

**Topic :** Humanities

## **Deployment of a Digital Textbook Conforming to a Textbook**

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### **Abstract**

This article argues for digital textbook dissemination in Japan. Digital textbooks project was distinguished in its range, budget, dissemination, and involvement of schools among ICT education projects in Japan. In addition, it enclosed characteristics of 100% conforming to textbooks and curriculum. The results of detailed interviews with a publisher and extensive social factors were introduced to clarify the barrier and future role of digital textbooks. Some political and technological issues were identified to improve dissemination. In addition, we have become aware of communicating with foreign agents over differences in curriculum.

### **Keywords**

Digital textbook; Digital materials; Textbook publisher; International communication; Educational policy

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## **1. Introduction**

The teachers' edition of digital textbooks were developed after revision of school curriculum in Japan. Digital textbooks for elementary schools, lower secondary schools, and high schools published in 2011, 2012, and 2013, respectively. These digital textbooks have mediated lesson materials involving not only the content of textbooks, but also audio/visual materials and simulations. Digital textbooks were designed to facilitate the following functions (Textbook Publishers Association of Japan, 2015).

- To provide easy to understand explanations
- To offer textbooks through using various modalities
- To improve students' lesson involvement

Subsequently, the students' edition was introduced in 2013.

So far, we have met various mediated materials in education, but the project regarding digital textbooks was distinguished in its range, budget, dissemination, and involvement. In addition, it enclosed characteristics of 100% conforming to textbooks and curriculum.

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Unfortunately, there are a limited number of international reports regarding diffusion of digital textbook in Japan, and this study summarizes current dissemination and acceptance of digital textbooks in schools. It also discusses the future of this field and possible international communication.

The methods included a review of documents and interviews at a publisher to collect concrete dissemination facts.

## 2. Specification and Variety of Digital Materials

The production and development of digital textbooks are not independent activities of publishers. CoNETS (Connecting to the next education for teachers and students) is a syndication of digital textbook publishers in Japan that has coordinated specification of digital textbook. The syndication covers 12 textbook companies among 42 textbook publishers. Although each digital textbook has characteristic component, the system of digital textbooks is similar. Then, we selected a leading publisher to know more details.

The following statements are based on the interview at Tokyo Shoseki Co., Ltd. (Takano, T., 2016).

### 2.1. *Digital textbooks*

Digital textbooks in the market are categorized as the following three types.

#### a) Digital textbook, teachers' edition

- Content development: HTML5, Java Script
- System data provision: DVD/ Download from a server of contracted organization (e.g. a rural education office)
- Terminal: Computer
- Measure for an infringement on copyright: Digital Rights Management (DRM)
- Monitor: LCD or Interactive white board (IWB: Wired and interactive display with a server controlled as well as white board function of more than 50 inch, 260 million IDR, installed as a standard lesson media in Japan, see Figure 1)



Figure 1. Interactive White Board

- Fee: DVD 9.5 million IDR/textbook (one time contract, selectivity rate 90%) or download (one year contract, selectivity rate 10%) 2.5 million IDR/textbook
- Functions: In addition to the digital view of a textbook, various tool buttons appear in the screen. The following statements are a list of familiar functions.
- Display
  - Enlarge contents
  - Change font

Read aloud with speed control  
 Transparency  
 Black and white reversal  
 Spot light (focusing)  
 Marker.

- Interactive
  - Over writing, hiding and moving
  - White board
- Informative
  - Link to animation or video
  - Web links
  - Link to digital dictionary
  - Visual contents list
  - Additional exercises
- Customize
  - Rearrange textbook contents
  - Insert photo
  - Slide show of selected parts

b) Digital textbook, students' edition, EPUB3 version

This version is distributed as a supplement of the teachers' edition

- Content development: EPUB3 (Same format as the International Digital Publishing Forum: IDPF)
- Terminal: Tablet
- System data provision: Download from a server of a school
- Functions: Mainly this offers display functions in teachers' edition.

