Relationship between the Usage of Electronic Devices and the Academic Performance of Students

Junfeng Li[1, *]

[1]School of Business, Monash University, Australia

*Corresponding Email: Jlii0121@student.monash.edu

Abstract. With the rapid development of social science and technology, electronic devices are widely used in people's lives. This study aims to explore the impact of the usage of electronic devices on students' academic performance using Ordinal Logistic Regression. Through the data analysis of the CFPS database, design electronic device usage, key school, perception of Internet as independent variables, and the academic performance is used as a dependent variable as a Ordinal Logistic model. The findings revealed that the length of the use of electronic devices has a significant negative correlation with the academic performance of students. Whether students belong to key schools and students' perception of the importance of the Internet to learning have no significant effect on academic performance. The results show that academic performance can be improved by controlling the length of time students use electronic devices.

Keywords: Electronic device, Academic performance, Perception of Internet, key school, Electronic Device Usage

1   INTRODUCTION

Information technology penerates people's daily life. With the continuous improvement like 5G technology that has been widely used all over the world, people live in the era of the Internet of Everything. Unconsciously, the mobile phone has become an inseparable "partner" of people. It has also become the fifth largest media after newspapers, radio, television and the Internet [1]. According to the 47th "Statistical Report on the Development of China's Internet" released by the China Internet Network Information Center, "as of December 2020, the number of mobile Internet users in my country reached 986 million, of which young students accounted for the largest group, reaching 21%. "[2]. Smartphones with functions such as socializing, shopping, entertainment, learning, and financial management have become an indispensable tool in people's daily lives [3].

Teenagers have a higher probability of addiction to mobile phones. According to research conducted by many countries, 30% of teenagers are addicted to mobile phone use and have a negative impact on their academic performance [4,5]. Excessive use of mobile phones can lead to very weak interpersonal relationships and are not

good at communicating with others. Browsing some unhealthy content on the mobile phone will make children physically and mentally hurt [5]. Besides, too much use of mobile phones will cause self -control to decrease, and the user will become more and more lonely, immersed in the world of mobile phones [3]. What's more, if students use electronic devices too much, sometimes they may even appear "illusions". Take the ringtone of others as their own by mistake [6].

Key schools are one of the important features of the Chinese education system. The key schools in China's compulsory education stage aims to promote the improvement of the conditions for running schools in a few schools, the improvement of the quality of education, and the cultivation of elite talents [7]. Because the teaching resources and teaching management of key schools and non -key schools are different, this article will also analyze whether students belong to the relationship between key schools on their academic performance.

In addition to objective factors, the students' attitude towards learning is very reference. Especially students' perception of the importance of the Internet to learning. Therefore, this article will also consider the relationship between students' perception of the importance of the Internet to learning and academic performance in the study. However, relevant research is limited as many studies use the mobile phone addiction rate to examine whether the use of electronic devices has a significant negative impact on students' academic performance. The previous studies were analyzed only by whether to use electronic equipment to affect the academic performance instead of analyzing it by the quantity of the usage of electronic devices.

Therefore, the article adopted 2020 CFPS (China Family Panel Studies) to examine the relationship between the time that student spend on electronic devices and their academic performance. At the same time, two new factors will be considered, namely whether students belonged to key/demonstration schools and students' perceptions of the importance of the Internet to learning.

2   LITERATURE REVIEW

2.1   ACADEMIC PERFORMANCE

Academic performance is the standard for assessing a student's learning status and usually measured with two dimensions, namely GPA (Grade Point Average) and CFU (Credito Formativo University) [8]. There are many factors that affect academic performance. Among them, Yi pointed out that academic performance is closely related to parental education methods, teacher - student relationships, and companion relationships. The study, which sought to explore whether there were any adverse effects of mobile phone use on academic performance, found evidence that there is indeed a negative correlation between the use of electronic devices and academic performance [9]. The authors point out that most research findings, especially when examining the effects of Internet use and gaming, point to a negative correlation between electronic device use and academic performance. 49,609 junior students performed better in relation to lower internet use.

According to the results of the empirical study, the use of mobile phones by middle school students has no necessary effect on their academic performance. In the survey of Xi'an, the proportion of middle school students holding mobile phones is as high as 60%, indicating that mobile phones, as an important tool in the age of network information, have gradually been integrated into the daily life of middle school students [1]. The conclusions of this study differ from those of most related studies. In 2011, the era of information technology has not developed so rapidly, electronic devices have not yet spread to all places, electronic devices are not as intelligent as they are now, and their functions are not as many. The majority of students do not yet have access to their own electronic devices, so the conclusions drawn differ from those drawn by other related studies.

2.2   Electronic devices

The number of people using electronic devices has grown substantially in recent years. The percentage of Americans who own a smartphone in 2018 is 77 percent, up from 35 percent in 2011. Smartphones are almost ubiquitous in the lives of young people [9]. The development of information technology in the United States has always been at the forefront of the world, and the popularity of information technology has enabled more and more people to own a set of smartphones.
H1: Usage of electronic devices has a significantly impact on students' academic performance

2.3   Key Schools

Zhu pointed out that due to the teaching resources, teachers, management systems, cultural environment, and material environment of key schools, they are far better than non-key schools. It caused a serious two - level differentiation, which is unfair [7]. Therefore, under normal circumstances, the academic grades of students in key schools are better than the academic performance of students in non -key schools.
   H2: Students of key schools has a significant academic performance than those in normal schools.

