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Research on the Impact of e-Schoolbag on Students' Development: from the Perspective of Personal Learning Skills

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Abstract: With the continuous development and deepening of educational informatization, society has increasingly recognized the application of digital learning media and platform in the classroom. As one of the important means of modern educational informationization, e-Schoolbag has exerted great influence on both students and teachers. In order to understand the effect of e-Schoolbag on student's growth from the perspective of personal learning and thinking skills, this study chooses 26688 students in city S district M as the research object. The analysis is from the independent learning, creative thinking, reflective learning, cooperative learning, Self-management and effective participation of these five aspects. At the same time, the study also compared the influence of different learning period and gender. The results show that the use of e-Schoolbag has different effects on the five dimensions of students. In the group of primary school students who use e-Schoolbags, gender difference also affects the influence of e-Schoolbags on students' personal learning and thinking skills.

Keywords: Education informatization, E-Schoolbag, student growth, personal learning and thinking skills

1. Introduction

In 1999, the e-Schoolbag was first used in Singapore and has received widespread attention. With the development of technology, digital educational equipment is going to be an indispensable part of students' learning life. From the blackboard in the traditional classroom, the projection screen, the electronic whiteboard, to the current each students equipped with learning electronic terminal in 1:1 digital learning environment, various of information technologies have provided a rich form of information representation through the development of practical products with leading value, which changed learners' perceptions of things and their learning behaviors (Zhiting & Jueqi, 2014).

In November 2000, the ministry of education of China promulgated the "notice on the implementation of the Notice on the implementation of the "school-school communication" project in primary and secondary schools". In 2009, it began the experimental plan about the e-Schoolbag in Taiwan area and formally implemented in Taipei in 2011. As an important terminal product of educational informatization and digitalization, e-Schoolbags began to enter the vision of schools and were repeatedly piloted in the voice of mixed praise and criticism and endless controversy (Youmei & Huibin, 2014). Ten years after the issue of project, in 2010, Hong Kong put forward the e-Schoolbag learning experimental plan. In the same year, Shanghai municipal government issued the outline of Shanghai medium - and long-term education reform and development plan (2010-2020), which clearly pointed out that digital curriculum environment construction and learning mode reform experiment should be carried out. Improve students' information literacy and innovation ability, guide students to master the ability of using modern information technology to acquire knowledge and it is necessary to promote the development of e-Schoolbag and cloud computing auxiliary teaching, and promote students to use information technology to enrich in-class and out-class learning and research(the ministry of education of the people's republic of China, 2010). Shanghai Hongkou district took the lead in responding to the call and entered into the development mode with regional units and overall

promotion by government departments in the new round of development 10 years(Xiaohua, 2014). In 2017, the information technology curriculum standards for ordinary high schools clearly pointed out that digital learning and innovation is one of the four core qualities of information technology discipline. In April 2018, the ministry of education promulgated the "action plan on education informatization 2.0", which means that China's education informatization has stepped into the 2.0 era from the 1.0 era and has higher requirements and expectations for the development of education informatization. Another 10 years have passed. Under the support and guidance of relevant policies, schools in different regions in China have launched pilot projects of e-Schoolbag and achieved good results. At the same time, there are still many scholars' influences on students and teachers brought by e-Schoolbag into the classroom, such as students' classroom teaching behavior pattern (Xianlong, Xiaobing, Yonghe, & Xinhua,2013), students' academic performance and learning experience(Jueqi, Riezebos, Xiaobing, & Zhiting, 2015), teacher development (Hui, Yanjun, &Shaoqing, 2016) and other aspects. As the most critical link in the application process of e-Schoolbag, students' feelings and growth can best reflect the application effect. Therefore, from the perspective of students' growth, this study attempts to explore the impact of e-Schoolbag application on students' personal learning and thinking skills, and further analyzes the impact of different type of students, hoping to provide a reference for relevant researchers.

2. Research Design

2.1 Research Purposes

The purpose of this survey is to find out whether the personal learning and thinking skills are improved compared to non-experimental students after using the e-Schoolbag. The results of this survey also provide reliable data and conclusions for subsequent research.

2.2 Survey Methods and Questionnaire

The survey used Guan Jueqi's self-reported questionnaire for personal learning and thinking skills (Jueqi, 2017), and used online research methods. The questionnaire consisted of 27 questions and set the level of “very agree, mostly agree, neutral, mostly disagree, and very disagree”. Combined with the key research questions, the questionnaire content is divided into five dimensions for survey students, namely independent learning, creative thinking, reflective learning, cooperative learning, self-management and effective participation.

