A Comparison of Functions and the Effect of Digital Textbook in Japan and Korea

Yu Taizan
Graduate School of Kansai University, Osaka, Japan
Sunhee Bhang*
Hangyang University, South Korea
Haruo Kurokami
Kansai University, Osaka, Japan
Sungho Kwon
Hangyang University, South Korea

Digital textbooks are becoming popular in both Japan and Korea. They have similar circumstances about digital textbook. Digital textbooks will be widely introduced into schools in the near future in Japan and Korea. Comparing digital textbooks in both countries at the present stage can result in enriching their functions. By comparing functions of digital textbook in both countries, we will describe its features. In Japan digital textbooks are superior in terms of functions to help students' understanding and to support teachers' explanations. Korean digital textbooks have the advantage of supporting learning interaction with teacher and student including communications outside of class.

Keywords: digital textbook, comparative research, function, effect

Introduction

In the tide of e-book, digital textbooks are developed in many countries. Both Korea and Japan are leaders in conducting nationwide projects to introduce digital textbooks into schools. These efforts make digital textbook rise in popularity in both Japan and Korea.

In Japan, the first digital textbook was developed in 2005 by a school-textbook company. It was for teachers to project and enlarge paper textbook in front of students. It also have many other functions. We will illustrate the functions later in this article.

In late 2010 MEXT (the Ministry of Internal Affairs and Communications) proposed deployment of digital textbooks to all elementary and junior high school students until 2015, in the "Haraguchi – Vision". Under this vision, 10 elementary schools were selected as experimental schools and the effect of digital textbook and tablet PC was tested. In addition, MEXT launched the Innovation of Learning Projects. The purpose of this project was to research on proper contents and appropriate usage of digital textbooks. The effect of digital textbooks has been tested from the point of Hardware– and Software-view.

Several companies have developed digital textbooks mainly for teachers. These textbooks cover subjects such as Japanese, science, social studies and mathematics. A noticeable feature is that they have various functions, such as showing movies and pictures, marker-drawings and picture enlargement. At present, the prototypes of digital textbooks for students have already been developed and a trial version is being tested.

In Korea, the "Education and Human Resources Development Ministry" and the "Korea Education and Research Information Service Korea" have been developing digital textbooks under the policy of "Government's Plan to Introduce Smart Education". In this policy, digital textbooks are scheduled to be introduced into elementary and junior high school until 2014. The textbooks were tested with 300 students at four elementary schools in 2006, and the government selected the prototype of digital textbooks in 2007. The pilot schools started using digital textbooks for six subjects; Korean, English, mathematics, sociology, science and music. More specifically, fifth grade students in the pilot schools have been taught with the digital textbooks in six subjects: Korean, English, mathematics, sociology,

*Corresponding Author

sciences, and music. Sixth grade students used digital textbooks in four subjects: Korean, mathematics, sociology and science (Kurokami et al., 2010).

As stated above, digital textbooks will be widely introduced into schools in the near future in Japan and Korea. Comparing digital textbooks in both countries at the present stage can result in enriching their functions. There are some research dealing with functions of digital textbooks (Oyanagi, 2010; Shimizu et al., 2010). For example, Oyanagi (2010) classified functions of digital textbooks in Japan and showed the effect of motivating and supporting students understanding. However, research focused only on Japan

Purpose of the Research

This research, therefore, aims to clarify the characteristics of digital textbooks in both countries. In this research, characteristics means the way of using digital textbook in both countries. For the purpose, we will analyze "how digital textbook is expected to be used", and "what kind of functions were built in digital textbooks". Therefore, we conducted comparative research focusing on functions of digital textbooks. The effect of digital textbooks was also reviewed. Both countries have used very similar learning materials and teaching methods. Paper textbooks are published under the guideline of educational contents by the government. Teachers stand in front of a large group of students and organize students' idea and opinions into a common classroom opinion. Despite of the similarity, digital textbooks in each country seem to have some differences. Functions and usages in common and in difference between Korea and Japan will lead to enlarge perspective of the next types of digital textbooks in both countries.

In this research, we analyzed and listed functions and effect of digital textbooks in both countries. We compared each list with each other to identify common and unique functions. Although digital textbooks in Korea were for teachers and students, those in Japan in use were just for teachers at the current time. The development of digital textbook for students was in progress but the functions of those were still concealed in Japan. Therefore, we choose several digital textbooks for teacher and one prototype of digital textbook for students as a research subject of Japan side.

Method

Comparison of the Functions

Most functions of digital textbooks are assigned to buttons in the tool bar on each page and are easily known. There are, however, some function in a deeper layer of dialogue windows and combinations of keys. We listed all functions using digital textbooks themselves and manuals the digital textbook.