2.4   Students' perception of the importance of the Internet to learning

Zhu found that it is very important to maintain self -monitoring in network learning, and it will have a significant correlation with academic performance [10]. This shows that in Internet learning, it is not necessary to obtain good academic performance by relying on the students' perception that the Internet is important to learning, but to achieve good results in the process of the self-control while learning in the Internet.
H3: Students' perception of the importance of the Internet to learning has a significant impact on students' academic performance

2.5 Relationships

Relevant researches have shown that adolescent addiction to the use of electronic devices leads to a negative impact on academic performance and interpersonal relationships. In Hadlington's research, the usage of students used electronic devices was used as an independent variable, and their academic performance were used as a dependent variable to draw a correlation conclusion. In 41 researches within 20 provinces across the country from 2011 to 2020, Zhou found that the total incidence of mobile phone addiction among middle school students in my country was 23.40%, which was lower than that of South Korea (31%) and Thailand (36%). But higher than Japan (12%) and Spain (18%). This proves that there are certain differences in the incidence of mobile phone dependence among middle school students in different countries [11]. Wang found that the tendency of mobile phone addiction is significantly negatively correlated with academic performance, which is consistent with the research results of Bian Yingfang et al. and Cao Meilan, who found that excessive use of mobile phones has a negative impact on academic performance [12].

3 Methods

3.1 Data Sources

2020 CFPS (China Family Panel Studies) database is used, of which, Academic Performance and Network Module. There are 28,590 samples were selected for this topic. Since the object of this study is middle school and high school students, after screening and deleting observations with missing or incomplete information, 1181 valid samples were finally obtained.

3.2 Description of Variables

From the CFPS 2020's personal Q&A questionnaire, the study has chosen the usage of the students' electronic device, whether the student belongs to the key/demonstration school, and the students believe that the importance of the network to learning as an independent variable.

Dependent Variable.
Dependent Variable is measured by Academic performance. It indicates the top% of the grade ranking is used as. In order to facilitate analysis, the five intervals of variable students are assigned a value of 1-5. Details are as follows:
  Students' recent exams ranked among the top 10% of the grade to 1;
  Students' recent exams ranked 11%-25% in grade to 2;
  Students' recent exams ranked 26%-50% in grade to 3;
  Students' recent exams ranked 51%-75% in grade to 4;
  Students' recent exams ranked last 24% in grade to 5.

Independent variable.
(1) Key School. Binary question with yes and no answer. This variable means whether the students belong to the key/demonstration school.

(2) Perception of Internet. 5-likert scale question (1=very important to 5 very unimportant). This variable means students' perceptions of the importance of the Internet to learning.

(3) Electronic Device Usage. This variable means the length of time for students to use electronic device per day, which is a continuous variable.

4   Results

4.1   Descriptive statistics

In a sample of 1181 students: For the independent variable - the average time spent online by students using electronic devices is 195.6 minutes per day and the standard deviation is 174.58. The minimum value is 0 minutes and the maximum value is 1080 minutes. For the independent variable - whether the students belong to key/demonstration schools, 352 students study in key/demonstration schools, accounting for 29.81%; 829 students do not study in key/demonstration schools, accounting for 70.19%. For the independent variable - the importance of the network for learning, 34 students think that the Internet is very important to learning, accounting for 2.88%; 135 students think that the Internet is important to learning, accounting for 11.43%; 396 students think that the Internet is very important to learning. Learning is generally important, accounting for 33.53%; 385 students think the Internet is not important for learning, accounting for 32.6%; 231 students think the Internet is very unimportant for learning, accounting for 19.56%.

In the dependent variable - students' academic performance, the number of students in the top 10% of the grade is 203, accounting for 17.19%; the number of students in the 11%-25% ranking is 336, accounting for 28.45%; the number of students in the 26%-50% ranking is 374, accounting for 31.67%; the number of students in the 51%-75% ranking is 189, accounting for 16%; the number of students in the bottom 24% ranking is 79, accounting for 6.69%.

4.2   Regression

Among the several variables in this study, students' academic performance, whether the students belong to the key/demonstration school, and students' perceptions of the importance of the Internet to learning are categorical variables. The usage of student use of electronic devices is an ordinal variable. Therefore, this study is well suited to use Ordinal Logistic Regression analysis.

Using the CFPS database and Stata statistical software, the above-mentioned dependent variables and independent variables were subjected to Ordinal Logistic Regression, and the regression coefficients were tested for significance. The obtained econometric model results are shown in the following table.

