

Tablet Personal Computer Use by Medical Students in China: A Quantitative Study

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Tablet Personal Computer Use by Medical Students in China: A Quantitative Study

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Abstract

Background: Few studies investigated tablet personal computer (PC) usage by medical students in China. This study determined how medical students were currently using tablet PC and applications (apps), and their attitudes towards using tablet PC and apps in China.

Methods: A self-administered questionnaire was adopted for data collection from 300 third-year medical students at West China Medical School of Sichuan University in China. Data was analyzed using SPSS 15.0.

Results: 283 of the 300 respondents owned a tablet PC, of which 249 possessed an iPad, and 189 made the purchase for both academic and non-academic-related purposes. 67.1% of students used tablet PC mostly for non-academic related purposes in class, and 59.9% of students used tablet PC when they found the lecture unattractive. 61.9% of students admitted that using tablet PC in class was distracting. Most respondents, however, were still positive towards the use of tablet PC in class. Academic-related apps were widely used by respondents, of whom only 11.9% were willing to pay for academic-related apps.

Conclusions: Our study suggests widespread tablet PC usage amongst third year medical students in China, with most medical students being positive towards tablet PC use, even though non-class related use and distraction were high in class. Thus, adaptive strategies and proper guidance by medical schools and faculty members are needed urgently to minimize drawbacks, and to use beneficial aspects of tablet PC.

Key Words

Medical Education; Tablet Personal Computer; Media in Education

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Introduction

Information technology is continually revolutionizing modern education¹. Electronic devices, such as personal computers (PC), personal digital assistants, smart phones, and tablet PC, have been widely adopted by the faculty and students². These provide quick and easy access to online educational resources, geographical and temporal flexibility, and personalized learning. According to studies^{3,4}, the implementation of PC and PDA has shown to enrich student learning and to increase their performance. A new chapter in the field of modern education started in 2010 and 2011 with the launch of iPad and Android tablets, which in spite of being small, are powerful in functions, portable, wireless and versatile in data entry. In addition, many smart applications (App) available on tablet PC ease our access to information. Being empowered with such benefits, tablet PC has quickly gained popularity among students, especially after 2010; replacing laptops, textbooks, and notebooks in classrooms, especially in college.

Tablet PCs are being widely used in medical education. A recent study showed that 86% of radiology residents used iPad daily when they were provided with an iPad⁵. Reputed Medical schools, such as Stanford University and University of Minnesota, have adopted iPads in their medical curricula⁶. Tablet PCs are not only gaining popularity in developed countries like the United States, but also in developing countries like China. Even though the use of traditional PC and other electronic devices in medical education have been extensively studied, only a few studies have been carried out to investigate the use of tablet PCs by medical students in advanced countries^{5,7,8}, and almost none in China. In this study, we aimed to determine how medical students are currently using tablet PC devices and apps in and out of class and their attitudes towards using tablet PC and apps in medical education at a medical school in China.

