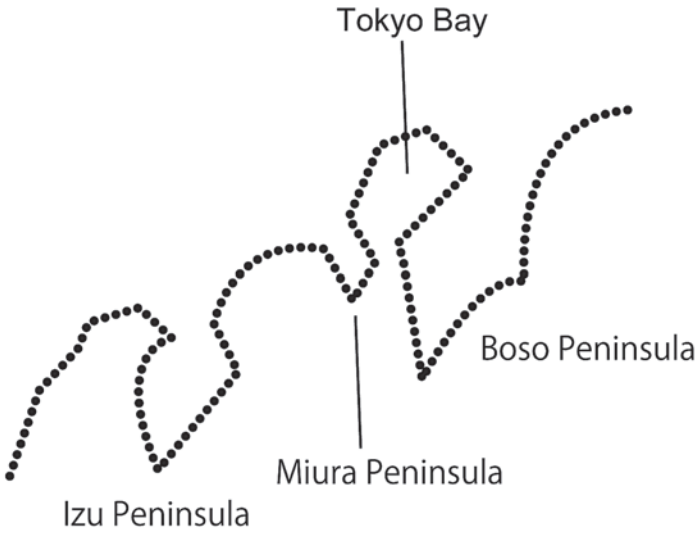


Figure 6 3-fold enlarged Braille drawings of three peninsulas (in full-size drawing)

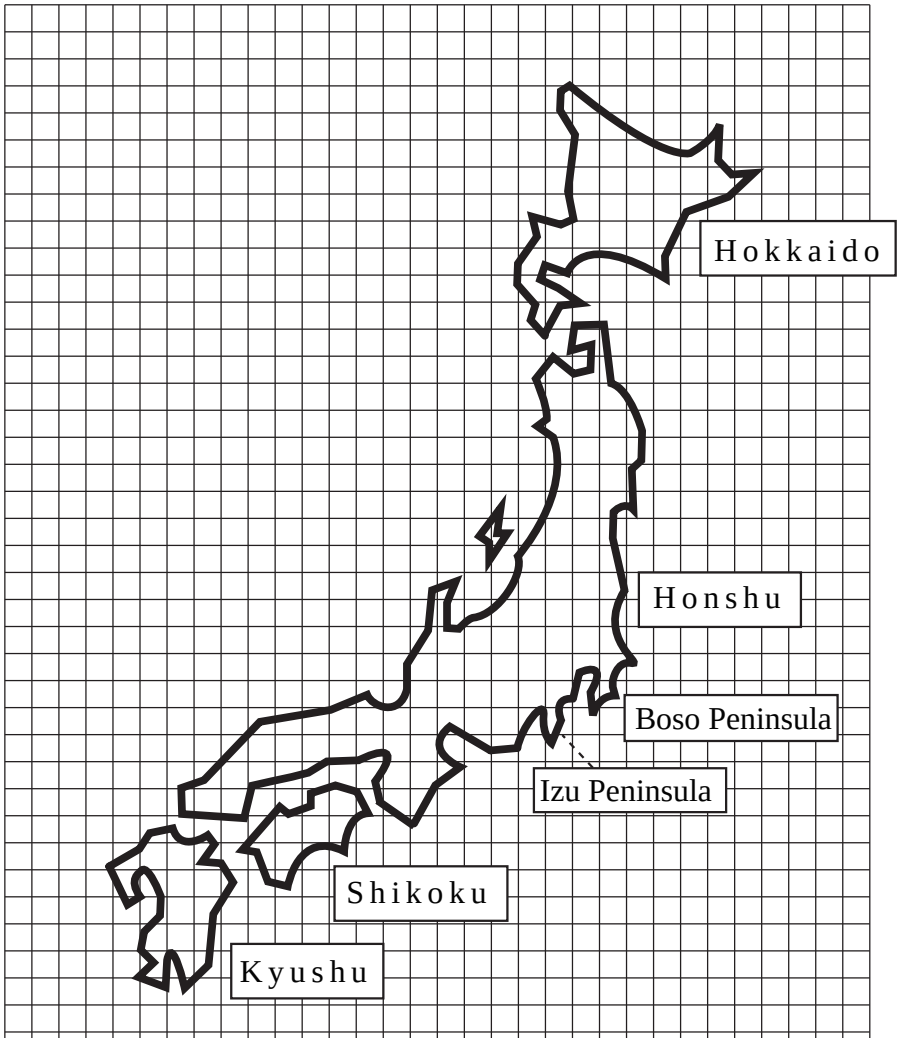


Figure 7 Braille drawings in the case of two components in 6x6mm grids
(The space among 4 islands Hokkaido, Honshu, Shikoku and Kyushu is larger than the original drawing so that it will stand at 2mm or longer.)

pictorial cuts.

（3）Number of components per unit area

The complexity of pictorial cuts is also measured by the number of components per unit area, such as the number of continuous lines and curves and the number of separated components.

If the number of components per unit area assumes a smaller value, the pictorial cut is simpler and less complicated. When making tactilely recognizable Braille dots drawings, how many components are appropriate per unit area?

Bris (2003) [2] recommends a 6 x 6mm grid should include only two tactile drawing components for each. As mentioned above, the number of components in this context includes the number of continuous components, such as continuous lines and curves. Bris (2003) insists on two components in a 6x6 mm grid for the following reasons: (a) a Braille letter plus a space with the next Braille letter would be almost equal to 6x6 mm; and (b) distinguishing Braille letters means distinguishing a pattern consisting of two elements, considered as two lines.

Further investigation is necessary to validate this criterion, as well as its theoretical base. However, it is an effective approach to create a certain sized grid as a unit area and to count the maximum number of components in the grids to quantify simplicity.

Figure 7 is an example of 6x6 mm grids and contour lines in the aforementioned Japanese atlas, based on above criteria, converted to Braille dots drawings to fit one page of a Braille textbook. In this case, some portions of the Japanese atlas, such as Miura Peninsula or Chita Peninsula, have necessarily been omitted. If editors intend to express these omitted portions, they need to convert them into Braille dot drawings by enlarging the portions.

4. Creation of Braille dots drawings suitable to types of pictorial cuts—simplification and essential information.

If editors intend to prepare a Braille dots drawings as simple as possible consistent with the abovementioned guidelines, it is important to omit less important information and to simplify the original pictorial cut so that important information is delivered to readers. For this purpose, editors need to identify what is essential information in the original pictorial cuts.

Simplification is not difficult if the original pictorial cut is less important in terms of its shape or may take a simpler shape. However, editors have a serious problem if the shape of the original pictorial cut is important. In this context, when converting to Braille dots drawing, it is useful to distinguish pictorial cuts in which their shape is important and those in which their shape is less important or is acceptable in a simpler shape.

Hereinafter, by distinguishing these two cases, this section distinguishes pictorial cuts from the viewpoint of what kind of information should be delivered to readers, and then describes more practical guidelines for various pictorial cuts.

（1）Pictorial cuts in which shape is less important or is acceptable in a simpler shape

a. Graphs

Graphs, including bar graphs, line graphs, band graphs, and circle graphs, essentially express numerical values in relation to a certain topic in the form of a bar, line, band, or sector form. For this reason, in most cases original pictorial cuts are also relatively simple. In this situation, a tactile drawing should only express bars, lines, bands, or sector forms, which are also tactilely understandable.

If expressing these data in Braille dots drawings, editors should only pay attention to the following points: (a) describing vertical/horizontal axes of bar or line graphs in a weaker tone than data lines or bars; (b) simplifying numerical values on these axes; (c) expressing background grids of graphs by embossing on the inside of the paper (Endnote 9); and, (d) describing bars of bar graphs as a series of dots in a row to three rows. By doing so, the resultant tactile drawing will be tactilely recognizable, even if it takes a similar form to the original graph. However, if the original graph is a plate-like 3D graph, looks diagonally, is a plate-like circle graph, or is an oval-shaped circle graph, editors should convert it to a 2D rectangle or circular form to make it tactilely understandable.

The following are examples of circle and line graphs from elementary school level Social Studies textbooks (See Figures 8 and 9). In these examples, the oval-shaped circle graph has been converted to a circular form, while the line graph is expressed in the same manner as the original graph.

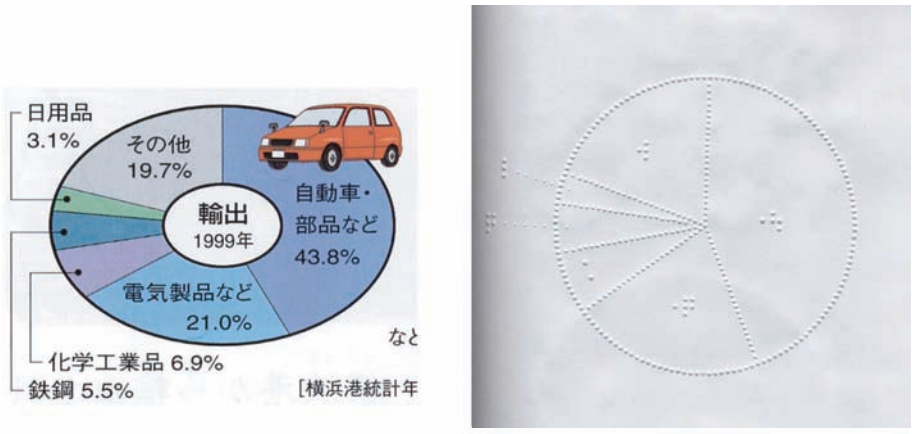
A problem occurs if multiple numerical values are provided in relation to a certain topic. In this case, editors may divide the graph to describe two or so numerical values for each of these graphs.

