SUPPORT FOR STUDENTS WITH DYSLEXIA USING DAISY

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Abstract

Japanese Ministry of Education, Culture, Sports, Science and Technology conducted the survey in 2012 and found that 4.5% of students in the regular classrooms of public schools, grade 1 to 9, have significant difficulties on reading and/or writing. Many of them have dyslexia which is a reading disorder while they have normal intelligence. Support of students with dyslexia in a regular classroom is a difficult issue but in many case we found that provision of educational materials in DAISY multimedia format is crucial to support those students. This article discusses an experimental support conducted at an elementary school in Nara prefecture in 2011-12. There were two students with reading disorder in a regular classroom of 5th grade. One of the students already enrolled in the resource room to be supported by a qualified teacher who were familiar with dyslexia and textbooks in DAISY format. The project provided the classroom with three laptop computers and text books in DAISY multimedia format. Students could read books with narration along with highlighted text, adjustable font size, narration speed and color contrast. Students with dyslexia read text books in DAISY format when their classmates are reading normal text book. DAISY version of questions for examination were used by those two students when their classmates were having examination printed on paper in the same classroom. When two students had questions printed on paper, their score was about 10 points out of 100 when average was 70. When they used DAISY version of examination, their score showed average or more. The result indicated that the students knew most of the answers but they couldn't read questions printed on paper. The methods of presentation of the questions profoundly impacted their score. The results of the experimental support suggests that the use of DAISY version of educational materials including questions for examinations dramatically improves the learning environment and confidence of students with reading disorder in a regular classroom.

Keywords: Dyslexia, DAISY, Accessible educational materials

Introduction

Authors have been directly supporting students who were diagnosed dyslexia by provision of textbooks and examinations in DAISY multimedia format, instructions for reading system and other technical support in collaboration with the nationwide network of volunteer producers of textbooks in DAISY multimedia format. The support work of authors to the students and adults with dyslexia included revision of the copyright law which was achieved in 2010 and evaluation of outcome of the support to identify the evidence of effective support in collaboration with teachers and supporters of dyslexic students.

This report discusses on the questions for an examination in DAISY multimedia format which may accommodate the requirements of students with dyslexia in a regular classroom. This experimental support was a joint effort of many concerned people including the teachers of the school, Accessibility Working Group of DiTT lead by the Microsoft Japan, Japanese Society for Rehabilitation of Persons with Disabilities, NaD, a DAISY textbook production volunteer group, and the Assistive Technology Development Organization.
The project was conducted from August 2011 to March 2012.

Background

Japanese Ministry of Education, Culture, Sports, Science and Technology conducted the survey in 2012 and found that 4.5% of students in public school have significant difficulties on learning. It is about 450,000 students out of 10 million students at compulsory education (grade 1 to 9) in Japan. And two students in a regular classroom with 40 students in the public school. Many of them have Dyslexia which is a reading disorder despite a normal intelligence.

Dyslexia

Dyslexia is a spectrum disorder, with symptoms ranging from mild to severe. People with dyslexia have particular difficulty with phonological awareness, verbal memory, rapid serial naming and/or verbal processing speed. Dyslexia only affects some skills and abilities, and is not linked to a person's general level of intelligence. Children of all intellectual abilities, from low to high intelligence, can be affected by dyslexia. In some countries such as US, it is said that 10% of the population have certain degree of dyslexia. The exact cause of dyslexia is unknown, but it's seen more commonly in families. Students with dyslexia struggle to read text books and to follow the class. Those students need appropriate support like making use of Assistive Technologies just like some students need glasses to read text on black board.

Digital Talking Book

Students with dyslexia have difficulties in reading printed materials but can understand the contents by listening to the audio. Digital talking book have been used by those students especially in the country such as Sweden, Norway, USA, UK and other European countries where dyslexia has been recognized and supported.

In those countries, DAISY has been used as the international standard for accessible digital talking book specification and the government is taking responsibility and allocating budget to produce and to distribute DAISY to students with print disabilities. In the US, 26.000 text books for compulsory education have been converted.

DAISY has been developed and maintained by the international NGO, DAISY Consortium which was established in 1996 by members of IFLA/SLB (International Federation of Library Association / Section of Libraries for the Blind). DAISY Consortium now has members from more than 50 countries.

There are different types of DAISY books. Audio only, text only and full-text fullaudio (multimedia DAISY). Full-text full-audio DAISY have synchronized audio with text and images. Students can see the highlighted text on the screen while listening to the recorded audio.