c) Digital textbook, students' edition, digital materials version

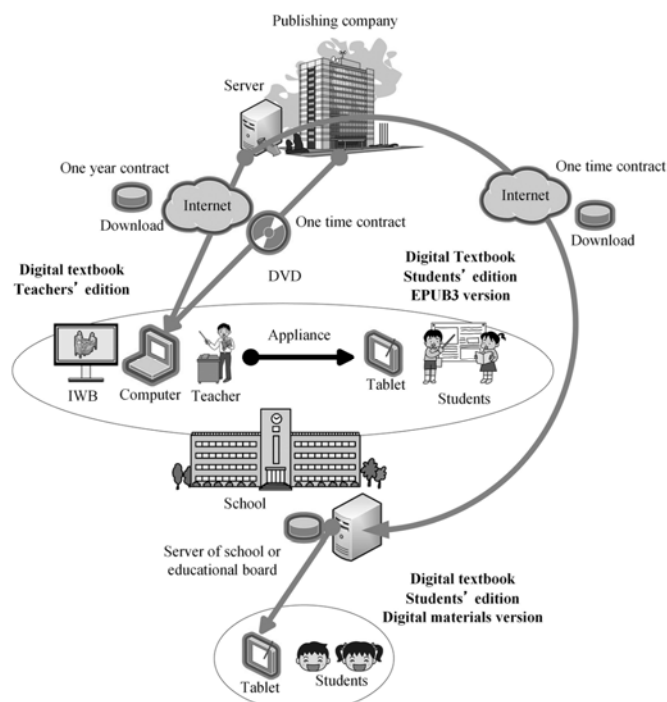


Figure 2. Distribution of Digital Textbooks

Content development: HTML5, JavaScript, This version includes digest of textbook contents.

- Terminal: Tablet or PC
- System data: Download from a server of contracted organization (e.g. a school or a rural education office)
- Functions: Digest of contents of teachers' edition.
- Fee: One year contract and cover all students of a subject, 2.5 million IDR/textbook

Figure 2 shows the variety of digital textbooks and methods of distribution.

## 2.2. Other digital materials in terms of a textbook

### a) Worksheet database

About 5,000 sheets for elementary schools and 5,000 sheets for lower-secondary school have been developed.

- Content development: PDF and word processor files
- Selectivity rate: About 22% of elementary schools and lower secondary schools.
- Functions: Worksheets for drill, exercises of essential items, achievement tests, follow up exercises, and applied exercises. Possible to customize items by a teacher in charge if needed.
- System data: Provide service via Web (see site view in Figure 3). Data are stored in a server of publisher. Content delivery network (CDN) service is used to improve access response.
- Fee: 8.7 million IDR/year per subject

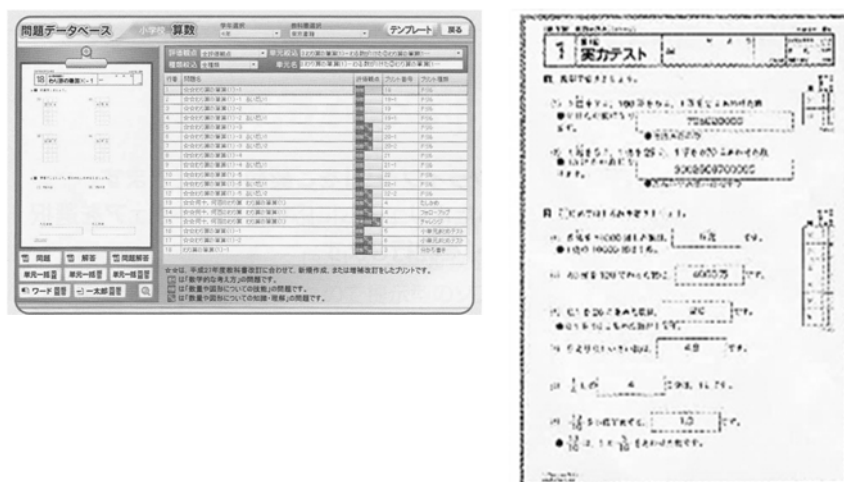


Figure 3. View of web service site (left) and sample worksheet (right) of worksheets database

### b) Audio visual materials

There are 2,200 titles for elementary graders, and 1,500 titles for lower-secondary graders.