This strategy is also recommended in the elementary school level Social Studies chapter of the current Braille textbook editorial guidelines [8].

b. Schematic diagrams

Schematic diagrams graphically illustrate functions of a certain thing, configurations/interactions among various portions, or flow of goods or information. Rather than imitating the exact form of the original, schematic diagrams are often illustrated in a simplified or deformed manner. Some schematic diagrams illustrate intangible stuff as well.

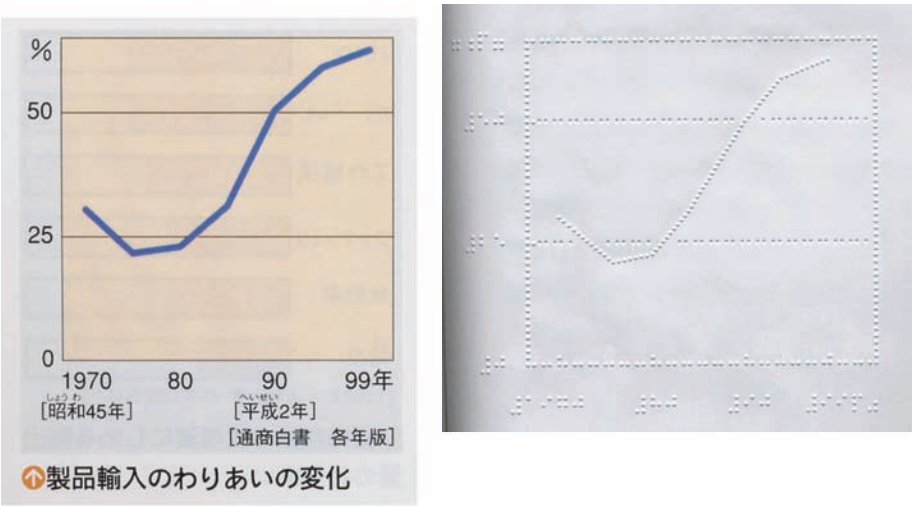
To be more specific, examples of schematic diagrams include creature's organic functions diagrams, electrical



a. Original Textbook: New Social Studies 5, Part 1; Tokyo Shoseki; pp.87; 2002 edition
(The subject of the graph is 'Trading Goods in Yokohama Bay'.)

b. Braille Textbook: Visually Impaired Person's Elementary School 5-3; pp.171; 2002 edition

Figure 8 Braille drawing of circle graph (Elementary school social studies textbook for 5th graders)



a. Original Textbook: New Social Studies 5, Part 1; Tokyo Shoseki; pp.92; 2002 edition

b. Braille Textbook: Visually Impaired Person's Elementary School 5-3; pp.227; 2002 edition

Figure 9 Braille drawing of line graph (Elementary school social studies textbook for 5th graders)

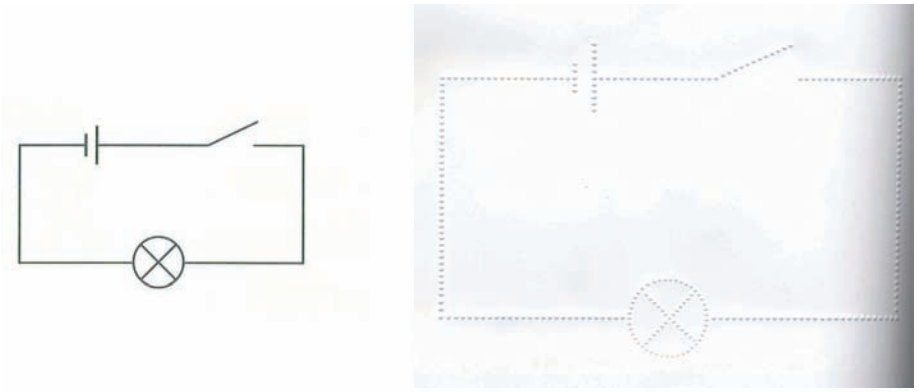
diagrams for science, and flowcharts for social studies.

Schematic diagrams by definition essentially illustrate functions of a certain thing, configurations/interactions among various portions, or flow of goods or information. Their shapes are not necessarily an emulation of their originals. They may take a simpler shape as long as they accomplish their purpose.

Original pictorial cut has rather simple shape in some cases. Even if it takes complicated shape, schematic diagrams may get simplified or deformed in an easily understandable manner as long as they deliver essential information.

Here is an example of an electrical circuit in the current Braille textbooks on science (see Figure 10). This example essentially illustrates how a battery, switch, bulb and electric wires are connected. Since the original pictorial cut is simple, this is an example of converting to Braille dots drawing as it is.

Then, although the original textbook illustrates a pictorial cut that looks similar to the real goods, here is an example of a pictorial cut that serves as a schematic diagram and is convertible to Braille dots drawing (see Figure 11). In this



a. Original Textbook: Junior High School Science 1st category; Kyoiku-Shuppan; pp.84; 2002 edition

b. Braille Textbook: Visually Impaired Person's Junior High School Science 1st category; pp.112; 2002 edition

Figure 10 Braille drawing of electric circuits (Junior high school science 1st category textbook)

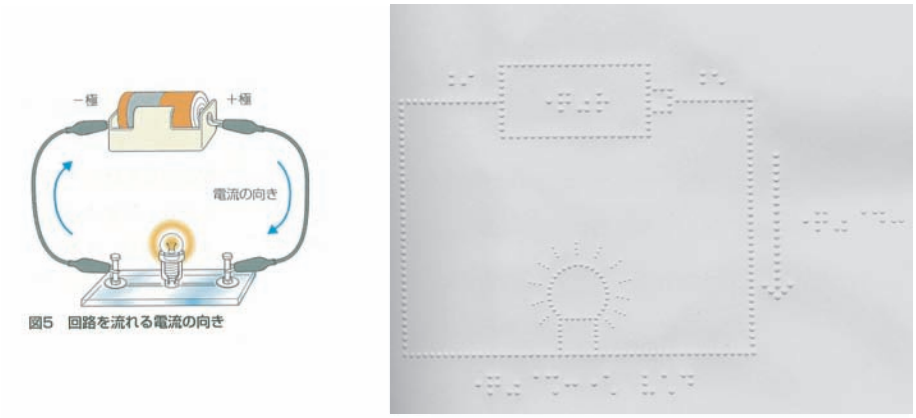


図5 回路を流れる電流の向き

a. Original Textbook: Junior High School Science 1st category; Kyoiku-Shuppan; pp.83; 2002 edition

b. Braille Textbook: Visually Impaired Person's Junior High School Science 1st category; pp.107; 2002 edition

Figure 11 Braille drawing of electrical current direction (Junior high school science 1st category textbook)

example, the pictorial cut essentially illustrates direction of electric current, and the shape of actual battery, miniature bulb or conductive wires, as shown in the original pictorial cut, is not so important. For this reason, they are illustrated in a simplified manner in Braille dots drawing. In addition, this example appropriately deforms the shape of positive electrode because it essentially illustrates the electrical flow from positive electrode to negative electrode.

By the same token, if experimental tools or experimented plants/animals are shown in an explanatory drawing for science experiment, and their configuration or task flow is more important than their exact shapes, then this kind of explanatory drawing should be treated in the same manner as schematic diagram. In the same manner, if a functional diagram of organs of living creature is able to get simplified as mentioned earlier, it is easily recognizable tactilely.

（2）Pictorial cuts in which their shape is important

a. Photos and pictures

Among photos or pictures of goods or animals/plants, there are ones in which their expressions are dependent on the shape of objects.

In this case, Braille dots drawings should express as similar shape as possible to original pictorial cuts.

Even in this case, if simplification is necessary, editors should simplify the pictorial cut, taking into consideration

essential information that should be delivered by the pictorial cut. For example, if a pictorial cut is designed to show a certain animal/plant species, it is necessary to put a priority on important characteristics that distinguish them from other species. If it is designed to depict a species group, for example insects in general, it is necessary to express their clear characteristics, such as three body sections (i.e., head, bosom and abdomen) and six legs attached to the bosom region.

b. Maps

Maps show actual landforms. The shape of coastal lines, river flow lines, and prefectural boundaries has meanings because it represents actual landforms.