In Japan, from 2003, conversion of text book in full-text full-audio DAISY format have been started by the volunteer for students with dyslexia. At that time, copyright low didn't allow to share DAISY text book to other students with dyslexia. In 2008, copyright low have been changed and volunteer started to network and share works. Currently, more than 2000 students in public schools are using DAISY text books provided by volunteers.
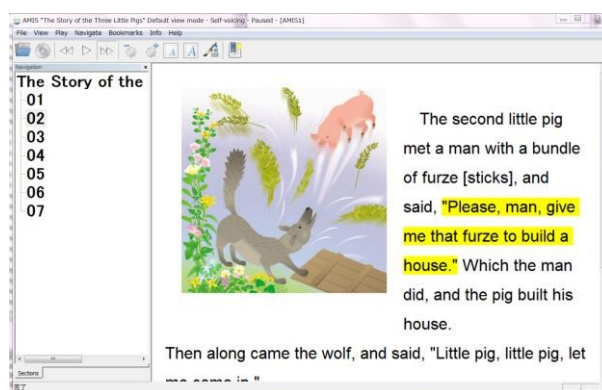

Figure 1- full-text full-audio DAISY book played on AMIS. Contents published by JSRPD.

Participants
Two 5th grade students with reading disorder in same class participated in the experimental support project.

Participant A: Enrolled in a resource room at nearby school to get support from special teacher one hour a week from 1st grade. Using DAISY text books from 3rd grade.

Participant B: From 5th grade, difficulties on learning became obvious and started using DAISY text book.

Following are the condition of the participants at each grade.
* 1st grade
   Participant A could not remember Kana characters and started to attend resource room one hour a week. • 2nd grade
   Participant A kept attending the resource room one hour a week.

- 3rd grade
  Participant A kept attending the resource room one hour a week but his learning was delayed for more than two grades.
  At the resource room, experienced DAISY books for first time and found that he could understand better by listening than reading on the paper. He started using DAISY text books at the resource room and at the house. He became actively participate in a class, increased self confidence and could keep sitting on the chair during the class.
- 4th grade
  Participant A started to use DAISY text books on laptop in a classroom. Also experienced examination DAISY format and proved that he could get the average score when he listen to the question.
- 5th grade
  Participant A recommended DAISY to Participant B and 2 students started to use DAISY in a class room.
  Participant A and B started to use examination paper in DAISY format for Japanese language, Mathematics and Social study.

Environment
Project site: 5th grade class of a public school, a resource room at nearby school and a student's house.
Involved teacher: Classroom teacher, teacher of a resource room and a president of the school
Duration: From 1st August 2011 to 31st March 2012

Hardware and software
Hardware: Lenovo ThinkPad T410s/T410si
OS: Windows 7 professional
DAISY playback Software: Dolphin EasyReader 6.02 Japanese version, AMIS 3.13 Japanese version

Contents
- Text books
  Text books in full-text full-audio DAISY format produced by volunteers network and downloaded from JSRPD server.
  DAISY2.02 format with text, image and human narration which have functions; Enlarge font, Change contrast, Highlight a sentence which is read aloud, Change audio speed, Click on the sentence to start reading the exact text.
- Classroom materials
  Teacher was distributing a printed handout especially at the social study class. Fulltext full-audio DAISY2.02 format handout converted from MS Word file.
- Examination paper
  Full-text full-audio DAISY 2.02 format converted from the scanned and OCRed data.

Class room settings
Three laptop computers were provided to a class.

Each two participants had a laptop on their desk. One laptop was placed at the back of the class and all the students were allowed to use it.
Laptops were equipped with headphone and mouse.

Example of the flow of the Japanese language class
Following flow is an example of the Japanese language class using DAISY text book.
1. Teacher first show a story in DAISY format on the projector in front of the class. All of the students watch and listen to DAISY.
2. The teacher show the same story again and students repeat after it.
3. After that, teacher ask some questions.
   Students look for the answer in the text book. At that time, two participants use DAISY textbook on laptop. Some of the students who want to use DAISY book on laptop also use the computer at the back of the class. Students use the heading, sentence and page navigation effectively when they use DAISY book to find the specific sentence in the story.
4. Students answer the question and discuss.

Figure 2- picture of a student using DAISY textbook with headset in a class room.

Examination
Participant A have been asking teacher to read aloud during examination.
During the experimental support project, examination in DAISY format was provided to the participants. They wrote answers on the printed paper as other classmates.