Digital textbooks in Korea are designed and developed under KERIS (Korea Education and Information Service). Thus there is just one sort of digital textbook for each subject in a grade. We have more than one in Japan; five digital textbook of Japanese language and six in science and math. We analyzed all digital textbooks of them and listed to the union of sets.

After listing up all the functions of digital textbooks in both countries, we discussed educational meaning of these functions; namely when to use and for what to use them. This matching was made from not only from the viewpoint of the developer but also that of teachers and students. That means that we choose a couple of units and made lesson plans to identify where and how to introduce digital textbook. This analysis led to classify the functions into seven categories for Japanese digital textbooks and nine for Korean ones.

In addition, we observed classes in both countries, in which digital textbook was used. The feature of the digital textbook was clarified by considering correspondence with a characteristic function and its practical usage. In addition, we made the similarities and the difference clear.

Comparison of the Effect

In addition to the analysis of the functions of digital textbooks, we reviewed how the effect is measured in each country, because expectation of digital textbooks is reflected on this measurement. For this purpose, we set two viewpoints. The first is the evaluation of items and the second is the method of measurement. We thought that evaluating contents and method would reveal the diversity of digital textbooks in both countries.

In Japan, we chose the report titled "The survey on the effect on learning from the use of electronic blackboard" by MEXT. Though this report is focus on the effect of electronic blackboard, digital textbook was used as contents in practical use of the blackboard. In the review of Korea side, we chose "A Study on Measurement of thee Effectively of Digital Textbook" by KERIS (Korea Education & Research Information Service) as the target of analysis.

Results and Discussions

The Japanese digital textbook was classified as Table 1. For example, "moving page" will be used in class, by teacher and students, to show the textbook contents. The function of "enlarging figure and text" will be used in same situation. Therefore, we put them together into the category of "Showing textbook". We found 7-function categories in Japanese digital textbooks (Table 1).

Table 1. *Categories about Functions of Digital Textbooks in Japan*

Category	Function	Explanation	Using situation		
			When	Who	For What
Showing textbook	Moving page	Moves to the next page	In class	Teacher /students	Showing textbook
	Viewing both/single pages	Showing page in both/single page			
	Scrolling display	Showing page by scrolling			
	Enlarging figure and text	Focusing figure or text in textbook			
	Partial enlargement	Focusing one part in textbooks			
Editing functions	Marker, Pen	Make line in textbook contents	In class	Teacher /students	Add own idea in textbook
	Words balloon, Stamps	Insert Words balloon or stamps in textbook			
Showing teaching materials	Video Clips	Showing video clips	In class	Teacher /students	Understanding by other content
	Diagram animations	Showing diagram animation			
	Network	Showing information through internet			
Training basics	Kanji, Alphabets	Memorize kanji/alphabets	In class	Students	Memorize basic knowledge
	Flash Card	Memorize basic knowledge by Flash Card			
	Drill	Drills and exercises for memorize basic knowledge			
Sharing information	Board	Sharing students screen	In class	Teacher	Sharing student's information
Student support	Dictionary	Using dictionary	In class	Students	Understanding knowledge
	Speaking sound	Checking English pronunciations by play sound			
Authoring teaching materials	Saving Edited Files	Save file edited by marker or pen	Out of class	Teacher	Making teaching materials
	Teaching materials	Making Teaching Materials by using Figure and Picture in Textbook			

Table 1 shows that Japanese digital textbooks have many functions to be used in classes. Six categories: "Showing textbook", "Editing functions", "Showing teaching materials", "Training basics", "Sharing information", and "Student support" always help teachers to make their classes.

On the other hand, "Authoring teaching materials" is the function to prepare classes. This category focuses on making teaching materials by using figure, and picture, in digital textbook, and saving edited

files. These functions mean that the teacher can customize resources in the digital textbook according to his/her lesson style. Table 2 shows categories about functions of digital textbooks in Korea.