The independent learning dimension includes five statements. They are: “I can clearly identify the problem to be answered/solved, or the task to be completed”, “I will solve the problem or task in a step-by-step way as planned”, “I can think about the problem according to different viewpoints ”, “I can obtain the information to help solve the problem/complete the task” and “I can discuss the evidence in detail to support the result”. The reliability analysis by SPSS 23.0 shows that the Cronbach α coefficient of this dimension questionnaire is 0.951, it is much higher than 0.7, which means that the internal consistency and the reliability of the questionnaire items are pretty good and the reliability of the questionnaire.

Creative thinking involves “I can generate ideas and explore possibilities for problems or tasks”, “I will continue to ask questions to expand my ideas”, “I will discuss and analyze my ideas with others”, “I will question my hypothesis and other people's hypothesis" and "I will try to choose a new problem-solving method". The reliability analysis by SPSS 23.0 shows that the Cronbach α coefficient of this dimension questionnaire is 0.905, it is much higher than 0.7, which means that the internal consistency and the reliability of the questionnaire items are pretty good and the reliability of the questionnaire.

Reflective learning includes “I will evaluate myself and others and discover learning opportunities.”, “In the process of problem-solving/completing, I will summarize my progress in time and act according to the results.”, “When I receive feedback such as praise and criticism, I will be active processing.", "I will sum up experience and guide the next study." and "I will communicate my learning with others in different ways.". The reliability analysis by SPSS 23.0 shows that the Cronbach α

coefficient of this dimension questionnaire is 0.945, it is much higher than 0.7, which means that the internal consistency and the reliability of the questionnaire items are pretty good and the reliability of the questionnaire.

Cooperative learning includes “I will cooperate with others for a common purpose.”, “I will lead the discussion to get results.”, “I can put forward the ideas of solving problems with others”, “I will be responsible for myself and others.”, “I will take the initiative to care for and help others." and "I will provide help and feedback to others.". The reliability analysis by SPSS 23.0 shows that the Cronbach α coefficient of this dimension questionnaire is 0.951, it is much higher than 0.7, which means that the internal consistency and the reliability of the questionnaire items are pretty good and the reliability of the questionnaire.

Self-management and effective participation include “around the goal, I can actively participate in learning and perseverance”, “I can actively seek advice and support when needed”, “I can propose methods for problems/tasks and break them down into specific implementations. Steps, "I will constantly improve myself to benefit myself and others", "I will express my opinion to influence others" and "I will support different opinions or ideas than me.” The reliability analysis by SPSS 23.0 shows that the Cronbach α coefficient of this dimension questionnaire is 0.941, it is much higher than 0.7, which means that the internal consistency and the reliability of the questionnaire items are pretty good and the reliability of the questionnaire.

At the same time, the SPSS 23.0 analysis found that the KMO value is 0.905, which is greater than 0.5 and is greater than 0.9, indicating that the questionnaire has good structural validity. As shown in Table 1, the value of sig. indicates that the differences are significant.

Table 1

Questionnaire validity analysis

Test of KMO and Bartlett		
Sample enough Kaiser-Meyer-Olkin metrics		.982
Bartlett's sphericity test	Approximate Chi-square	973173.341
	df	496
	Sig.	.000**

Note:* .p<0.05, ** .p<0.01, *** .p<0.001

2.3 Participants

26,688 questionnaires were collected and the effective questionnaires were 26,570. The school stage spans primary, middle and high schools. Among them, there are 14,026 students who have participated in the e-Schoolbag pilot project, and 12,544 students who have not used e-Schoolbag (Table 2).

Table 2

Sample basic information statistics

	Learning period	Male	Female	total
students who have participated in the e-Schoolbag pilot project	Primary	5515	5244	14026
	Middle	1248	1292	
	High	368	359	
students who have not participated in the e-Schoolbag pilot project		6520	6024	12544
Total				26570

3. Analysis of the Survey Results

3.1 Analysis of Differences between Male and Female Students

In order to understand the differences between the male and female students' personal learning and thinking skills in different learning stages, the study gets the scores corresponding to the dimensions to obtain the average value of the students under each topic. The higher the mean value of the students is in this dimension, the ability is stronger.

3.1.1 Overall Analysis of the Differences between Male and Female Students

By using SPSS 23.0 for independent sample t-test, the differences between the male and female students in the e-Schoolbag experimental site were obtained. The results of the data analysis were shown in table 3. The T-test results show that there are no significant differences between male and female students in the use of e-Schoolbag in three modules. They are independent learning, creative thinking, self-management and effective participation. However, there are significant differences in reflective learning and cooperative learning of these two modules. There are significant differences in the reflective learning module, that is, females are more able to rethink their self-reflection in learning than male, and more effectively carry out cooperative learning. Through self-reflection and teamwork, they can improve their learning effects and exercise their personal thinking skills.

