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The Impact of E-schoolbag on Students' Information Literacy Proficiency- A Case Study of M District in Shanghai, China

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Abstract: As one of the core competitiveness in the 21st century, information literacy has attracted more and more attention of the educators all over the world. However, limited empirical research focused factors that affect students' information literacy proficiency in educational practices. This paper reported a case study of a three-year e-schoolbag project in M District of Shanghai and explored the impacts of the e-schoolbag learning on students' information literacy proficiency. We conducted a questionnaire on students' applications of e-school bag and information literacy proficiency, and received 4002 valid responses. The independent-sample T-test results showed that the use of e-schoolbag had a positive impact on the students' information literacy proficiency, and among the students who used the e-schoolbag, there was a significant difference between male and female students on information literacy proficiency.

Keywords: E-schoolbag; information literacy; K-12

1. Introduction

Pilot activities of e-schoolbag application in primary and secondary schools has caused great concern in the educational reform of many countries. In March 2012, the Minister of the Federal Communications Commission and the Education convened Apple, Intel and other companies to consider concrete measures to tackle the challenges of the future development, and plan to promote an interactive digital textbooks in the popularization and application of the nation's K-12 schools in the next five years (Federal Communications Commission, 2012). Some of Chinese developed regions (such as Beijing, Shanghai, etc.) have also put e-schoolbag on educational information plan, including the "Shanghai long-term educational reform and development plan (2010-2020)", it clearly stated "promoting the development of 'e-schoolbag' and 'cloud computing' to meet secondary educational requirements". At the beginning of 2011, some primary and secondary schools in Hongkou District, Ningbo, Foshan, and Xi'an began to launch the e-schoolbag pilot project. Currently in China, the largest e-schoolbag project located in M District of Shanghai. The project set up 40 pilot schools in 2012, including 30 primary schools, 7 middle schools, and 3 high schools, mainly focused on Chinese, Mathematics and English. The experimental schools reached 65 in 2015, with a size of more than 8000 experimental students.

The 2000 Association of College & Research Libraries' (ACRL, 2000) Information Literacy Competency Standards for Higher Education defined information literacy as "a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information." In British, the 2011 Society of College, National and University Libraries (SCONUL, 2011) seven elements standards also suggested that information literacy is "a concept covering digital, visual and media literacy, academic ability, information processing, information skills, data monitoring and data management." In recent years, ACRL(2012) realized that it was not enough to promote information literacy, digital literacy and visual literacy in a patched way, and we must use a more open vision to pay attention to various forms of information to understand the information context, as well as new formed ways of academic exchanges, to perfect information literacy.

Students are the most direct beneficiaries of the e-schoolbag project. We study the impact of e-schoolbag application on students' information literacy proficiency, the results will provide empirical data to support the following study and policy decision. Penuel (Penuel, W. R., 2006) did a comprehensive analysis of 30 "one to one" digital learning trials, and found that "one on one" digital learning had a positive impact on students' technology use, information literacy and writing skills. Missouri State University researchers conducted a meta-analysis of 160 studies and found that "one on one" digital learning can improve students' technological literacy, had a significant influence on students' writing skills, furthermore, it may have a positive impact on cooperation, self-orientation and other 21st century skills(Sell, G., Cornelius-White, J., & Chang, C., 2012). The eight-year-study on digital learning, which conducted by Maine Learning Technology Innovation Project (MLTI), showed the project had a significant impact on the school curriculum, teaching and learning; the data from students showed the experiment improved their academic achievement of writing, mathematics and science, and enhanced the 21st century skills, including the students' access to information and information evaluation (Silvernail, D. L., Pinkham, C., & Wintle, S. E., 2011). Researchers of Israel's Bar-Ilan University did the analysis about the impact of digital learning on students' 21st century skill development, the study found that the students in experimental classes had a better access to information, information evaluation, information processing and expression than traditional classes (Spektor-Levy, O., & Granot-Gilat, Y., 2012). In summary, the applications of e-schoolbag have a wide range of impact on students' learning process and outcomes. Based upon a three-year e-schoolbag project in M District of Shanghai, this paper focused on the impact of e-schoolbag the impact of the e-schoolbag use on students' information literacy, to discover the value of e-schoolbag teaching from the student perspective.

2. Research Design

2.1 Research Questions

Question 1: Is there any significant difference between the students who have used e-schoolbag to learn and those not when it comes to information literacy proficiency?

Hypothesis 1a (H1a): After using the e-schoolbag, students show a better attitude towards technology applications;

Hypothesis 1b (H1b): After using the e-schoolbag, students have a more skilled technical operation skills;

Hypothesis 1c (H1c): After using the e-schoolbag, students have a better grasp of knowledge and skills of technical application;

Hypothesis 1d (H1d): After using the e-book package, students have a stronger moral security.