- Data: Data are stored on a server at the school (see Figure 4).
- Fee: 12-25 million IDR/grade per subject (one time contract)

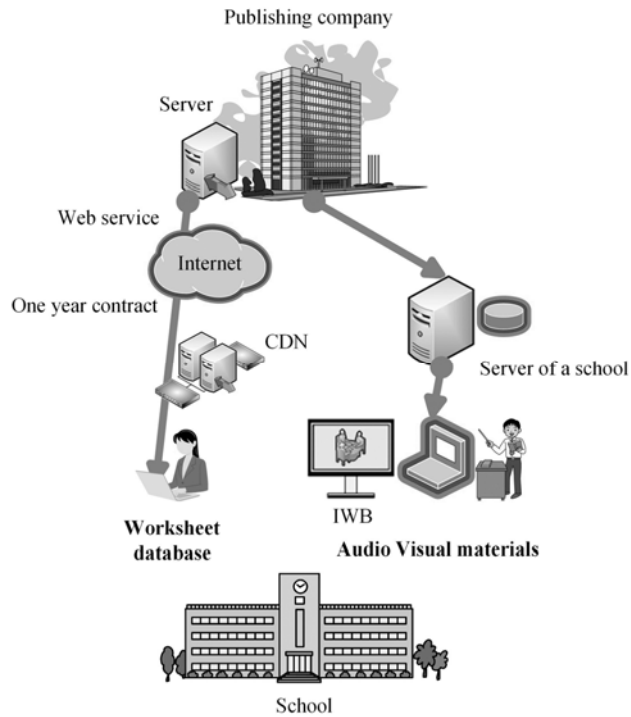


Figure 4. Other Digital Materials

Figure 4 shows the other digital materials and way of distribution.

### 3. Facts in Schools

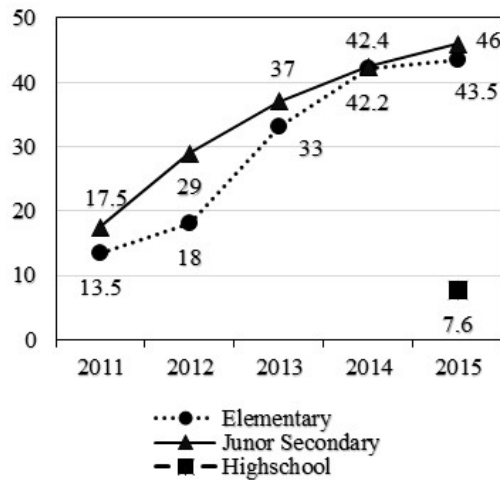


Figure 5. Dissemination Rate (%) of Digital Textbooks.

The Internet penetration rate in Japanese schools is 100%. All schools can introduce online services.

The dissemination rate of all digital textbooks is shown in Figure 5 (Textbook Publishers Association of Japan, 2015). The data show the rate of schools adopting digital textbooks. However, data from the dominant digital textbook show that the actual commercial product is uncovered. However, the digital English textbook in lower secondary schools has been adopted most frequently—it reached 30% of schools based on interviews with a leading publisher. This publisher has about 55% of the textbook market share (Takano, T., 2016).

### 3.1. *Benefit to use digital textbooks*

Reported benefit to use digital textbooks as described by the publishing company include (Takano, T., 2014):

- 1) Concrete explanations. They turn their eyes more from a desk toward a teacher.
- 2) Increase concentration on a main point of discussion.
- 3) Introduce a new mode of explanation via moving arrows on the screen.
- 4) Introduce a dynamic iconic view to embed arrows. This involves psychographic images of moving, action, changing, and depth of focus.
- 5) A tablet with a sensor can introduced for real time analysis. Augmented reality (AR) functions can also be included (see details in 5.1).