Table 3

A Comparison of Male and Female Students in E-Schoolbag Pilot Project

Students' personal learning and thinking skills	Gender	N	Mean	SD	p-value
independent learning	Male	7131	4.2028	.76825	.130
	Female	6895	4.2219	.72630	
creative thinking	Male	7131	4.1041	.74664	.432
	Female	6895	4.0944	.71825	
Reflective learning	Male	7131	4.1579	.74929	.014
	Female	6895	4.1883	.70880	
Cooperative learning	Male	7131	4.2129	.72170	.012
	Female	6895	4.2429	.68492	
self-management	Male	7131	4.1702	.72888	.108
	Female	6895	4.1896	.69631	

Note:* .p<0.05, ** .p<0.01, *** .p<0.001

3.1.2 Analysis of the Differences between Male and Female Students in Primary School

By using SPSS 23.0 for independent sample T-test, the differences between the male and female students in the primary school of e-Schoolbag experimental sites were answered in the questionnaire. The results of the data analysis were shown in table 4. The results of the T-test show that there are no significant differences between the male and female students in the primary school by using e-Schoolbag when it comes to independent learning, creative thinking, self-management and effective participation. However, there are significant differences in the modules in reflective learning and cooperative learning. The data shows that female students in primary school are more able to rethink and introspect after class than male. At the same time, they also pay more attention to teamwork and learning in daily learning, and promote their learning and development through collective wisdom.

Table 4

A Comparison of Male and Female Students in Primary School E-Schoolbag Pilot Project

Students' personal learning and thinking skills	Gender	N	Mean	SD	p-value
independent learning	Male	5515	4.1287	.75980	.136
	Female	5244	4.1502	.73237	
creative thinking	Male	5515	4.0257	.73286	.565
	Female	5244	4.0177	.71812	
Reflective learning	Male	5515	4.0839	.73736	.010
	Female	5244	4.1201	.70822	
Cooperative learning	Male	5515	4.1460	.70919	.018
	Female	5244	4.1778	.68638	
self-management	Male	5515	4.1035	.71614	.075
	Female	5244	4.1278	.69608	

Note:* .p<0.05, ** .p<0.01, *** .p<0.001

3.1.3 Analysis of the Differences between Male and Female Students in Middle School

By using SPSS 23.0 for independent sample T-test, the differences between the male and female students in the middle school of e-Schoolbag experimental sites were answered in the questionnaire. The results of the data analysis were shown in table 5. The results of the T-test showed that there were no significant differences between the male and female students in the five dimensions of independent learning, creative thinking, reflective learning, cooperative learning, self-management and effective participation.

Table 5

A Comparison of Male and Female Students in Middle School E-Schoolbag Pilot Project

Students' personal learning and thinking skills	Gender	N	Mean	SD	p-value
independent learning	Male	1248	4.4303	.77777	-0.966
	Female	1292	4.4576	.64172	
creative thinking	Male	1248	4.3577	.76374	-0.577
	Female	1292	4.3420	.65862	
Reflective learning	Male	1248	4.3936	.76194	-0.529
	Female	1292	4.4085	.65731	
Cooperative learning	Male	1248	4.4197	.75026	-1.265
	Female	1292	4.4545	.63035	
self-management	Male	1248	4.3841	.75931	-0.265
	Female	1292	4.3915	.65125	

Note:* .p<0.05, ** .p<0.01, *** .p<0.001

3.1.4 Analysis of the Differences between Male and Female Students in High School

By using SPSS 23.0 for independent sample T-test, the differences between the male and female students in the high school of e-Schoolbag experimental sites were answered in the questionnaire. The results of the data analysis were shown in table 6. The results of the T-test showed that there were no significant differences between the male and female students in the high school using the e-Schoolbag in the five modules of independent learning, creative thinking, reflective learning, cooperative learning, self-management and effective participation.