On the other hand, if it has a complicated shape, tactile drawing of such map is not tactilely imperceptible.

As explained in the example of Braille dots drawing of Japanese atlas, if Braille users are supposed to understand the exact shape, proportion or positional relationship of Boso Peninsula, Miura Peninsula and Izu Peninsula, editors should pay due attentions to partially enlarging the atlas.

As explained earlier, if expression is necessary in a limited space, editors should omit minor information and depict rather rough information.

5. Addition of detailed text information

As explained above, editors should create Braille dots drawings in line with practical guidelines by simplifying the original pictorial cuts to deliver essential information to readers, taking into consideration the content of the original pictorial cuts. In addition, editors may offer text information on the Braille dots drawing before showing the Braille dots drawing.

In this relation, Japan Braille Library's Working Group on "Introduction to Tactile Drawings for translation into Braille" (1988) [12] calls for editors to include the text information as follows.

1) Basic concepts that should be known to readers before they read the drawing
2) Overall layout of the drawing
3) Explanations on each portion of the drawing
4) Explanations on explanatory notes in Braille (If inserting Braille explanatory notes in the drawing, necessary text information is unable to get inserted as a whole and is replaced with its summary. In this case, commentary on the text information is necessary.)

Providing such information prior to Braille dots drawing would facilitate reader's understanding of the Braille dots drawing. In particular, this strategy is necessary because Braille users are facing difficulties in grasping overall drawing at once due to their tactile field much narrower than visual field of ordinary persons. In other words, providing such text information prior to a drawing will compensate the limitations of tactile perception that only provides partial information and will facilitate understanding of the entire picture.

On the other hand, the current Braille textbooks do not include detailed text information to this extent. They include explanations on the marks in Braille dots drawings or explanatory notes in Braille (mentioned in above 4)) at best.

This is probably because Braille textbook editors assume that teachers would make explanations on Braille dots drawings in the classroom. However, more detailed text information would be necessary at least for children/students' self-study purposes.

Someone argue that Braille dots drawings would be unnecessary if text information explains Braille dots drawings. However, understanding from text information would be basically different from understanding by touching a Braille dots drawing.

In this relation, let us look at an example by referring to the said book 12) and actual examples of the said textbook. For example, as to Braille dots drawing that illustrates how convex lens would work in junior high school level science category 1 textbook as shown in Figure 12, the following text information might be provided prior to the Braille dots drawing.

> In this illustration, a convex lens is located vertically, and light comes from the left side, goes through the convex lens, and forms a focus on the right side.
> The convex lens is divided to five sections. The lines represent how the light goes through each of these sections. How much the light is refracted is different among these sections. The light is refracted at a larger angle at the top and bottom sections. Refraction gets weaker at the second section from the top as well as the second section from the bottom. In the center section, the light is not refracted and goes straight.
> For this reason, the light gathers at a certain point on the right side of the convex lens, forming the focus.

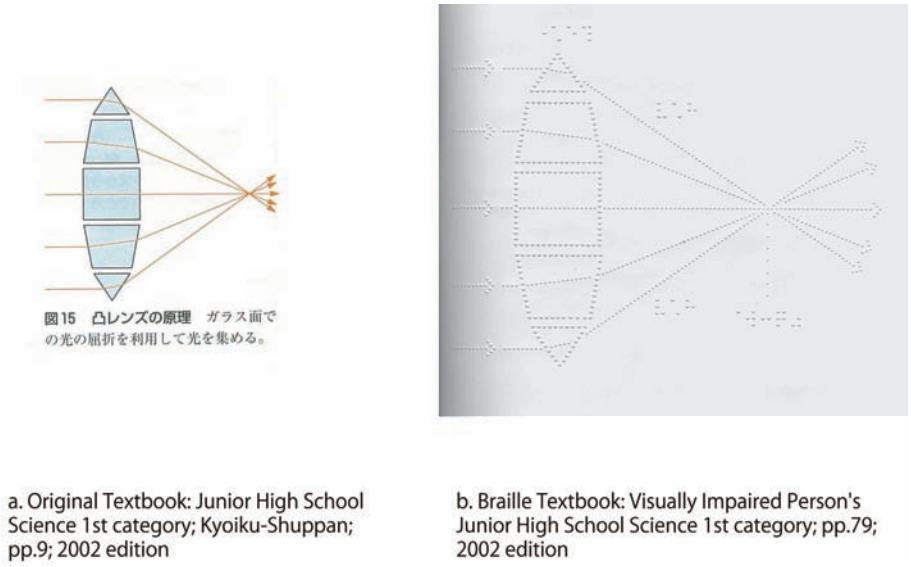
To enhance children/students' abilities of tactile drawing perception, the authors believe that children/students should read the text and touch Braille drawing by comparing between the text and the drawing.

IV. Discussion

1. Conversion to tactile drawing in Braille dots drawing form

As explained earlier, Braille dots drawings are unique format because they basically consist of dots only. They have some limitations, such as line width or shortest line length, resulting from dot types available.

In particular, as three dot types are only available,



a. Original Textbook: Junior High School Science 1st category; Kyoiku-Shuppan; pp.9; 2002 edition

b. Braille Textbook: Visually Impaired Person's Junior High School Science 1st category; pp.79; 2002 edition

Figure 12 Example of adding detailed text information (Junior high school science 1st category textbook)

Braille printers provide much narrower expressions than Braille textbook publishers, which are capable of using approximately 5 dot types.

If editors use Braille printers, they need to exercise their ingenuity for expressions in textbooks. It is expected that manufacturers will develop Braille printers equipped with a wider variety of dot types.

Such Braille printers are necessary because teachers need to prepare Braille dots drawings as teaching aids of Braille textbooks, or to provide Braille dots drawings for Braille users commuting to ordinary classrooms, where such Braille dots drawings are not printed at Braille printing houses.

This paper (see III. 2. (2)) argues that a single drawing should have three line types at maximum because tactile field is smaller. This does not mean that three dot types are enough. As for line types, it is important to use three line types (out of five types) in an appropriate manner, taking into consideration dots used for surface patterns or location points.

In terms of improvement in Braille printers, some problems are pointed out in a research project that prepared computer-based Braille dots drawings in line with those on Braille textbooks and evaluated the output from Braille printer [13]. One of the authors of this paper has worked on this research project. In this project, he prepared Braille dots drawings with Braille dots drawings creation software EDEL and Braille printer *ESA721 Ver. '95* mentioned earlier. Unlike Braille dots drawings on the textbook, he has found some problems: Dots are not neatly arranged in straight lines or curves; dots are not evenly distributed in some portions; and small dots are embossed higher than medium or large dots. In addition to the aforementioned problems, the authors hope that these problems get solved.

2. Simplification in preparing Braille dots drawings

As criteria for creating Braille dots drawings, this paper points out the distance between two points and the number of components per unit area.

From the past research projects, the former should be 2mm-6mm, or at least 2mm, while the 6x6 mm unit area should include two components at maximum in terms of the latter, as explained earlier.

Further examinations will be necessary to check out feasibility of these criteria. However, as tactile drawings should be simple as much as possible, editors should follow more concrete guidelines, such as giving the distance between two lines as large as possible, and reducing the number of components per unit area as much as possible.

Simplification in line with these criteria does not mean that editors should simply satisfy these criteria. As mentioned earlier in this paper, editors should simplify pictorial cuts so that their essential information will get delivered to readers, taking into consideration importance of their shapes as well as characteristics of pictorial cuts, such as graphs, schematic diagrams, pictures, photos or maps.

3. Making appropriate Braille dots drawings suitable to types of pictorial cuts

Rather than explaining how to convert all types of pictorial cuts to appropriate Braille dots drawings, this paper only discusses a limited number of pictorial cut types, such as graphs, schematic diagrams, photos, pictures and maps. For example, this paper omits geometric figures in mathematics. In addition, schematic diagrams include

various pictorial cuts with different characteristics each other. It is important to suggest practical guidelines for converting each of these graphic types to Braille dots drawings in an appropriate manner, and further efforts are necessary to do so.

However, as stated above in this paper, rather than exhaustively suggesting how to convert various pictorial cuts to Braille dots drawings, it would be more effective to suggest concrete and practical guidelines by sorting out pictorial cuts based on importance of their shapes as well as the essential information that they should deliver to readers.

4. Education expertise in preparing Braille dots drawings

As for the current Braille textbooks, editorial board members are responsible for selecting which original textbook's pictorial cuts should be converted to Braille dots drawings. In addition, they also give instructions on which pictorial cuts would not be converted to Braille dots drawings and should be replaced with text information.

These selections and instructions cannot be done without knowledge on visual disabilities and each subject of school curriculum.

This paper has argued that pictorial cuts should be simplified so that their essential information would get delivered to readers. This task cannon be done either, without knowledge on such subject and the contents of their portions. This also holds true when adding detailed text information to Braille dots drawings.