Table 2. *Categories about Functions of Digital Textbooks in Korea*

Category	Function	Explanation	Using situation		
			When	**Who**	**For What**
Showing textbook	Moving page	Moves to the next page	In class	Teacher /students	Focusing textbook
	Viewing both/single pages	Showing page in both/single page			
	Page Drag tool	Showing page by scrolling			
	Seeing List	Showing list of text			
	Drop down menu	Selecting page with drop down menu			
	Enlarging pages	Focusing figure or text in textbook			
Editing functions	Pen/ Line/ Circling Tool	Make line/ circles in textbook contents	In class	Teacher /students	Add a own idea in textbook
	Memo Tool	Insert Memo page in textbook			
Showing teaching materials	Flash Movie, Media Player	Showing video clips	In class	Teacher /students	Understanding by other content
	Rotating 3D shape	Showing 3D shape			
	Web hard/ Download	Showing information through internet			
Share information	Survey	Survey student's opinion	In class	Teacher /students	Share information
	Discussion	Discussion between students			
	Board	Sharing students screen			
	Repository	Save file that student investigate			
Student support	Dictionary	Using dictionary	In class	Students	Understanding knowledge
	Speaking sound	Checking English pronunciations by play sound			
Portfolio	Blog	Making students blog	In/ out of class	Students	Making study portfolio
	Log in/off	Log in to digital textbook			
Authoring teaching materials	Making 3D shape	Making 3D shape to understanding diagram	In/ out of class	Teacher /students	Making teaching materials
Self learning	Diagnostic Evaluation	Evaluate students	Out of class	Students	Self learning
	Assignment	Showing assignment to students			
Teacher support	Teacher Conference	TV conference for teachers	Out of class	Teacher	Making lesson plan
	Class Management	Control students information			
	Study map	Making students study map			
	Teacher Manual for class	Showing teacher manual			
	Teacher Guidance Plan	Making guidance plan			
	Tracking Learning plan	Searching learning plan			

As the result of the comparison (see Table 3), we created six common categories; "Showing textbook contents", "Editing function", "Showing teaching materials", "Sharing information", "Authoring teaching materials" and "student support". "Training basics" was the only one category for Japanese-unique functions. The other three categories are unique for Korean digital textbooks; "Portfolio", "Self learning" and "Teacher Support".

Table 3. *Common and Unique Functions of Digital Textbooks in Both Countries*

	Category	Japanese side	Korea side
Common	Showing textbook	Moving page	Moving page
		Viewing both/single pages	Viewing both/single pages
		Scrolling display	Page Drag tool
			Seeing List
			Drop down menu
		Enlarging figure and text	Enlarging pages
		Partial enlargement	
	Editing functions	Marker, Pen	Pen/ Line/ Circling Tool
		Words balloon, Stamps	Memo Tool
	Showing teaching materials	Video Clips	Flash Movie, Media Player
		Diagram animations	Rotating 3D shape
	Sharing information		Survey
			Discussion
		Board	Board
			Repository
	Authoring Teaching materials	Saving Edited Files	
		Teaching materials	
			Making 3D shape
	Student support	Dictionary	Dictionary
		Speaking sound	Speaking sound.
Unique	Training basics	Kanji, Alphabets	
		Flash Card	
		Drill	
	Portfolio		Blog
			Log in/off
	Self learning		Diagnostic Evaluation
			Assignment
	Teacher Support		Teacher Conference
			Class Management
			Study map
			Teacher Manual for class
			Teacher Guidance Plan
			Tracking Learning plan

Features in Japanese Digital Textbooks

"Training basics" is a category only for the Japanese side. Digital textbooks is used to show basic facts, such as "Japanese ideograph/English alphabets" in language learning and chronological tables in social studies, numerous times to train students to remember and master them in Japanese classes (Figure 1).

Figure 1. Training Japanese characters with digital textbook in Japanese class

Most digital textbooks in Japan have many contents and functions for the purpose.

Though we have five common categories, we could find some typical differences even in a common function. For example, in the function of "Authoring Teaching Materials", Japanese digital textbooks have more vourious functions to make teaching materials with contents of the main texts.

Features in Korean Digital Textbooks

On the Korean side, we found three unique categories: "Portfolio", "Self learning" and "Teacher Support". Digital textbooks in Korea were designed to be used not only by teachers but also by students in the same textbook. This is the reason why the greatest difference, between the usage of digital textbooks in Korea and Japan, is in "Portfolio". For example, digital textbooks can be used to make a portfolio of each students using the blog function. Students can record their learning activities in blogs, and easily look back again at their own study.

Even in the same categories, there are big differences. Discussion function in category of "Sharing information" supports discussion by browsing all students' displays. Students can explore their ideas with tablet PCs and display these ideas on the big monitor in front of other students (Figure 2). Student can discuss with these ideas.
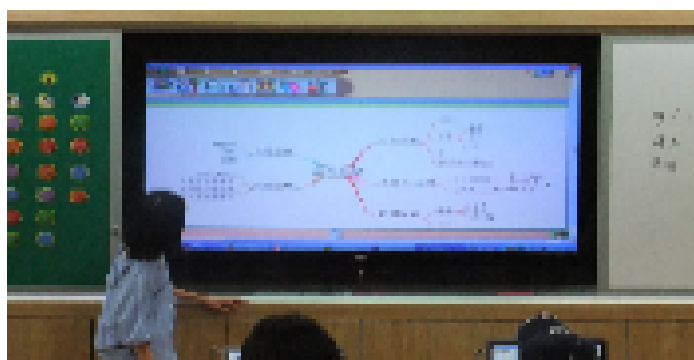