Table 1. Correlation of dependent variable and independent variables(self-painting)

	Academic performance	Usage	School	Network
Academic performance	1.0000			
Usage	0.1251	1.0000		
School	0.0273	0.0146	1.0000	
Network	-0.0085	0.0169	0.0055	1.0000

Table 2. Regression Analysis(self-painting)

Academic performance	Coefficient	P value
Top 10% ranking		
Usage	-0.0018	0.012*
Key school	-0.1829	0.528
Perception of Internet	-0.0806	0.539
11%-25% ranking		
Usage	-0.0022	0.001***
Key school	-0.0505	0.852
Perception of Internet	-0.0720	0.564
26%-50% ranking		
Usage	-0.0013	0.040*
Key school	-0.1481	0.581
Perception of Internet	0.0240	0.846
51%-75% ranking		
Usage	-0.00008	0.904
Key school	0.0793	0.783
Perception of Internet	-0.1193	0.369

It can be seen from the chart that the analysis results of Ordinal Logistic Regression model. The significant of students in different interval of academic performance are affected by the usage of electronic device differently.

The usage of the students' electronic device.
It can be obtained in the regression analysis of the usage of the students' electronic device that among the top 50% of the students in grade, the usage of electronic device is significantly related to the academic performance. However, for the ranking between 51% and 75% students in the grade, the usage of the students' electronic device is not significantly related to the academic performance. The coefficient of the top 10% students is -0.0018, which is significant correlation. ($z=0.0007$, $P=0.012<0.05$); The coefficient of the 11%-25% students is -0.0022, which is significant correlation. ($z=0.0006$, $P=0.001<0.05$); The coefficient of the 26%-50% students is -0.0013, which is significant correlation. ($z=0.0006$, $P=0.04<0.05$); The coefficient of the 51%-75% students is -0.00008, which is not significant correlation. ($z=0.0007$, $P=0.904>0.05$). The results presented above means that of the top 50% of the students in the grade, H1 assumption is supported and establishment. The usage of students' electronic device is significantly affect the academic performance of students. Conversely, H1 assumption is not supported in the last 50% of students' ranking interval

in the grade. Thus, the usage of students' electronic device is not significantly affect the academic performance of students.

Key Schools.
We can know from the regression analysis table that the independent variable-whether the students belong to the key/demonstration school are not significantly correlated regardless of the student ranking range. The coefficient of the top 10% students is -0.1829, which is not significant correlation. (z=0.2894, P=0.528>0.05); The coefficient of the 11%-25% students is -0.0505, which is not significant correlation. (z=0.2709, P=0.852>0.05); The coefficient of the 26%-50% students is -0.1481, which is not significant correlation. (z=0.2684, P=0.581>0.05); The coefficient of the 51%-75% students is 0.0793, which is not significant correlation. (z=0.2872, P=0.783>0.05). This can be explained that whether the students belong to the key/demonstration school have no significant relationship with the academic performance of students. Thus, H2 is rejected.

Students' perceptions of the importance of the Internet.
The regression analysis table demonstrated that the independent variable - Students' perceptions of the importance of the Internet are not significantly correlated regardless of the student ranking range. The coefficient from top 10% ranking to 51%-75% ranking students are -0.0806 (z=0.1314, P=0.539>0.05), -0.0720 (z=0.1248, P=0. 0.564>0.05), 0.0240 (z=0.1233, P=0.846>0.05), -0.1193 (z=0.1327, P=0. 0.369>0.05), which means students' perceptions of the importance of the Internet have no significant relationship with the academic performance of students. Thus, H3 is rejected.

5   CONCLUSION

This research used Ordinal Logistic Regression to analyze the relationship between students' academic performance and students' usage of electronic devices.
The results show that among the students in the top 50% of the academic performance ranking, the students' academic performance has a negative impact with students' usage of electronic devices. Students achieving above-average academic standing tend to minimize the use of electronic devices. They may spend time on study and extra-curriculum. And they may have excellent self-control capabilities, they can arrange their electronic devices reasonably.

The longer students use electronic devices, the more students get relatively poor academic performance. Using electronic device for a long time will make students addicted. It will also cause students to have interpersonal relationships and not be good at making friends. Even some toxic information will be received on some electronic devices to affect students' mental health.

At the same time, we also analyzed some other factors that may affect students' academic performance. The analysis found that whether students belonged to

key/demonstration schools and students' perceptions of the importance of the Internet for learning do not significantly affect students' academic performance.

In the study of whether the students belong to the key schools, the analysis results conflict with the assumptions. The difference between the results and assumptions may be that the management system of key schools and non-key schools is basically the same at present. The school's management execution of students does not have large differences in key schools and non-key schools, and the management of students' electronic device is very strict. Thus, the research assumption is inconsistent with the conclusion.

Similarly, in the study of students' perceptions of the importance of the Internet, the analysis results conflict with the assumptions. This may be because students' self-control ability is not good enough. Students think that the Internet is important for learning, but they may not have enough self-control to learn from the Internet. Instead, they used to use the Internet to leisure and entertainment, which has also led to bad academic performance. Thus, the research assumption is inconsistent with the conclusion.

Based on the above analysis and conclusions, the following suggestions for students' academic performance are put forward. Among the factors affecting academic performance, students' usage of electronic devices is very significant, especially for students with middle and upper grades. For students who want to improve their academic performance, they can scientifically control the length of time they use electronic devices to improve their academic performance.

6   References

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