An important matter is who should do these tasks when translating textbooks to Braille textbooks for Braille users commuting to ordinary classroom. Rather than simply depending on Braille creation volunteer groups, visually-impaired person's schools in local communities should play more active roles in these tasks, for example.

Endnote 1: Braille dots drawing means a graphic that consists of dotted lines or dot patterns and embossed with dots similar to Braille dots used on Braille-use sheets.

Endnote 2: In vacuum-formed graphics, original drawings are duplicated in the following manner: (a) producing a convex original plate; (b) heat-treating the original plate after putting a plastic sheet on it; (c) softening-up the sheet and extracting the air from inside to closely attach the original plate and the plastic sheet; (d) detaching the sheet from the original plate.

Endnote 3: Zinc plate printing means embossing dots on paper by embossing dots at the same location on two zinc plates, and then inserting Braille-use paper between these two zinc plates and applying pressure with a roller. When preparing Braille drawings in this manner, tools may be used to manually emboss the dots onto the zinc plates. In addition, various types of dots are available, depending on the tools used. It is also possible to neatly prepare straight lines, curves, and surface patterns by adjusting embossed dots.

Endnote 4: Hereinafter, all Braille textbooks cited in this paper are the current 2002 version, as are all original textbooks corresponding to the Braille textbooks.

Endnote 5: Braille textbooks also include short lines as well as arrow-head-like combinations of short lines ("<" and ">") printable with the tools available at Braille printing houses.

Endnote 6: Another printer, NewESA721, that belongs to the same product series as ESA721 Ver.'95, is also compatible with Braille creation software. There is no difference in dot types and dot sizes.

Endnote 7: Different Braille textbooks use slightly different dot types. This is probably due to the differing dot types used by Braille textbook publishers and Braille dot creators.

Endnote 8: The Braille drawing creation software, EDEL, is capable of adjusting the distance between dots. The abovementioned data represent the distance between dots with the numerical values 6, 4, or 7 when EDEL is used for creating Braille dots drawings.

Endnote 9: "Embossing on the inside of paper" means embossing a dot on the opposite to the ordinary side of paper. Ordinary dots take a convex shape, but "embossing on the inside of paper" will yield hollow-like dots.

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- Received August 30, 2004; Accepted November 22, 2004 -

NISE Bulletin, 10, 29-40, 2010

Ideological Genealogy Underlying "Individualized Education Support Plans"

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Abstract: The government of Japan has implemented various programs to replace "special education" with "special needs education." In this context, the development of "Individualized education support plans" is one key element. This paper identifies new aspects of "individualized education support plans" from the perspective of their necessity for educational and non-educational objectives, in particular welfare objectives and analyzes their historical and ideological meaning.

Key Words: Special needs education, individualized education support plans, welfare, ideological genealogy

I. Introduction

The government of Japan has implemented various programs to reform special education in particular by replacing "special education," with "special needs education" [1]. In this context, "special education," means the provision of education at special locations, depending on the child's degree of disability, while "special needs education," refers to the provision of educational support suitable to the educational needs of each child/student with disability.

According to the basic principles of "*The Future Directions of Special Needs Education (Final Report)*" released in 2003, this systemic reform has the following purposes: (a) to address/ to cater to the needs of/ to meet the needs of children who have Learning Disabilities (LD), Attention Deficit – Hyperactivity Disorder (ADHD), or high-functioning autism (HFA) enrolled in regular classrooms; (b) to pay due attention to changing perspectives on disability in the international community; (c) to provide flexible education tailored to the educational needs of each child; (d) to adopt the viewpoint of children/students; and (e) to take into consideration the decentralization of power from central to local governments.

In response to the report, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) established the Special Needs Education Ad-Hoc Committee under the auspices of the Central Council for Education. The Ad-Hoc Committee has met 22 times since March 2004, and on 8 December 2005, the Central Council for Education submitted a report entitled "*Appropriate Framework to Promote Special Needs Education*." This called for a review of the special education school system, a re-examination of programs at the elementary and lower secondary school levels, and a review of the teacher credential program. To comprehensively institute special needs education, the report highlights the necessity of preparing individualized education support plans, appointing special needs education coordinators, and establishing regional special support cooperative councils [2].

Preparing individualized education support plans is meaningful because these plans aim to provide comprehensive support for the entire life of a child with a disability/(the entire lives of children with disabilities) and more effective education services by involving relevant organizations, and because they are also future-oriented to form local networks to support children with disabilities by accumulating individualized education support plans for each child.

Some researches explains the origin of individualized education support plans from an historical perspective [3], but only a few studies date back further to explain the historical viewpoint of nations that have come to guarantee the welfare of their citizens. It is only possible to understand the true meaning of the concept of individualized plans as a human right only following an overview of such historical developments.

In addition, a welfare state absolutely requires fiscal economic capability. The authors note the socioeconomic paradigm shift behind current reforms in Japan. Children with disability go-out into the real world after schooling so "individualized education support plans," will surely depend on what theses children are expected to do in that society. In this context, this paper briefly discusses the paradigm shift in special education in terms of capitalism and democracy,

that are the fundamental principles of modern industrialized societies and also examines how disability-related legislation has turned into/has been manifest as the “Services and Supports for Persons with Disabilities Act.”

As mentioned above, this paper identifies new aspects of "individualized education support plans" from the perspective of their necessity for educational and non-educational objectives, in particular welfare objectives, and analyzes their historical and ideological meaning.

II. Education from the Perspective of the Welfare State

This section briefly discusses the history of the welfare state as the background for education by the state. This is because education for children with disability only works well in collaboration with welfare services for children and for persons with disability. The concept of individualized support plans first appeared in the, “Five-Year Plan for Implementation of Priority Measures” in Basic Programme for Persons with Disabilities (December 2002). To understand the objectives of this basic programme, it is necessary to clarify what a welfare state is. Hereinafter, this paper examines how the ideology of the welfare state has been actualized from an historical point-of-view in Japan and in the rest of the world.

1. Steps Toward the Formation of the Welfare State

This section looks back on how the welfare state has been actualized in the world history, in particular from the perspective of Marshall (1950) [4]. It will then explore how “basic human rights,” “freedom and rights,” “the right to live,” and “the right to education,” are established in statutory form, for what purposes and in what order.

In the eighteenth century, from the viewpoint of guaranteeing rights, citizens (the capitalist class) demanded of the government (the privileged class) to guarantee civil rights, in particular property rights and freedom of contracts as the foundation of the capitalist economy. The “right to education,” may be viewed as forming one part of these civil rights. However, since they intended education for the capitalist class at that time, in particular tutoring at home or education for children of the capitalist class, the right to education did not necessarily mean public education as we see today [5].

In the 19th Century, governments have come to guarantee political rights by easing restrictions on political suffrage based on gender or tax payment while at the same time increasing the number of citizens with voting rights to assure state legitimacy. As the working class grew as a social force, workers also expected their children to be educated in schools financed by public expenditure. In the late 19th Century, free-competition capitalism structurally shifted to monopolistic capitalism. In this paradigm shift, governments required mass nationalism to unite their peoples (that is, all citizens including the working class) to exercise control over the labor movement. This is how the welfare state was formed through government intervention. National education systems were established to operate as *the cultivating apparatus of nationalism*. In the Meiji era, the Japanese government viewed Prussia as a model of the world’s first welfare state. The right to education emerged as a civil right for the education of the capitalist class and was a right in which the government was unable to intervene, but since that time, it has grown into a public education right to which the government can intervene.

In the 20th Century, social rights were added because the inherent inequity of capitalism developed into a social problem. As poverty, disease, lack of access to education, unsanitary living environments, and unemployment hampered national reconstruction after WWII, analysts called for the government to comprehensively guarantee national minimum standards. The typical example of this trend is the, “*Beveridge Report*”[6] in the UK, which proposes a basic model for welfare states in developed Western nations. Despite some differences in welfare service levels among nations, since the mid-twentieth century, industrialized capitalist nations generally followed the path towards the type of modern welfare state that guaranteed basic welfare services for their citizens. On the other hand, in socialist nations during the Cold War era, the welfare state had exactly been their national goal.

2. Criticism of the Ideology of the Welfare State

The Cold-War structure in the post-WWII period has led to conflict over political ideologies in developed nations. The degree of development of a welfare state is related to the political ideology of the nation. During this time, social democrats were influential and calling for a planned socialistic economy by correcting excessive capitalism. However, the capitalist class also accepted welfare services because better employer-employee relationships were expected to contribute to corporate growth backed by economic growth. Economic growth has improved social welfare programmes, that is directly associated with an aging population in developed countries, and bloated administrative organizations [7].

The pressure for change in the idea of the welfare state was the global slowdown in economic growth because the resources required for social security were supplied by economic growth. The aging of the population and the social security system of the welfare states in developed countries had crossed the threshold even before the economic slowdown had begun.