Figure 2. The idea of a student is projected on the big monitor

Korean digital textbooks also aim to support teachers' work. Guidance plan and related manuals are distributed to teachers through digital textbooks. These materials can be useful help in designing lesson plan, and in communication among teachers through the teacher conference function. The way of evaluation is also supported by digital textbooks. In Korea, digital textbooks serve as an integrated tool for many teachers' works.

The Differences in the Usage of Digital Textbooks

These differences in the functions of digital textbooks influence instruction in classrooms. Teachers in Japan use digital textbooks in order to encourage concentration and promote understanding subject materials. While teachers in Korea use digital textbooks in order to deepen thinking and expression of students.

Differences in the functions of digital textbooks reflect on the form of usage of digital textbooks as a matter of course. Kurokami et al. (2010) found differences of usage of digital textbooks in Japan and Korea. Japanese teachers are apt to use digital textbooks not only to provide information to students but also to support student understanding of contents through clearer images with pictures and movies. In addition they use digital textbooks to explain student's thinking by focusing and underlining the contents of textbooks.

On the other hand, Korean teachers use digital textbooks to provide multiple means of representation, expression, and engagement to all students. Digital textbooks have the function to increase three types of interactions. The first is the interaction between teachers and students. Teachers can grasp the progress of each student through online watching system of digital textbooks. The second is the interaction among students. Students can exchange opinions through BBS system builted in digital textbooks. The last is the interaction between students and the other resources. Students can access outer resources such as national databases.

Summary at the Moment

By and large, digital textbooks in Japan are superior to help teachers to explain and deliver subject matters to students. Korean digital textbooks are designed to promote interactions among teacher and students in a classroom and establish communication channnel between students and information outside of class.

We are able to learn from each other with the results. The functions to promote discussion could change communication in Japanese classrooms into more visible and more active one. Korean students' achievement might be improved by enhancing training of basics function such as Flash Cards.

Various digital textbooks including those for students will be developed in Japan in the future. It is important for Japan to learn from other Korean-unique functions. On the other hand, digital textbook could help Korean teachers to make more flexible lessons by enhancing functions to support teaching in large group situations in Korea.

Comparison of the Effect

It is important that educational effect is verified when introducing new media such as digital textbooks into schools. It has not only political meaning but also practical meaning. Teachers will be able to know the strength and weakness of the new media through surveys to verify its effect. Some systematic surveys related to the effect of digital textbooks were conducted in Japan and Korea.

As we mentioned, we compared a typical survey for each digital textbooks in both countries. Table 2 shows what wes asked and measured in the surveys.

Table 4. *Evaluation Items in Surveys on Digital Textbooks*

	Evaluation item	Japan	Korea
Common	Usability investigation (teacher)	Questionnaire	Questionnaire
	Usability investigation (student)	Questionnaire	Questionnaire
	Academic achievements	Achievement test	Achievement test
Unique	Teacher training	Checklist	Questionnaire・Satisfaction of each subjects・Utilization invitation to others・Learning continuation
	Digital content satisfaction		Flow survey
	Learning devotion		Self-learning ability scale
	Self-learning ability		Questionnaire
	Problem solving ability		

Evaluation items in common are usability investigation for teachers and students, and academic achievements of students. The impression of effectiveness of digital textbooks and the burden they felt in using them were asked in the usability investigation for teachers. Some sets of experimental group and control group were formed in the survey for students for comparison studies. Objective tests were conducted in both countries to prove the validity of digital textbooks. These surveys show the statistical significance in common in most subjects. Namely, digital textbooks can raise academic achievement.

Unique set of evaluation items in Japan is on teachers training. This set is self-rating about teacher's ability of practical use of ICT. Pre-post survey was conducted before and after using digital textbooks. The result is that the utilization of digital textbooks effectively raises the teacher's ability of using ICT.

On the other hands, KERIS measured the effectiveness by more various and systematic aspects. It focused on "Digital contents satisfaction", "Learning devotion", "self-learning ability", & "Problem solving ability". Each item tested by some scales or questionnaires that were made in previous research. Though the results are rather complicated, statistical significances were also showed in the all items by comparative research.