Results of using DAISY
After making use of DAISY textbooks and DAISY examination papers, there were following outcomes.

Outcome in the class room
- Mistakes during reading aloud text book at the class was decreased (participant A and B)
- Started to borrow a book at library (participant A)
- Started to raise hand and read aloud text book voluntarily in a class (participant B)
- More active participation in the class (participant A and B)

Outcome in the house
- Participant A had to ask his mother to read aloud to do the home work before. When he could use DAISY materials, he could independently do the home work by himself.
- The amount of fights with his mother decreased. Because he could read independently and that lessened the stress of both participant A and his mother.

Outcome of the examination
- Examination score of social study

On 16th May, both participant A and B worked on the examination in normal printed paper. Score of participant A was 5 and participant B was 10 when average was 70. On 30th September, both participant A and B worked on the examination in full-text full-audio DAISY format. Score of participant A was 70 and participant B was 70 when average was 84.4.

Table 1 - Examination score of social study (* indicate the use of DAISY)

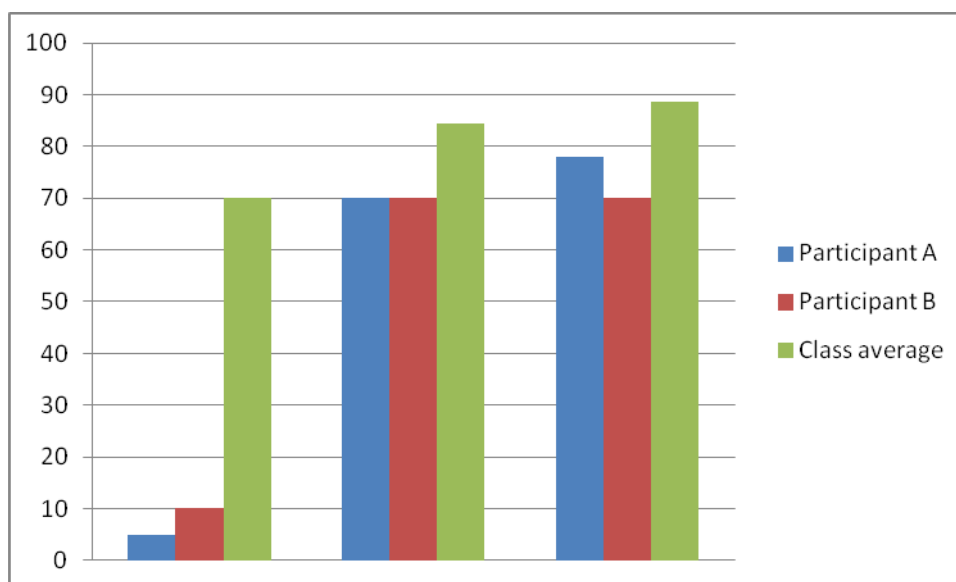| Date	Participant A	Participant B	Class average	Gap with average	
				Participant A	Participant B
16 May	5	10	70.0	-65	-60
30 Sep	* 70	* 70	84.4	-14.4	-14.4
22 Nov	* 78	* 70	88.6	-10.6	-18.6

Figure 1 - Examination score of social study in bar chart

When participants used DAISY format, examination score increased significantly. Class teacher said "Even though students understood what they learned in a class, when they used printed examination paper, they couldn't answer because they couldn't read questions. When they used DAISY format, without extension of the examination time, they could output their knowledge and could get nearly the average score."
- Examination score of Japanese language

On 24th May, participant A used DAISY format and participant B used normal printed examination paper. Score of participant A was 90 and participant B was 30 when average was 87.0.

On 22nd June, both participant A and B used DAISY format. Score of participant A was 80 and participant B was 50 when average was 86.4.

On 3rd Feb, both participant A and B used DAISY format. Score of participant A was 100 and participant B was 90 when average was 95.

On 27th Feb, both participant A and B used DAISY format. Score of participant A was 70 and participant B was 80 when average was 84.4.