In the 1980s, in this context, Margaret Thatcher in UK and Ronald Reagan in the US came to power and criticized the concept of the welfare state from a neo-

liberal perspective. They criticized (a) its non-economic aspects (i.e., lower incentives for investment and labor), (b) its unproductiveness (i.e., the shift of capital and human resources from the private sector leading to a bloated bureaucracy), (c) its inefficiency (i.e., unsolved poverty, and negative spiral of dependence on government), (d) its authoritarian regime (i.e., stronger social control through bureaucratic dominance), and (e) its denial of freedom (i.e., no choice in welfare services and heavy taxation). Neo-Liberalism advocates absolute distrust in human rationality and assumes that even rational judgment inevitably results in human errors. For this reason, they attached higher values to trial-and-error in the free private sector than monopolistic intervention by the State [8]. In addition, as the Cold War ended in 1989 following the collapse of the Berlin Wall, the transition to social democracy, as argued by traditional political leftists, had become an unrealistic option.

Why did economic growth slow? According to Keynesian economics, government intervention should lead to sustainable economic growth and full employment. As an explanation for this phenomenon, in organized capitalism with highly-organized workers and capital, mass production and mass consumption has been progressing, and government intervention is able to create effective demand through public works and monetary policy. However, if the economy shifts to high-mix low-volume production, workers are divided into full-time skilful workers and unstable peripheral workers, sending down the trade union membership ratio. This prevents consensus building and benefits sharing through labor-management cooperation that results in the failure of centralized, comprehensive government intervention. In addition, economic globalization has also diminished the effectiveness of government economic interventions in a single nation.

Slightly deviating from the main subject of this paper, new social movements spread out on a global scale at the same time as criticism was voiced against welfare nations. First, women, minorities, persons with disability and others whose rights were not fully guaranteed began to criticize policymakers. In Keynesian-style welfare nations, continuously employed regular workers enjoyed the highest old-age pension benefits. In other words, they were societies most favorable to adult males, the ethnic majority, and able-bodied persons. As a result, discrimination based on gender, race, and disability emerged. In addition, since economic growth also led to environmental pollution and destruction that would eventually erode human welfare, environmental problems became an issue of social concern.

For these two decades, industrialized capitalist nations have come to face common problems that cannot be solved by ideology, such as economic globalization, the pursuit of environmentally friendly and sustainable economic growth, an aging society, unemployment, in particular for young people, and increasing homelessness. Policymakers are expected to actively address these cross-class problems through education, welfare reform, economic policy, environmental protection, and crime prevention. Modern society is very unstable because capitalism is unable to coexist with the modern welfare state but, at the same time, cannot exist without it [9].

3. New Development of the Welfare State

This is so-called “welfare pluralism,” or “the welfare-mixed economy,” that recognizes problems and contradictions in welfare states and suggests possible solutions. These concepts encourage plurality of welfare service suppliers, rather than exclusively depending on the welfare services of the state. One of the important purposes of social policies is the redistribution of resources to correct inequality resulting from capitalism In this resource redistribution process, in most cases, the government forcibly collects taxes and insurance premiums and provides welfare services, pension benefits, and allowances. There are several channels for this redistribution process. For example, child allowances and a reduction of income tax for dependents also yields similar effects, although the former represents increased revenues for households, while the latter leads to decreased expenditure. In addition, family allowances provided by corporations also bring about similar effects. This concept is sometimes called the “Social role-sharing of welfare services” [10].

Recently, the informal sector, such as households or neighbors, as well as the private non-profit sector is also considered to play an important role in the provision of welfare services. In particular, many nations attach importance to the redistribution process through the private non-profit sector. Recognizing the importance of this private non-profit sector, the report of the Wolfenden Committee (1978) [11] describes four categories of the most popular welfare service suppliers in the United Kingdom (i.e., the voluntary system, the informal system, the commercial system, and the statutory system), and aims to analyze the social services provided by private non-profit organizations. Before making such analysis, the Wolfenden report also discusses the overall system for providing social services. Highlighting that the four types of service providers to satisfy social needs that cannot be met by individual citizens, the report calls for a pluralistic supply framework in which each of these service providers plays their own role, rather than exclusively depending on only one service provider.

In reality, the shift to a welfare mixed economy did not occur in the late 1970s. Ever since the state became involved with welfare, these four sectors blended to form current welfare services provision [11]. Since the 1980’s onward, due to the arguments about the welfare mixed economy,

there has been progress in the analytical method of welfare due to developments in international comparative research between welfare states and the promotion of community care within each state. As a result, rather than addressing public-private role-sharing primarily intended to scale-down the role of governments, analysts and policymakers began examining where to collect necessary financial resources (i.e., tax, insurance, or self-pay burden), who should control service quality, what kind of role government should play, what kind of role NPOs and private enterprise should assume, and what kind of relationship (balance) should be maintained. We also add that within modern welfare states, education is also managed using the concept of a mixed economy[2].

III. Characteristics of Social Welfare in Japan: Focus on State Responsibility and Social Solidarity

1. From Post-war Reconstruction to the Welfare State

Following WWII, Japan started national reconstruction as a new democratic nation under a new constitution. With almost all citizens starving (malnourished?), there were about 8 million people, including returnees from overseas, in need of social help. The GHQ document, "*Public Assistance*" stressed the principles of (a) nondiscriminatory equality, (b) state responsibility (i.e., the separation of public and private), and (c) the necessity to provide social assistance as much as possible within the limits imposed by the overall budget). Consistent with these principles, the Japanese government established a basic framework of social security in the post-war recovery period. Rather than being based on the pre-war concept in which the public was at the emperor's mercy, the government emphasized state responsibility for citizens (i.e., private individuals).

The "*Recommendations on the Social Security System*," in 1950 ("*The 1950 Recommendation*") defined the direction of the post-war social security system in Japan and called for state responsibility to coherently and comprehensively implement with public assistance, public health, and social welfare programs centering on social insurance programs. As for social solidarity, the 1950 Recommendation concluded that, "As long as the state assumes such responsibilities, citizens must also respond to the state's efforts and must, with a spirit of social solidarity, assume their social obligations necessary for maintaining/operating this framework." Japan then implemented with social security and social welfare legislation during the period of high economic growth since the mid 1950s. The "right to live," is also guaranteed as a social right under state responsibilities. While gradually evolving towards a modern welfare state, since the 1960s Japan has improved its social security programs in a context of high economic growth.

The 1962 "*Report on Basic Policies for Comprehensively Coordinating Social Security Programs and Recommendations on Implementing with Social Security Programs*," ("*The 1962 Recommendation*") reexamined the issue of an appropriate social security system for solving the income gap problem emerging in the high economic growth period and called for the improvement of public assistance and social welfare. As for social solidarity, the 1962 Recommendation mentions, "To develop this framework in a sound manner, it is necessary to organically combine it with the government's other policy actions, win sufficient understanding of this framework among citizens, and permeate (a) vivid atmosphere of social solidarity among citizens," placing top priority on the public responsibilities of the state. At best, the recommendation merely calls for citizens to recognize their daily social solidarity as a moral standard.

During the high economic growth period, social welfare programs have improved. Japan has seen the implementation of universal health insurance coverage and universal pension coverage during this period and in the early 1970s, introduced free-of-charge medical care services for the elderly and a price-indexed pension program. These are all in preparation for Japan's aging society of the future, and the year 1972 could be described as the first year of the modern welfare era. By describing this as a "Guarantee reasonable living standards through social solidarity," social security law experts recognize that the concepts of social solidarity have yielded successful outcomes, such as social insurance programs. In this process, the intergenerational insurance/pension funding system (i.e., present elderly persons are supported with insurance premiums collected from younger generations) was established. In this period, rather than simply providing social security programs through social solidarity as a moral standard, the government has provided substantive social security programs backed by legislation. The trend of sector-based social security expenditures (Figure 1) illustrates social security-related issues on a time-series basis.