Table 6

A Comparison of Male and Female Students in High School E-Schoolbag Pilot Project

Students' personal learning and thinking skills	Gender	N	Mean	SD	p-value
independent learning	Male	368	4.4026	.64041	.714
	Female	359	4.3294	.73304	
creative thinking	Male	368	4.3605	.64334	.644
	Female	359	4.2975	.68091	
Reflective learning	Male	368	4.3605	.65809	.232
	Female	359	4.3378	.67435	
Cooperative learning	Male	368	4.4079	.63735	.817
	Female	359	4.3291	.66789	
self-management	Male	368	4.3575	.64504	.624
	Female	359	4.2969	.67024	

Note:* .p<0.05, ** .p<0.01, *** .p<0.001

3.2 A Comparison of Students' Personal Learning and Thinking Skills of the Impact of e-Schoolbag

The study uses SPSS 23.0 to analyze the data of students whether or not to use e-Schoolbag. The results of the data analysis were shown in table 7. The results of T-test show that there are extremely significant differences in five modules independent learning, creative thinking, reflective learning, cooperative learning, self-management and effective participation between students use e-Schoolbag and not. That is, students who use e-Schoolbag to learn have higher independent learning ability than those who do not use e-Schoolbag (Mean = 4.2122>4.0420); they have stronger creative thinking skills (Mean = 4.0993>3.9616); stronger reflective learning ability (Mean = 4.1728>4.0207); stronger cooperative learning ability (Mean = 4.2277>4.0966); stronger self-management and effective participation (Mean = 4.1797>4.0418).

Table 7

A Comparison between experimental and non-experimental E-Schoolbag Pilot Project

Students' personal learning and thinking skills	School type	N	Mean	SD	p-value
independent learning	Experimental	14026	4.2122	.74796	.000
	Non-experimental	12544	4.0420	.74267	
creative thinking	Experimental	14026	4.0993	.73281	.000
	Non-experimental	12544	3.9616	.70635	

Reflective learning	Experimental	14026	4.1728	.72980	.000
	Non-experimental	12544	4.0207	.71715	
Cooperative learning	Experimental	14026	4.2277	.70399	.000
	Non-experimental	12544	4.0966	.68590	
self-management	Experimental	14026	4.1797	.71310	.000
	Non-experimental	12544	4.0418	.69599	

Note:* .p<0.05, ** .p<0.01, *** .p<0.001

4. Research Conclusion

4.1 the Effect of E-Schoolbag to the Different Gender of Different Learning Period Students' Personal Learning and Thinking Skills

Through the analysis of the effect of e-Schoolbag to the different gender of different learning period students' personal learning and thinking skills, we can get that there are no significant differences in the three modules of independent learning, creative thinking, self-management and effective participation for students who use e-Schoolbag to learn. However, there are significant differences between the two modules of reflective learning and cooperative learning. There are significant differences between reflective learning and cooperative learning and the differences between the two modules are shown as the ability of female students to be higher than male. However, only in the primary school stage, there are significant differences between the male and female in the reflective learning module and the cooperative learning module. There are no differences in other modules. There are no differences between the other learning period, including middle school and high school. On the one hand, due to the increase of learning pressure in middle and high school, students pay more attention to the memory of knowledge in the use of e-Schoolbag and focus on improving their academic performance, while ignoring the improvement of their own thinking. The lower the learning period, the broader the thinking of students and the use of e-Schoolbag can jump out of the inherent framework, which will produce different effects. On the other hand, students with less experience in e-Schoolbag have a more positive attitude. At the beginning of the use of e-Schoolbag, due to the novelty, students have a positive attitude towards e-Schoolbag. After using the e-Schoolbag for a long time, the slow update speed of the e-Schoolbag restricts the enthusiasm of the students, and the students with less experience have a more positive attitude towards the e-Schoolbag (Lichun & Jianli, 2015).

4.2 the Effect of E-Schoolbag to Students' Personal Learning and Thinking Skills

Through the analysis of students whether to use e-Schoolbag or not, based on the fact that there are just several inevitable differences between the students, such as teachers, the level of the schools, we found that students who use e-Schoolbag have a more effective improvement in their personal learning and thinking skills. It can be seen through the extremely significant differences in independent learning, creative thinking, reflective learning, cooperative learning, self-management, and effective participation. That is, overall, compared with the group that did not use the e-Schoolbag, the students who used the e-Schoolbag showed higher independent learning ability, stronger creative thinking ability, stronger reflective learning ability, stronger cooperative learning ability, stronger self-management and effective participation consciousness. It can be seen that the application of e-Schoolbag can not only feel the advantages brought by external factors but also feel the growth of students' thinking.

Limitation and Outlook

This study about e-Schoolbag is based on the example of all pilot students in one of districts of Shanghai and investigates and analyzes the changes in personal learning and thinking skills in the

process of participating in the e-Schoolbag project. However, the research still has some shortcomings. First of all, the students' personal learning and thinking skills are measured only through questionnaires. There is no analysis and discussion on the deeper cognitive rules of students. Secondly, due to the large amount of experimenters, there are many uncontrollable interference factors, such as students' level of knowledge, the teaching style and level of application of e-Schoolbag of teachers. I hope that the greatest improvement will be made in the in-depth study in the future.

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