

Meta Analysis on the Digital Textbook's Effectiveness on Learning Attitude

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Abstract: This study was applied the digital textbook's effectiveness on the learning attitude to the reports about 24 schools for research designated by the MEST(Ministry of Education, Science & Technology) and local Education Offices in 2008 and 2009. From the report data, the researcher calculated the overall effect size on learning attitude and respective effect size on the subjects of Korean, Mathematics, Sociology, Science and English. The result of this study is as follows: First, in terms of the digital textbook' effect on learning attitude, its overall, average effect size was 0.20 and 57.5% in the U3 index. The digital textbook appeared 7.5% improvement in the learning attitude compared to that of paper-printed textbook. Second, its effect on each subject was appeared in order of Korea(0.28), Sociology(0.27), Science(0.25), Mathematics(0.08), and English(0.08). According to Cohen's interpretation method, it can be said 3 subjects of Korean, Sociology and Science have small-sized improvement effects. But the subjects of English and Mathematics seemed not to have any change in learning attitude depending a kind of textbook.

Keywords: Digital Textbook, Learning Attitude, Meta-Analysis

1. Introduction

Existing teaching & learning systems centering the paper-printed textbook hinders the curriculum's often revision, which essentially needs due to the rapid social changes and the knowledge's shorten life span. Also seasonable supplement of educational cost much time and money[5]. Furthermore, with its limited contents, the paper-printed textbook reveals its limits in meeting learners' various learning needs and in raising more creative personals[4]. Therefore, there are increased the request on the digital textbook to fit in the U-learning Environment as well as to overcome above limits (the paper-printed textbook's limits) for rearing talented personnel required in the knowledge-information society[1][2][3].

To meet the needs of this age, Korean government suggested its vision for developing and commercializing high-quality textbook to suitable in the future educational environment[6] through the 'Digital Textbook's Commercialization Plan' in 2007, and started the development of model digital textbook[7][8]. And By designating 5 schools for researching in 2007, 20 schools in 2008 and 112 schools in 2009 respectively, the government tries to evaluate the learning effects of digital textbooks by applying them to real school situations.



Figure 1. Comparison of the two classrooms

2. Purpose and Methods

The purposes of this study are to estimate how much influence the digital textbook has on the learning attitude per subject compared with the paper-printed textbook's effects and to draw some suggestions for the digital textbook's effective application. For these purposes, this study conducted the metal-analysis targeting 24 reports about the research-schools designated by the MEST(Ministry of Education, Science & Technology) and local Education Offices in 2008 and 2009. And this study set following research matters:

First, How much size of overall average effect the digital textbook influences on the learning attitude?

Second, What subject is the digital textbook's influence on learning attitude appeared in?

This study was analyzed the operational reports of 24 schools currently designated for researching the digital textbook.

Table 1. 24 Field Research Reports' Current Situation about Research Targets

Number of Schools	24 Elementary School		
Number of Classes for Research	5th Grade	40 Classes	80 Classes
	6th Grade	40 Classes	
Number of Students for Research	Experimental Group	2205 people	5255 people
	Compared Group	3050 people	
Subject for Research	Korean, Sociology, Mathematics, Science, and English		
Application Period	2008 - Current(7 researches), 2009 - Current(17)		
Designating Institution	the MEST(11 schools), Local Education Offices(13)		

The study used some self-evaluation questions asking about the learning attitude, the subject preference, the learning pattern and learning-spent time. The questionnaire was produced by school after selecting some of KERIS' Learning Attitude Standard Questions. In this study, the survey results were calculated in the standardized unit of effect size.

In measuring and interpreting the digital textbook's effect sizes, this study used Cohen(1977)'s scale(standard).

3. Results and Discussion

As the result analyzing the cases acquired from the 24 reports selected for this study, digital textbook's overall, average effect size was the same as that of [Table 2].

Table 2. Digital Textbook's Overall, Average Effect Size (Improvement Level of Learning Attitude)

Kind	N	M(ES)	SD	U3%
Digital Textbook	24	0.20	0.458	57.5%

According to the [Table 2], the digital textbook's overall, average effect size was 0.20. Using Cohen(1977)'s interpretation standard for size effect, the result means that there was the 'small effect'. The overall effect's U3 index was 57.5%, and the figure means that the

experimental group applying the digital textbooks improved its learning attitude of 7.5% more than that of the paper-printed textbook group.

For the classes using the digital textbooks, it was identified that students' learning attitudes in the subjects of Korean, Sociology and Science improved bigger than those of Mathematics and English. The self-evaluation questions were composed of the subject preference, the understanding level about class lesson, the concentration level, the initiative level, and the existence of class preparation & review. To get the responses, this study used various methods such as gathering data, communicating with students and setting some simulation situations. It is judged that the digital textbook's effect size on learning attitude was relatively bigger in the subjects of Korean, Sociology and Science which the students feel less, cognitive burden. For the subject of Mathematics and English, it can be interpreted that the digital textbook's effect size didn't have any big difference from that of paper-printed textbooks. This no difference may be considered that the digital textbook's strengths couldn't overcome the cognitive burdens which the subjects English and Mathematics have.

Table 3. Digital Textbook's Effect Size on Learning Attitude by Subject

Subject	N	M(ES)	SD	U3%
Korean	24	0.28	0.387	61.0%
Sociology	24	0.27	0.466	60.6%
Science	24	0.25	0.584	59.8%
Mathematics	24	0.08	0.474	53.1%
English	24	0.08	0.262	57.5%

4. Conclusion

In this study, we performed robot-aided education in a real classroom and surveyed the Digital textbook's model application has some important meaning in that students have naturally experienced a future-type teaching-learning pattern through various activities. However, for drawing common conclusion that a class utilizing the digital textbook improved student's academic achievement level or other cognitive powers, some researches with enough data from long viewpoint must continually be delivered. The digital textbook's efficiency needs to be proved in longer viewpoint. In addition of the digital textbook's cognitive effect, its definitive efficiency must steadily be reviewed.

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