2. Re-examination of Welfare Programs and the Change in Quality of Social Solidarity

Following the oil shock of the late 1970s, Japan began to reexamine social security programs in a context of lower economic growth. The central government's documents began emphasizing social solidarity as a moral standard, specifically family nursing care, mutual assistance between neighbors, and corporate welfare programs. The expression, "Japanese-style welfare society," emerged at this time. For example, cabinet approved the "*New Socioeconomic Seven-Year Plan (1979),*" that stated,

> As Japan has almost caught up with developed nations in North

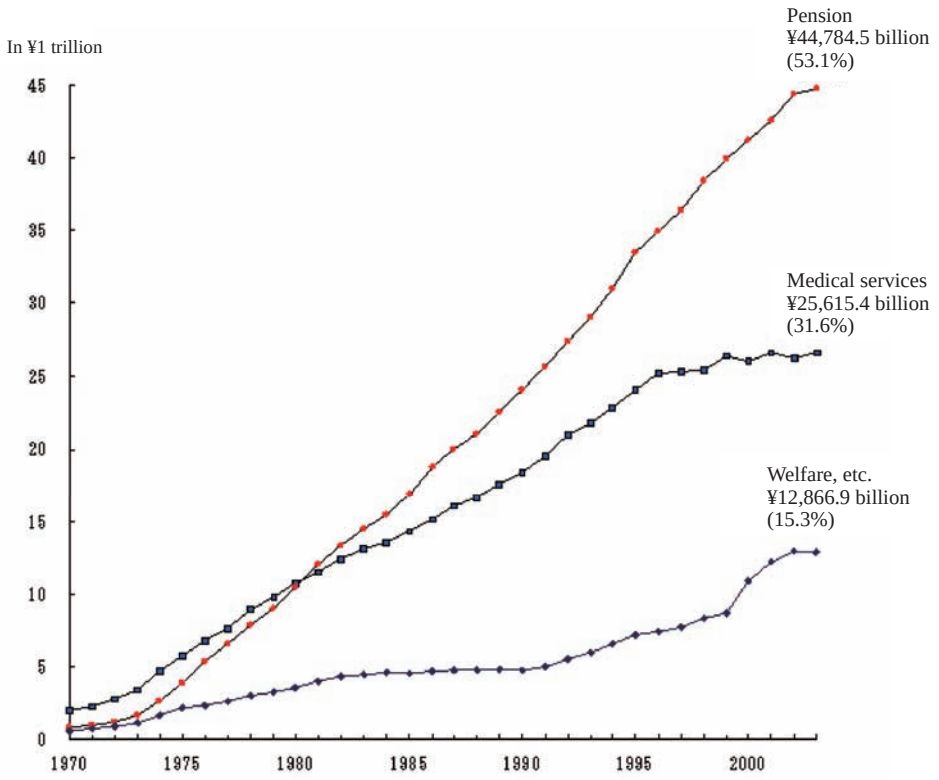

Figure 1 Sector-based social security benefits expenditures
(http://www.ipss.go.jp; Data come from the FY2003 social security benefits expenditures.)

> America and Europe, Japanese citizens should start to seek for qualitative improvement, shifting away from quantitative expansion…….Basically, Japan should create a new-style welfare society by taking advantage of its socioeconomic characteristics, such as a strong work ethic among its people and a high-level of social mobility. To this end, in addition to improving the living standards of Japanese citizens by taking advantage of a free economy’s creative vitalities, highly-efficient government should emphasize the guaranteeing of public welfare services, while solidarity circles should be formed in local communities based on the independent mindedness of citizens and stable households so that each Japanese citizen is able to achieve a fulfilling social life.

In this type of Japanese-style welfare society, citizens should first make self-help endeavors, then, if it is impossible, they should be supported by the solidarity of the local community. Public assistance is a last resort measure. Obviously, social solidarity is a moral standard of citizen cooperation and should not serve as basic principle for achieving public social welfare. The democratic principle calls for “private individuals” to assume public responsibility as a member of Japanese society.

In 1982, the 2nd Ad-hoc Commission on Administrative Reform released its report “*The Third Report on Administrative Reform: Basic Report - Constructing Energetic Welfare Society*.” This is also based on self-help, mutual assistance, and private-sector vitality, while recognizing social solidarity as a tool to reduce public expenditure. Advocates of a “Japanese-style welfare society,” or “the construction of an energetic welfare society,” emphasize social solidarity as a moral standard for Japanese citizens and intend to reduce public expenditure by attaching greater importance to mutual assistance (daily cooperation between citizens). This is a similar trend to neo-liberalism in the US and UK. In other words, by reexamining social solidarity based on government programs at that time, the government began attaching greater importance to the concept of social solidarity in terms of private mutual assistance between citizens.

3. Social Welfare Basic Structural Reform and Exploration of the New Social Solidarity

In the 1990s, the third comprehensive recommendation was released to set forth the direction of social security in the future. This recommendation puts additional emphasis on social solidarity. In 1995, the Social Security Council released the report entitled, “Reconstruction of Social Security Programs” (“*The 1995 Recommendation*) that explains the basic philosophy of social security, as follows:

> Social security programs have expanded to cover all people in

> Japanese society. In addition, Japanese citizens are supposed to pay social insurance premiums, taxes, and support/build social security programs. To this end, Japanese citizens should fully understand social security programs, have a sense of ownership of these programs, and actively participate in them. It is also cooperation in societal context of mutual help to address difficulties that might be faced by any individual. In this sense, social security should be the proof of 21st Century's social solidarity that is beneficial for all people, created by all people, and supported by all people. This is the basic philosophy of social security for the 21st Century.

The 1995 Recommendation also states,

> The most important thing is that all citizens should have the social security mindset; in other words, a strong sense of self-help and social solidarity. In addition to intra-generational mutual help, such as healthy people supporting sick people and working people supporting unemployed persons, there is intergenerational support, including public pension programs mostly dependent on payments from younger generations. In a society where most people live longer, those who have supported the elderly when they were young will be, in turn, pension beneficiaries in the next era. In other words, long-term social solidarity is the basis of social security programs. In addition, social solidarity is not a mutually dependent relationship, but giving "a helping hand," and living together with other people in a similar fashion to fulfilling responsibilities for their own, or for their family members. In this context, if the elderly make an effort to take care of themselves by maintaining good health and staying self-reliant, younger generations will be more willing to understand and support the elderly.

In the reform plan section, the 1995 Recommendation also addresses education, stating,

> To foster the mindset of "caring about other people," or a "welfare spirit," and the concepts of cohesion and solidarity among citizens, efforts based on long-term perspectives are necessary. While respecting the self-motivation of each citizen, the government should implement with fostering "a social solidarity mindset" and provide welfare education in schools, corporations, local communities, and other locations centering on home education.

In particular, the phrase, "social solidarity" is frequently seen in the 1995 Recommendation. The recommendation recognizes social solidarity as basic relationship, mutual assistance, and cooperative relationships in the human society and calls for citizens to fully understand these relationships. In this context, "social solidarity" refers to public responsibilities, and stays as a moral standard.

When the 1995 Recommendation was released, various criticisms emerged. Above all, was the criticism that the government intended to avoid public responsibility by using the phrase, "social solidarity," demanding spontaneous solidarity, or mutual help between citizens. When comparing the arguments of the 1995 Recommendation and those of the October 2005 MEXT report, "*Redesigning Compulsory Education for a New Era*," an interesting phenomenon is demonstrated. As for the objectives and principles of compulsory education, the MEXT report states,

> Compulsory education has two purposes: Developing the character of individual citizens; and nurturing people to make up the nation and society. These two purposes remain unchanged in any period. Compulsory education plays an important role so that children are able to develop their character, be independent, cultivate their individuality, unleash their potential to its maximum, and build up the foundation to lead a happy life regardless of their career. It is necessary to foster citizens so that they will be able to strongly and affluently survive in a rapidly changing society by thinking and taking action on their own. At the same time, compulsory education should foster individual qualities necessary for building a democratic and peaceful nation and society.

It also emphasizes public responsibility by adding,

> As compulsory education has these purposes, schools should provide high-quality education by striking a balance between knowledge, virtue, and a healthy body at any location in Japan and it must be a reliable location to which parents are able to send their children without anxiety. The central government needs to guarantee equal opportunity, quality assurance, and charge-free *free-of-charge education services as set forth in the Constitution so that citizens will have equal access to high-quality education. In particular, improvement in compulsory education is absolutely necessary as a safety net that guarantees a certain level of education to all citizens without regional gaps and prevents deteriorated inequalities and the creation of hierarchization.

On the other hand, the government's stance of nurturing citizens through compulsory education suggests that social solidarity based on individual freedom, that is, democracy, has not yet taken root in Japan. This Japanese-style solidarity is the same as the solidarity as a moral standard emphasized in Japan in the early 20th Century. When contemplating the meaning of "self-reliance" in developing individualized support plans for persons with disability, such Japanese-style solidarity is problematic.

In the mid 1990s, the government commenced social welfare structural reforms consistent with the aforementioned recommendation. In 1998, the Social

Welfare Basic Structural Reform Taskforce of the Central Social Welfare Council released an interim report entitled, "*Social Welfare Basic Structural Reforms*," that outlined the reform principles. It stated:

> "In a matured society, citizens should basically support their life by themselves under their own responsibility. However, due to problems in their daily life, citizens are sometimes unable "to stand on their own feet, with their own effort. Rather than protecting only a limited number of citizens as in the past, social security in the future should aim to provide social solidarity-based support for all citizens experiencing such difficulty and support their self-reliance so that each citizen will be able to lead his/her life in their own household or local community with the dignity as human beings, regardless of disability or gender.