Table 2 - Examination score of Japanese language (* indicate the use of DAISY)

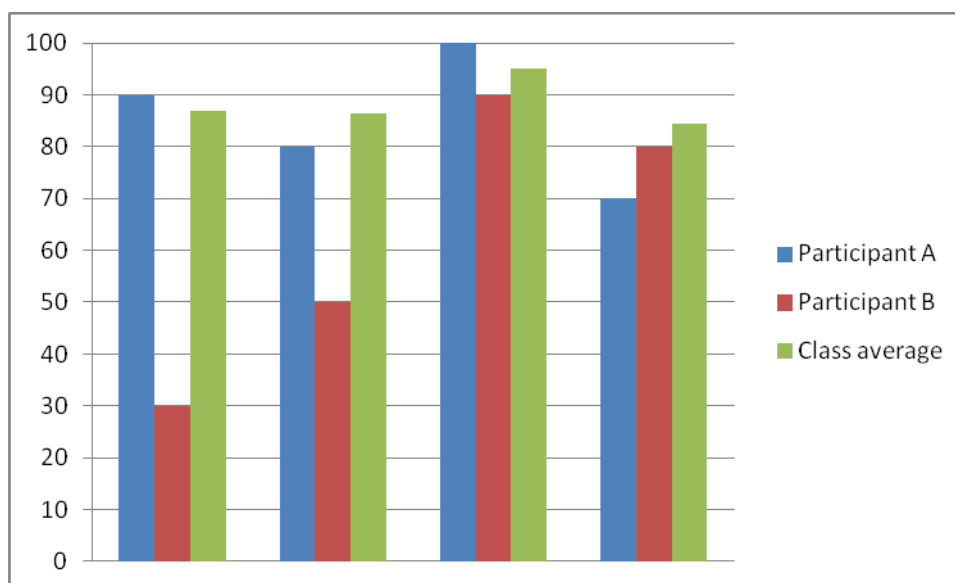| Date	Participant A	Participant B	Class average	Gap with average	
				Participant A	Participant B
24 May	* 90	30	87.0	+3	-57.0
22 June	* 80	* 50	86.4	-6.4	-36.4
3 Feb	* 100	* 90	95.0	+5	-5
27 Feb	* 70	*80	84.4	-14.4	-4.4

Figure 2 - Examination score of Japanese language in bar chart

From May, participant A used DAISY format examination and 2 out of 4 examinations, his score was above average. His score on 27th Feb was 83% of the average. It was due to that the annual conclusion examination used a new story which was different from the normal examination which uses the story learned at class. Participant B used printed examination paper on 24th May and his score was 34% of the average. His score went up to 60% of the average on 22nd June when he used DAISY format and his score went up to almost average on later 2 examinations with use of DAISY format.

Both participant A and B increased motivation for learning by their increased score.

Challenges

Even though those students need DAISY format to read, it is not easy for student to acquire DAISY text books and examination in Japan.

Ministry of Education, Culture, Sports, Science and Technology provides PDF files of the text books to the volunteers upon request but not the DAISY format. DAISY text book production and distribution relies on the volunteers' work which is unstable.

- ➢ Students can't receive whole text book in DAISY format at the beginning of the semester. Sometimes DAISY version distribution delays
- ➢ Not all text books could be converted because of the shortage of volunteers
- ➢ No quality assurance
- ➢ Need to pay postage fee when asking to send CD
- ➢ Internet security at school avoid teacher to download DAISY books

Even though students could receive DAISY text books, if the examination paper is printed on the paper, they will have difficulties to read and understand the questions. But it is difficult to receive DAISY examination paper in Japan.

Conclusion

Using DAISY text book and DAISY examination improved examination score of students with reading disorder.

Many students who are unfound and recognized as lazy or slow learners in public schools may be having reading disorders. They are losing self confidence and motivation for learning because of the low score. The experimental support suggests that the educational environment of students with reading disorder can be improved by the use of DAISY textbooks, examination and other materials in a classroom, resource room and at the students house.

The number of students using DAISY text books is increasing every year and almost 2000 students are using DAISY text books in Japan. Students using DAISY text books in Japan include students with dyslexia, AHDH (Attention Deficit Hyperactivity Disorder), blind and low vision, physical disabilities preventing students to hold a book and other Print Disabilities. All those students will benefit from making use of DAISY for their learning.

References

DiTT (2012)「実証研究プロジェクト L 読みに困難のある児童の通常の学級での デジタル教科書・教材の活用」, http://121.119.176.71/office/DiTTprjL.pdf, (accessed 2015-05-14)

Ministry of Education, Culture, Sports, Science and Technology (2012)「通常の学級に在籍する発達障害の可能性のある特別な教育的支援を必要とする児 童生徒に関する調査結果について」, http://www.mext.go.jp/a_menu/shotou/tokubetu/material/__icsFiles/afieldfile/2012/12/10/1328729_01.pdf, (accessed 2015-05-14)