Question 2: Among the students who have used e-schoolbag to learn, is there any significant difference between male and female students when it comes to information literacy proficiency?

Hypothesis 2a (H2a): Male students show a better attitude towards technology applications;

Hypothesis 2b (H2b): Male students have a more skilled technical operation skills;

Hypothesis 2c (H2c): Male students have a better grasp of knowledge and skills of technical application;

Hypothesis 2d (H2d): Male students have a stronger moral security.

2.2 Methods

The study focused on students involved in e-schoolbag pilot projects and students hadn't used e-schoolbag before. We designed "Student Information Technology Application Questionnaire." It contained 35 questions, which were set according to the Likert scale, focusing on four modules, namely technology attitude (A1-A6), technical operation skills (B1-B10), knowledge and skills of technical application (C1-C16), safety moral (D1-D3). As for participants, we chose experimental students in 40 pilot schools of e-schoolbag project in M District as the research object, and non-experimental students in the same grades of the pilot schools as a control group. All the students were chosen from the 40 pilot schools.

Table 1: The details of questionnaire

Mark	Modules	Question Number
A	Technology Attitude	A1-A6
B	Technical Operation Skills	B1-B10
C	Knowledge and Skills of Technical Application	C1-C16
D	Safety Moral	D1-D3

3. Results and Discussions

3.1 Validity and Reliability

The survey received 4002 valid responses, 2717 students have participated in the e-schoolbag project for two years, while 1285 students haven't used e-schoolbag before.

Table 2: The details of participants

	Male students	Female students	Total
Use e-schoolbag	1446	1271	2717
Don't Use e-schoolbag	667	618	1285
			4002

Construct validity refers to the extent possible to measure the quality or the concept of the theory. To test the validity of the questionnaire, the most commonly used method is factor analysis. The KMO value of sample was 0.983(Table 3), Bartlett spherical test p-value <0.001, which indicated it was very suitable for factor analysis. And through the factor analysis, we found that item C3 had significantly lower load (0.318) in factor 1 than other items in the same module, and existed the correlation with other modules, so we deleted it. After removing C3, we did the second factor analysis. It can be seen from the factor load that C1, B5 constituted a level separately, so we removed C1, B5. After adjustment, the factor load of four modules in questionnaire varied from 0.636 to 0.857, the construct validity was good.

Table 3: Validity: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.983
Bartlett's Test of Sphericity	**Approx. Chi-Square**	143128.048
	df	561
	Sig.	.000

This study used Cronbach's α to evaluate reliability. We analyzed the questionnaire data and found that Cronbach's α of all modules were above 0.70 (Table 4), which indicated the good internal consistency and high reliability of questionnaire.

Table 4: Questionnaire reliability

Factors	Cronbach's α
Technology Attitude	.944
Technical Operation Skills	.951
Knowledge and Skills of Technical Application	.960
Safety Moral	.905

3.2 Variance Analysis between the Experimental and Non-experimental Students

We analyzed the questionnaire data of two students groups (use/non-use), and independent-sample T-test results showed that whether students used e-schoolbag or not made significant differences on all

the four modules (P-value(2-tailed) <0.01 in 95% confidence interval, difference reached extremely significance level). Namely, we should receive H1a, H1b, H1c and H1d. Compared with learning groups not using e-schoolbag, students using e-schoolbag performed a higher initiative to use technology; they were better to operate IT; they had stronger ability to use and solve IT problem; and they had stronger moral consciousness.

Table 5: Variance between the experimental and non-experimental students

Modules	Whether use e-schoolbag or not	Sample	Mean	Standard deviation	Sig (2-tailed)	T
A	Use	2717	4.3704	.80643	.000	4.328***
	Not use	1285	4.2433	.89508		
B	Use	2717	4.4820	.71258	.003	2.956**
	Not use	1285	4.4072	.76325		
C	Use	2717	4.4758	.67017	.001	3.532***
	Not use	1285	4.3902	.73623		
D	Use	2717	4.6419	.66344	.000	3.530***
	Not use	1285	4.5546	.75989		

** p<.005; *** p<.001

After excluding question C3, C1 and B5 in the factor analysis, we did independent- sample T-test on the remaining 32 questions, only to find on five questions (Table 6), there were no significant difference between the students who have used e-schoolbag to learn and those not. That is to say, there were significant differences in Module A and D. The details of questions were as follows:

B4: I can use the player to play multimedia resources (such as music, movies, animation, etc.)

B6: I can download a file, the software from the network.

B8: I can use e-mail, QQ, WeChat to contact with the teachers and students.

C10: I know a variety of ways of online communication, such as QQ, WeChat.

C11: When encounter extracurricular problems, I can seek help from teachers or classmates quickly.