The 2000 Social Welfare Act, which passed the Diet as a part of the Social Welfare Basic Structural Reform initiatives, gives higher priority to self determination of the consumer and choice of contract-based service suppliers, shifting away from traditional welfare services. In this context, the government is expected to provide support for this purpose. Related to this, Article 25 (The Right to Life, and state obligation of the state to guarantee that right), and Article 13 (i.e., respect for individuals, respect for life, freedom, and right to seek for happiness), expressed in the Japanese constitution are important. As mentioned in the preceding section, Article 13 originated from a civil right free from government intervention. However, by employing a different logic to Japanese-style welfare society theories (i.e., a shift from welfare services determined by local agencies to contract-based support chosen by the consumer), the Social Welfare Structural Reform emphasizes self-determination, self-responsibility, and social solidarity, while at the same time recognizing self-reliance.

Is the self-reliance of people with disabilities covered in Article 25? Or, is it covered in Article 13 of the Japanese constitution? This is an important difference. If it comes from social rights requiring government intervention, the public responsibility will inevitably expand relative to the past. In nature, it should be covered in both. A Japanese-style social welfare state must be based on the philosophy of the self-reliance of persons with disability who is respected even in social solidarity (as guaranteed by Article 13).

4. Potential for Social Solidarity in Japan

The 2000 "*Report of Taskforce on Appropriate Social Welfare for People requiring Social Supports*," states the creation of new "public" concept,

> It is necessary to restructure the 'current relationships' and seek for social welfare to include all people as society members (i.e., social inclusion) in a way to protect them from solitude, isolation, exclusion, or conflict and bring about a healthy and cultural life. To this end, flexible operation of public programs as well as the restructuring of voluntary support schemes in local communities is necessary. In particular, local governments are expected to achieve a 'mutual support society' through broad participation of local residents to develop and operate regional welfare plans in accordance with the Social Welfare Act, which will come into force in April 2003. In addition, it is desirable to create a new 'public' concept by forming cooperative relationships and linkages among various programs, organizations, and groups in local communities, such as social welfare councils, local governments, NPOs, Co-ops, agricultural cooperatives, and volunteers.

As mentioned above, public-private affairs are both an old and new problem. Government intervention expenditure was introduced with the recognition of the government that "private" is under the control of the "public" due to private facilities' long-term financial difficulties since the pre-war era and the public sector's dependence on the private sector. In the 1970s, Japan managed "the dollar shock" and "oil shock" and enjoyed a period of economic prosperity. "Japan as Number One," was phrase used by some analysts. After the subsequent "economic bubble," Japan has suffered the same problems as experienced by other advanced nations. In Japan, as it took a longer time than anticipated to overcome the post-bubble economic recession, it was at the time of Hashimoto Administration that the government proposed six major reforms; these were economic structure reform, financial system reform, social security structural reform, fiscal structural reform, administrative reform, and education reform. A succession of prime ministers following the Hashimoto Administration implemented with these reform plans.

Education reform was the last initiative. On 26 October, 2005, the Central Council for Education released the report, "Redesigning Compulsory Education for A New Era," which is a summary report setting forth future directions for education reform. This resulted in an amendment to the Basic Act of Education for the first time in the post-war era.

As education services for children with disability, special needs education is in accordance with the concept of Japanese-style social solidarity. But even now, "special education" is used from the context of Article 26 (the right to education). Individualized support plans care about persons with disabilities for their lifetime. In this sense, it is necessary to reaffirm that these plans serve as a bridge between education and social security, including welfare services. In addition, it is also necessary to understand the meaning of "self-reliance" or "support," in the historical context of the welfare state.

IV. Background of Individualized Education Support Plans

1. History of Policy for Persons with Disabilities in Japan

(1) Background leading-up to the 2002 Basic Programme for Persons with Disabilities

In December 2002, cabinet approved the, "*Basic Programme for Persons with Disabilities*," which inherit the concepts of "rehabilitation" and "normalization" writing in the "*New Long-Term Plan of Measures for Persons with Disabilities" (1993-2002)*. This defines basic policy principles for persons with disabilities for the 10-year period from 2003 to 2012 to further implement (expand the opportunities for) with the social participation of persons with disabilities. This "*Basic Programme for Persons with Disabilities*" describes priorities of problems to be solved by government, basic principles for each policy, and basic directions of possible policy actions. In this context, the principles of "normalization" means (a) creation of a cohesive society in which all persons, with and without disabilities, will support each other and respect their personality and individual character and (b) that persons with disabilities should enjoy human rights as an equal member of society, participate in society's activities under self-selection and self-determination, and assume their responsibilities as social members. In addition, as cross-cutting viewpoints for addressing these issues and future directions, the plan also calls for the (a) implementing a barrier-free society, (b) the provision of consumer-centered support, (c) policy action appropriate to characteristics of specific disabilities, and (d) the promotion of comprehensive and effective policy action.

From the first basic program for persons with disabilities —"*Long-Term Plan of Measures for Persons with Disabilities*" (1982-1992)—to the aforementioned, "*Basic Plan for Persons with Disabilities*," Japan's basic plans on the policy actions for persons with disabilities are linked with the action plans/programs for persons with disabilities of the United Nations, and have been conducted in a seamless manner.

For example, "*Long-Term Plan of Measures for Persons with Disabilities (1982-1992)*" is linked with the "United Nations Decade of Persons with disabilities," while "*New Long-Term Plan of Measures for Persons with Disabilities*," is linked with, "The Asia and Pacific Decade of Persons with disabilities." The "Biwako Millennium Framework (2002)," a high-level intergovernmental meeting held in the final year of "The Asia and Pacific Decade of Persons with disabilities" declared an extension of "The Asia and Pacific Decade of Persons with disabilities (1993-2002)" for an additional period of 10 years (2003-2012), on the initiative of the Government of Japan. In addition, the Framework participants also recommended regional policy actions of governments and stakeholders in the region to attain an inclusive, barrier-free society that respects the human rights of persons with disabilities.

In other words, "Basic Programme for Persons with Disabilities," is in accordance with the action plan of the "Biwako Millennium Framework (2002)." In addition, the basic principle of the action plans/programs for people with disabilities of the UN, which underlie a series of these programs, is the spirit of "full participation and equality for persons with disabilities."

In this context "individualized education support plans" have originated from the "Basic Programme for Persons with Disabilities" and the action plans/programs for persons with disabilities of the United Nations.

2. The origin of policy action for persons with disabilities in Japan

To understand the essence of UN action plans/programs for persons with disabilities, this section briefly explains the origin of the "normalization" concept, which serves as the basic principle of Japan's policy actions for persons with disabilities.

"Basic Programme for Persons with Disabilities," only describes "normalization" as "a philosophy aimed at a society where persons, with or without disabilities, are able to equally participate in social activities and lead self-reliant lives," but it does not explain in detail the necessary environment, code of conduct, or other principles of "normalization." Hereinafter, this section outlines the normalization concept, which serves as basic principle of Japan's policy actions for persons with disabilities.

(1) Overview

"Normalization" was first proposed by Bank-Mikkelsen in Denmark. At that time (1951-1952), Mikkelsen worked with a parent association of people with intellectual disability in Denmark, and he was asked to draft a paper demanding improvements to the Danish government policies on people with intellectual disability, namely "separation, detention and sterilization." In this 1953 paper sent to the Minister of Social Affairs in Denmark, he used the term "normalization" for the first time. Mikkelsen severely criticized the ideological similarity of the policies of "separation, detention, and annihilation" and compared them with the policies imposed on the Jewish people in Nazi Germany[12].

Mikkelsen said "let's provide citizenship to people with disabilities, let them live in ordinary houses in local communities, and let them have access to education." Later, Nirje systematized Mikkelsen's model and put it into a statutory form. Nirje defined normalization as "making living environment and local community life of people

with disabilities the same as, or almost the same as those of ordinary people, or making living environment or daily life conditions in a suitable manner for all of intellectually people with disabilities and other persons with disability.”

In other words, in addition to the living conditions of “house, job, and leisure,” as suggested by Bank Mikkelsen, normal life is defined from the viewpoint of normal life rhythms and normal developmental experiences in the lifecycle. In addition, as economic/environmental conditions, dignity as human beings and the world of men and women are also added, Nirje’s normalization concept has turned into a universal principle.

This way of thinking serves as the foundation of the 1971 UN “Declaration on the Rights of Persons with Disabilities” and also underlies the, “full participation and equality” concept promoted in 1981 as the theme of the “International Year of Persons with Disabilities” [8].

The normalization principle was also introduced to North America by Wolfensberger. Adopting a sociological perspective, Wolfensberger redefined the principle of normalization and constructed a new theory he called Social Role Valorization (i.e., people with disabilities should play their own roles in any society). This means that people with disabilities play a twofold societal role; Individual changes to fulfill potentials of people with disabilities at maximum and enhance their abilities to adapt to the society; and social changes to create positive images on people with disabilities in sociaty [13].

Taking this into consideration, Kouno states that education and welfare should “enhance [the] independence of people with disabilities” under the principle of “normalization” [14]. According to Kouno, persons with disabilities have been passive in terms of education or welfare. As education and welfare is provided by those people in a stronger social position, it is generally thought that persons with disabilities should simply receive them (i.e., paternalism). In contrast, the normalization concept cares about and respects individual choices and intentions of persons with disabilities as much as possible. Education and welfare services for persons with disabilities should be provided by recognizing persons with disabilities (or their parents) as core stakeholders. In education and welfare, support should be provided to enhance the independence and free choice of persons with disabilities.