On the other hand, teachers' opinions of Genesis digital textbooks were also reported (National Institute for Educational Policy Research, 2012). As a result, only one percent of teachers had used a digital textbook, and their potential opinions of digital materials were analyzed based on the following four factors.

- 1) Digital materials are useful to develop highly integrated lesson materials.
- 2) Digital materials can offer cues on lesson planning that needs to be developed.
- 3) Digital materials enhance motivation to study the content.
- 4) Known benefits to using digital materials materialize.

On these grounds, digital textbooks and digital materials are effective at improving lesson preparation.

## **4. Barrier for Dissemination of Digital Textbooks**

It has been five years since digital textbooks were installed, but dissemination rates are still increasing slowly. This is because of the following issues.

### 4.1. *Governmental promotion*

The Ministry of education, culture, sports, science and technology (hereinafter MEXT) operate an educational project regarding ICT in education (MEXT, 2015). However, a concentration on disseminating digital textbooks remains unclear, and the size of the total budget is insufficient to cover digital materials that are installed at all schools.

The budget plan for promoting learning using ICT is 114 billion IDR.  
The breakdown of this is as follows.

- Project to promote the educational use of ICT: 21 billion IDR
- Project to support rural governments to enhance ICT education: 37 billion IDR
- Project to investigate and maintain educational quality via ICT in depopulating societies: 18 billion IDR

- Project to develop progressive educational management system: 16 billion IDR
- Project to measure the effect of harmful environments on youth: 16 billion IDR
- Other projects: 7 billion IDR

#### 4.2. *Anticipated challenge*

The following statements show the upcoming challenges to dissemination.

- Promotion: Educational policy to introduce digital textbooks
- Infrastructure: Congestion control is a problem when a teacher uses classroom techniques in a computer room. It is particularly difficult to access audio-visual contents in cyberspace by all students at the same time.
- All textbooks in Japan are authorized by MEXT. Screening systems are approved only in the paper version, but the guidelines only authorize digital textbook after an argument (Impress Corporation, 2016).
- Law: There should be laws for exceptions to copyright or extravagant contracts for digital textbooks (MEXT, 2016). In addition, the current law can only cover the cost of paper textbooks in compulsory schools. Therefore, the meeting of the Investigative Commission for Digital Textbooks of Student Edition reluctantly proposed that cost of digital textbooks should be covered by a guardian (Asahi Interactive, 2016; Nikkei Inc., 2016).
- Consensus: Digital textbooks require a new pedagogical viewpoint. Tamura, Y. (2014) reviewed the following warning of instruction using digital textbooks.
  - 1) Learning becomes standardized
  - 2) Learning is only focused on getting the right answer.
  - 3) Because the opportunity to write disappears, students' ability to write decreases.
  - 4) The communication between a teacher and students stops.
  - 5) It is difficult to judge the answer with plural solutions such as a proof.
  - 6) Immediate feedback, namely, the game sense, disturbs the development of intellectual thinking.
  - 7) Programmed learning does not improve intellectual thinking and decision-making.

#### 4.3. *Consideration on the use of digital textbook in foreign countries*

The following record is a summary of interviews from a manager of ICT department in a publisher (Takano, T., 2016).

- There are fatal differences in academic explanations among countries. This requires studies of the similarities and differences.
- Math: The contents of elementary 1st grade is nearly the same, but many difficulties are seen after the 2nd grade.
- The appropriateness of visual contents is not adaptable among countries—especially in science, health and physical education, and world geography.
- It is difficult to extend copyright—especially visual contents.
- Translation of the digest would be possible for foreign educators.
- Digital textbooks can contribute to Japanese-language training.

Now, exchange and sharing educational digital contents are used including activities of open educational resource (OER); however, the introduction of our experience and know-how to develop a qualified textbook are another possible area of international communication. Thus far, an investigated publisher has the following cases of technical transfer with international agents.