In addition, the Korean survey took various types of examinees for the comparison. They controlled the comparative survey by gender, where they lived (agricultural area, fishing village, average city, and big city), scholastic ability (high, low, and average), and "educational background of the parent" as well as whether digital textbooks were used or not.

In Japan, digital textbook for teachers is developed and introduced into schools earlier. Therefore,

just a group of teachers were chosen as the target for the survey. When the development of the digital textbooks for learners will be implemented in short future, it will be necessary to put the similar influence of factors as Korean survey in consideration. Like the Korean survey policy, the Japanese survey should take these factors into account to evaluate and measure student abilities and background of them in various aspects rather than objective test.

Considerations

In this study, we compared digital textbooks in Japan and Korea from the viewpoints of functions and effect. The characteristics of each digital textbook became clear by the comparison.

At present, Japanese digital textbooks are designed in terms of functions to help teachers to conduct classes in masse effectively and efficiently. A lot of effort to verify the effect was, therefore concentrated to the impression in teachers and abilities to use ICT in the classes. Japan can learn many things to improve digital textbooks. For example, Japanese classrooms are said to change to more individual-based and group-based. Individual interpretation of the textbooks and group discussion are expected in Japanese classes. Therefore, these classes will support by function of digital textbooks such as discussion function figured out in Korean digital textbook.

In addition, there is a big difference in the coverage of digital textbook. Japanese digital textbooks cover just classes in classrooms. On the other hands, Korean ones support all schoolwork. Therefore, Korean digital textbook has unique function such as "Self learning" and "Teacher support". These differences cause differences in evaluation items and method. Simply speaking, Korean digital textbooks have wide functions more than Japanese ones. Japanese digital textbooks can use Korean digital textbooks as a reference to cover wider instructions in schools.

Korean digital textbook was developed and evaluated as a tool that supports various aspects of instruction at schools. Various kinds of survey items were adopted under the wide perspective in the survey to verify the effect of digital textbook. As described above, Japanese digital textbooks was developed especially focusing on class. Especially, "customizability" is a feature of Japanese digital textbook. We found difference even in common category in "Authoring teaching material". Japanese digital textbooks have many functions for customizing teaching materials depending on teacher's style. Korean digital textbooks have a function of "Teachers support" such as "Teacher manual for class", "Teacher guidance plan".

These functions guarantee all teachers do same or similar lessons. On the other hand, Japanese digital textbooks give assurance of diversity of classes depending on teaching style. Korea can refer to Japanese digital textbook as a reference to make customizability of the resources in digital textbooks.

In Japan, it is time for the big change of educational environment such as "developing digital textbook for student", "preparation of cloud computing systems for school". It is important to learn from Korea where development of digital textbook environment with multi- and student-centered functions is pushed forward. New design of digital textbooks as an integrated tool for teaching and learning, new definition of scholastic ability and evaluation method other than objective test need to be examined.

Korean educational environment will change also. Korean digital textbooks have functions for teachers and students at the same time. There will be a possibility to re-design digital textbooks for teachers and students separately like Japanese ones.

In this research, we obtained an overview of the feature of digital textbooks in both countries from the functions and the effect. This was, however, the pilot study to grasp the outline of the situation related to digital textbooks.

This type of co-research, but in a wider and deeper form, will be required as educational and technological change keeps on going.

References

Homepage of Tokyo-Syoseki Co., LTD. from http://www.tokyo-shoseki.co.jp/ retrieved on 29.05.11

Homepage of Mitsumura Tosho Publishing Co., LTD. from http://www.mitsumura-tosho.co.jp/ retrieved on 29.05.11)

Homepage of Dainippon Tosyo Co., LTD. from http://www.dainippon-tosho.co.jp/corporate/ retrieved on 29.05.11

KERIS (2010). The digital textbook effect measurement research report from http://www.keris.or.kr/upload/board01/1304389315230_303073620.pdf retrieved on 28.09.11

Kurokami, H., Kwon, S., Kishi, M., Bhang, S., Kim, S., & Taizan, Y. (2010). Analyzing usage of digital textbook and digital blackboard from cognitive process. *8th International Conference for Media in Education 2010 (ICoME),* 120-127.

MEXT (2009). Surveillance study about the learning effect etc. which are acquired by practical use of a digital board from http://www.mext.go.jp/a_menu/shotou/zyouhou/1297993.htm retrieved on 28.09.11

Oyanagi, W. (2011). A primitive investigation on utilization of electronic textbook. *The Annals of Center for Educational Research and Development Nara University of Education, 20*, 205-208.

Shimizu, Y., Koizumi, R., & Horita, T. (2010). Current conditions of electronic textbook for students and issues to be considered in Japan. *Research Report of JSET Conferences, 10*(4), 29-36.