The aforementioned “Social Role Valorization” concept is similar to the concept of “empowerment,” because Social Role Valorization calls for the reexamination of all social resources and the provision of an appropriate environment so that persons with disabilities are able to make their own decisions and play a leading role in their life when they are empowered.

（2）Concept of empowerment

Empowerment is a concept derived from social work theory. Barbara B. Solomon defines empowerment as “the process whereby the social worker or other assisting professionals engages in a set of activities with the client that aim to reduce the powerlessness that has been created by negative valuations based on membership in a stigmatized group” [13]. In this way, “empowerment” is not originally an exclusive topic for persons with disabilities.

The term “empowerment” was commonly used in the disabilities-related field when Justin Dart created a “Congressional Task Force on the Rights and Empowerment of Americans with Disabilities,” to seek for feasibility (to establish a rationale for the legislation, “Americans with Disability Act (1990).”

Under the empowerment concept, “since persons with disabilities also have high capabilities, the problem is how we should utilize these capabilities oppressed by society” [15]. Furthermore, users and consumers of social welfare services (i.e., persons with disabilities) should be additionally empowered and should be able to take control over their accessible affairs and problems that impact on their lives. Empowerment also includes not only taking control of accessible matters, but also actively reaching-out to service providers to solve their problems, eliminating oppressive social frameworks, and protecting human rights, such as their civil rights.

3. History of the perception of disability by the Japanese people

The “Annual Report on Government Measures for Persons with Disabilities (1995 edition),” states that, “persons with disabilities are facing physical obstacles, institutional obstacles, cultural/information obstacles, and awareness obstacles in implementing policies based on normalization. By eliminating these obstacles, the government aims to create an equal society in which people with disabilities are able to freely engage in their own social activities.” This is also the basic concept of “Long-Term Plan of Measures for Persons with Disabilities.” When persons with disabilities are motivated to engage in social participation, the biggest problem is the mental barriers imposed by society. The annual report describes the history of how Japanese people have viewed persons with disabilities, as follows.

1) People with disabilities are useless and troublesome. They are looked at with curiosity, or sometimes with abhorrence. These prejudices are still not eliminated, even today.
2) Ordinary people feel sympathy or compassion for persons with disabilities and try to do something for unhappy people with disabilities from their superior

position, which gives an unpleasant feeling to people with disabilities and their families.

3) Nowadays, people have a "coexistence" perspective, recognizing that persons with disabilities have the same ambition and human rights as ordinary people and are friends living together with ordinary people.

The annual report clearly states that concepts (1) and (2) are similar because they recognize persons with disabilities to be different to ordinary persons and that they precisely represent "awareness barriers."

In addition, from an educational perspective, other social practices, and ideologies, Hori (1997) categorizes and explains the perception of persons with disabilities, taking into consideration the concepts and actual practices for overcoming problems concerning persons with disabilities in the past [16].

1) The problems of people with disabilities are a threat to society. The purpose of education for children with disability is vocational training and adaptation to society, thereby denying people with disabilities's pursuit of their human rights and happiness.
2) The problems of people with disabilities should be addressed by mitigating/overcoming their disabilities. This way of thinking derives from the idea that people with disabilities should also enjoy human rights and the theory that medical services, training, and education will mitigate and overcome their disabilities and encourage their rehabilitation into society.
3) People with disabilities should also enjoy an ordinary life. Their problems are recognized from the viewpoint of persons with disabilities themselves. Normal life should be guaranteed for people with disabilities, whilst recognizing them as the holders of human rights.
4) The self-reliance of persons with disabilities should be achieved. The problems of people with disabilities should be recognized from the perspective of the person with disability. This way of thinking is closely related with normalization movements and focuses on the self-reliance of persons with disabilities as possessors of human rights.

Of these perspectives proposed by Hori, Concept (4) is based on the empowerment philosophy and also has some common features with Concept (3). The annual report (Concepts 1-3) and Hori's categories (Concepts 1-4) are incomplete in their expression, but current international and domestic normalization-based perspectives of persons with disabilities have significantly shifted from the previous disrespectful stance of ordinary people , and the recognition of persons with disabilities as special (Concepts 1 and 2), to a more rational and "coherent" stance from the viewpoint of the person with disability (Concept 3).

In other words, there has been a shift from the perspective of the provider to that of the service user. In addition, people generally used to have a "physically unimpaired" person's superiority-based viewpoint that persons with disabilities should improve/overcome their disabilities to participate in society, but such thinking has been replaced with the new concept emphasizing (cohesive) equality.

This ideological transition has also served as the background for new basic concepts in the "Appropriate Special Education for 21st Century (Final Report)," the "Basic Act for Persons with Disabilities," the "Basic Programme for Persons with Disabilities," and the "Appropriate Special Needs Education for the Future (Final Report)." In addition, Concepts 1-3 in the government annual report as well as Hori's categories (1-4) fundamentally appear to be an historical (time-series) transition, but in fact they are also connected with our current perspectives on children with disability (children with disability's education) and human rights.

4. Relationships with the International Classification of Functioning, Disability and Health (ICF)

The December 2002 "Basic Programme for Persons with Disabilities," states "To utilize ICF (International Classification of Functioning, Disability and Health) adopted in WHO (World Health Organization), in light of better understanding of disabilities and promoting appropriate measures, should be considered." ICIDH has been replaced with ICF because the rehabilitation concept, which emphasizes directly working on functional disabilities to mitigate impaired abilities or social disadvantages, has been replaced with the normalization concept, which works on the remaining "mental/physical functions," daily life "activities," and social "participation," to improve life function and living environment and, thereby, mitigate restraints on their activities and social participation and support life of service users. If we focus on a certain person with disabilities, the concept of ICF plus the "subjective dimensions" will yield specific image of "coherent" society as mentioned in the preceding section[17].

V. Conclusion

From a variety of directions, this paper has explored welfare, education, disability perspectives, human rights awareness, as well as other concepts and policy implementation underlying "individualized education support plans." To conclude, this section discusses the notion of "community building," one of the goals of individualized education support plans.

At present, "community building" is a keyword in the

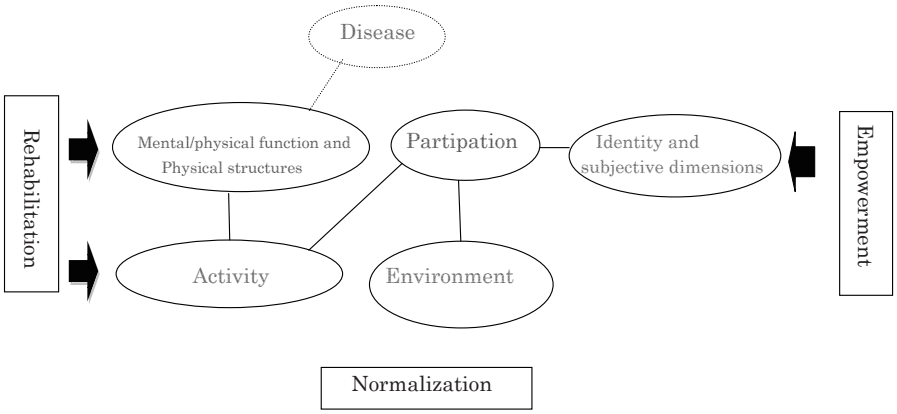

Figure 2 Structure and approaches for life functions and disabilities

health, welfare, and education fields. When looking at ideological genealogy behind individualized education support plan, future local communities should be imagined in which persons with or without disabilities will enjoy dignity as human beings and lead independent lives in their local communities. For this reason, the individualized education support plan is a tool for achieving the normalization concept in local communities (i.e., municipalities or smaller districts). Individualized education support plans are prepared for each and every child with disability. In this process, it is important that related organizations and local residents are motivated and actively engaged in dynamic activities.

The theoretical rationale to do so is based on the concept of “social capital” proposed by the American political economist, Putnam, in a survey of the decentralization of 20 local governments conducted over two decades in northern Italy in the early 1970s [18]. Putman demonstrated that while administrative service patterns were similar, their social, economic, and cultural contexts were significantly different, as were their performances as government entities. He used the term “social capital,” to explain this local government performance gap from the contexts in which the local governments were placed. He defined social capital as “features of social organization, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions.” He suggested, if they have rich social capital, people will voluntarily trust and cooperate with each other, and will implement with productive social relationships in the local community ranging from social to economic activities, in the local community, and leading to a well-functioning democracy [19].

We are now at a major turning point. Raising children with disability is never totally unrelated with problems in raising children without disability. As we engage in public education, we must have broad perspectives and address the quiet “needs” of children with disability immediately before us.

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- Received October 21, 2005; Accepted January 30, 2006 -