These include: India (content production), Saudi Arabia (qualified printing for textbook), Vietnam (technical transfer of textbook development system), Mongol (development of digital materials), China (online content delivery and publishing) and Egypt.

On the other side, the publisher has used offshore production in China, Vietnam, and Taiwan. Thus, the production of textbooks and materials are expanding.

## 5. Future View

### 5.1. Textbook AR (Augmented Reality)

After installing APP in a tablet or smartphone, audio/visual information appears when a student holds a tablet over the textbook (see Figure 6). A student can learn more details of the subject area knowledge or have an interactive mode of trial (Kyoiku Katei Shinbun Co., 2015).

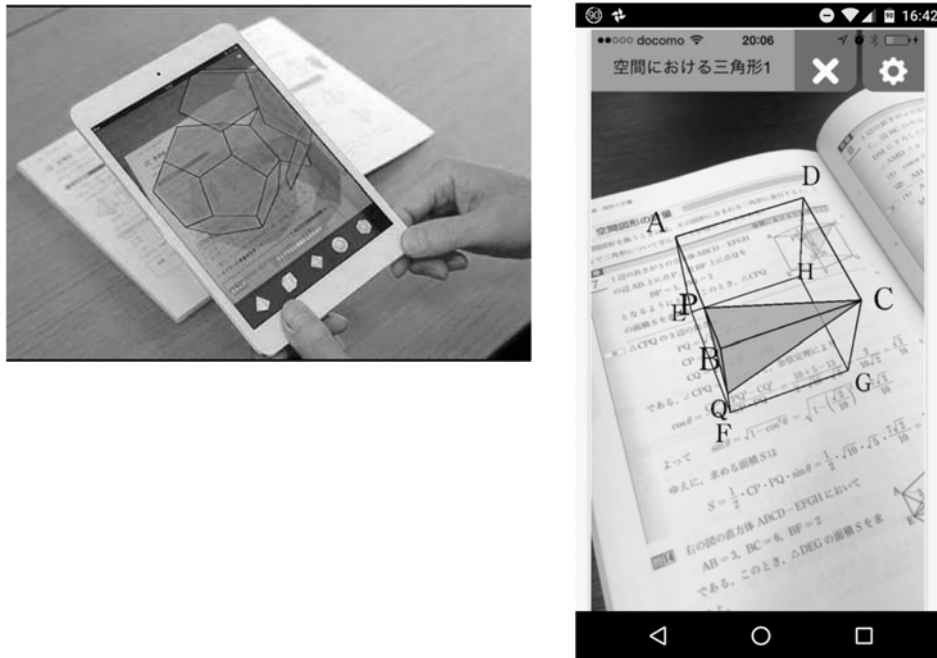


Figure 6. View of Textbook AR.  
(Cited from Tokyo Shoseki Co., 2015)

### 5.2. Space for free writing

In the students' edition, the following activities are under development: annotation (add free writing into contents); spacing (insert space under exercise); popup (create a new page during an exercise); and automated recording of their writing. (Kobayashi & Kato, 2016).



### 5.3. *Participative digital textbook*

Communicative functions for the teachers' edition have emerged. This allows teachers to upload their photo into a cloud, and the system arranges data in a service site with positioning data of GPS (The Education Newspaper, 2015).

In addition, the function of collection of learning history, cloud computing, collaborative learning, and automated disaster alert are in the trial stage (JAPET, 2013; NTT Communications Co., 2013); however, these are not ready to be standard because of security reasons (Uchida Yoko Co., Ltd, 2014).

## 6. Final Remarks

It is known that the media has no effect on student outcomes. Student outcomes involve the quality of the curriculum materials, instructional method, and student learning preferences (Western Interstate Commission for Higher Education, 2010).

For instance, we know that car navigation systems are convenient. While, we could still reach our destination with a paper map, the media decreases our stress and lets us focus on driving. Similarly, digital textbooks offer the same influence—they allow students to focus on learning.

## Acknowledgment

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