Table 6: Questions with no significant difference

Questions	Whether use e-schoolbag or not	Sample	Mean	Standard deviation	Sig (2-tailed)	T
B4	Use	2717	4.52	.807	.118	1.566
	Not use	1285	4.48	.854		
B6	Use	2717	4.48	.879	.083	1.731
	Not use	1285	4.43	.903		
B8	Use	2717	4.47	.865	.235	1.189
	Not use	1285	4.50	.852		
C10	Use	2717	4.59	.781	.098	1.655
	Not use	1285	4.55	.787		
C11	Use	2717	4.44	.814	.056	1.913
	Not use	1285	4.39	.867		

3.4.1 Variance Analysis between Male and Female Students

The results focused on students who have used e-schoolbag to learn. Independent-sample T-test results showed that there were significant differences in Module A and Module D, so we should refuse Hypothesis 2b and Hypothesis 2c. Male students were more enthusiasm in the use of technology than female students, so we should receive Hypothesis 2a. While the performance of girls was better than boys in safety moral module, especially in information security and information ethics, so we should refuse Hypothesis 2d. There were no significant differences in Module B and Module C between male

and female students.

Table 7: Variance between male and female students (use e-schoolbag)

Modules	Gender	Sample	Mean	Standard deviation	Sig (2-tailed)	T
A	Male	1446	4.3995	.84941	.045	2.019*
	Female	1271	4.3374	.75353		
B	Male	1446	4.4799	.76991	.0869	-.165
	Female	1271	4.4843	.64144		
C	Male	1446	4.4259	.71503	.713	.368
	Female	1271	4.4167	.59586		
D	Male	1446	4.6000	.74175	.000	-3.577***
	Female	1271	4.6985	.55770		

* p<.05; *** p<.001

Focusing on the gender, we conducted an independent- sample T-test on the remaining 32 questions in the same way, only to find on ten questions (A2, A3, A4, B1, B2, B8, B9, D1, D2, D3), there were significant differences between male and female students. In other words, among all the questions in Module C, we can not find significant differences.

Table 8: Questions with significant differences between male and female students (use e-schoolbag)

Questions	Gender	Sample	Mean	Standard deviation	Sig (2-tailed)	T
A2: I like to learn with technology	Male	1446	4.49	.880	.031	2.158*
	Female	1271	4.42	.813		
A3: It is very important for me to study by technology	Male	1446	4.27	1.001	.009	2.624*
	Female	1271	4.17	.955		
A4:I have confidence in learning by technology	Male	1446	4.39	.935	.002	3.082**
	Female	1271	4.28	.871		
B1: I am skillful at operating a computer.	Male	1446	4.45	.861	.012	2.500*
	Female	1271	4.36	.841		
B2: I can connect to network	Male	1446	4.44	.902	.015	2.426*
	Female	1271	4.36	.860		
B8: I can use e-mail, QQ, WeChat to contact with the teachers and students	Male	1446	4.48	.960	.001	-3.300**
	Female	1271	4.59	.738		
B9: I can install and uninstall the software	Male	1446	4.51	.908	.040	2.056*
	Female	1271	4.44	.894		
D1: I can distinguish the information on the Internet	Male	1446	4.54	.854	.006	-2.769*
	Female	1271	4.62	.678		
D2: I will not spread things unhealthy or restricted by copyright on the web	Male	1446	4.62	.808	.000	-3.566***
	Female	1271	4.71	.603		
D3: I can pay attention to the protection of personal information	Male	1446	4.64	.749	.000	-3.580***
	Female	1271	4.73	.558		

* p<.05; ** p<.005; *** p<.001

4. Conclusions

According to our survey results, the study found that:

Experimental and non-experimental students performed extremely significant differences in all the four modules. The data showed that after using the e-schoolbag, experimental students had improved in all aspects of information literacy, indicating that students have had good basic technical reserves already, which will create good environment to promote further regional e-schoolbag teaching application.

Focusing on students who have used e-schoolbag to learn, the differences were obvious between male and female students in some respects. Male students were more enthusiasm in the use of technology than female students, while the performance of girls was better than boys in safety moral module. If the school can provide targeted teaching for male and female students at the points of difference, the effect may be more pronounced.

In this study, students in the experimental classes and non-experimental classes performed significant differences in several aspects, such as information consciousness, information requirements, information acquisition, information evaluation, task completion, information management and organization, information innovation, and information ethics. As for experimental students, although the survey results showed that students have improved in all aspects of information literacy, this is still only the findings at this stage. So in order to verify the use of e-schoolbag can really enhance the capacity of information technology and ability of using technology to learn, we need to get continuous data. Moreover, we should observe the impact of e-schoolbag use on students' learning from other aspects, such as psychological outcomes, behavioral outcomes and other learning benefit outcomes.

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