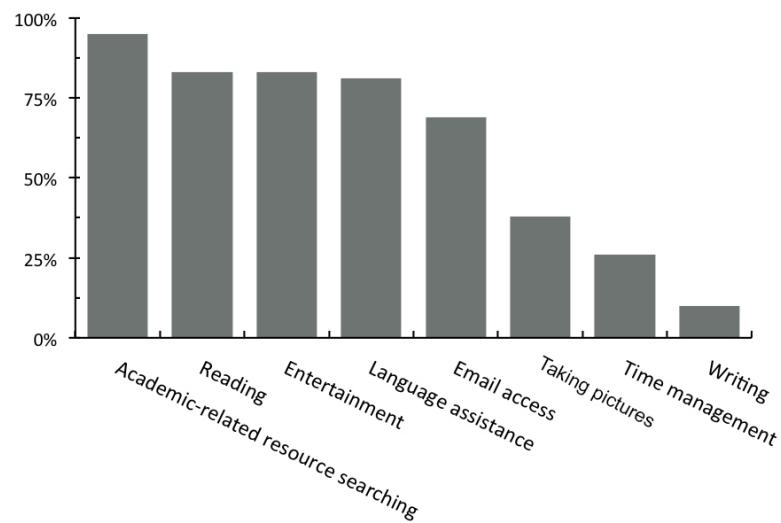


Figure 1: Type of usage for tablet PCs by respondents

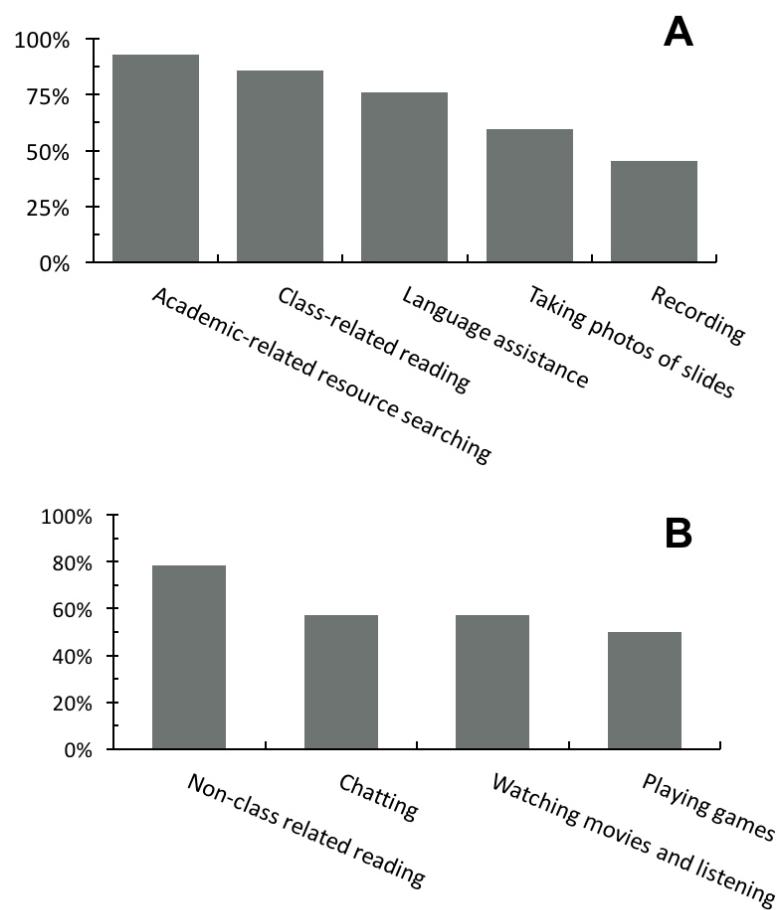
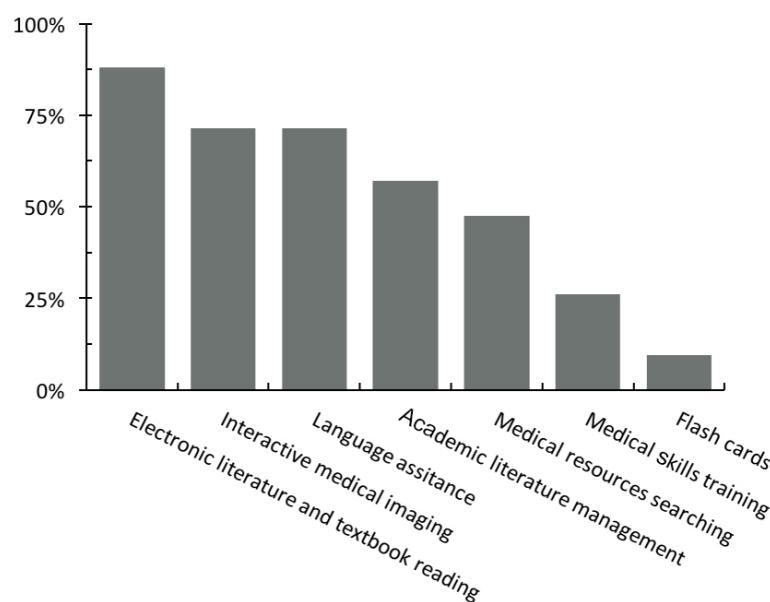


Figure 2: Purposes of tablet PC use in class.

(A) Type of usage of tablet PCs for academic-related purposes in class for medical students. (B) Type of usage of tablet PCs for non-academic-related purposes in class for medical students.

**Figure 3:** Types of Apps used by medical students for academic-related purposes

Material and Methods

A self-administered questionnaire in Chinese was developed for data collection after a review of literature. Twelve items were included in the questionnaire regarding the current use of tablet PC and apps, motivations to buy a tablet PC device, attitude towards tablet PCs use in medical education, and study-related apps. Items were all close-end questions including dichotomous choice (yes/no), single-best response questions, and multiple response items. Information on the purpose of this study was revealed to all participants. Convenience sampling was used; questionnaires were distributed to 300 third-year medical students (a stage before internship in hospital) from 2013 to 2014 at West China Medical School of Sichuan University, located in an economically developed area in China. Tablet PC use is neither encouraged nor banned in the classes of this medical school and are not essential for any course. Anonymous responses were collected and all 300 questionnaires were completed and returned with a response rate of 100%. Answers were extracted from questionnaires and double entry was performed to validate the data by two investigators independently.

SPSS 15.0 (SPSS Inc., Chicago, IL) was applied to do the data analysis. The frequency of each response was depicted and percentage was calculated. Continuous data was presented as mean \pm standard deviation (SD). Only students with tablet PCs were included in the data analysis except for mean age and proportion of students who owned tablet PCs.

Results

The mean age of all the respondents was 21.4 ± 1.6 years old. The survey showed that 283 of the 300 respondents (94.3%) currently owned a tablet PC: 249 of 283 (88.1%) tablet PC owners possessed an iPad; 27 (9.5%) used Android models and the other 7 (2.4%) participants used devices running on Windows system. 76.2% of tablet PCs were purchased with financial support from parents. Of all the students who have a tablet PC, the main motivation to make the purchase just for learning was found in 88 (31.0%), while for both learning and entertainment were 189 (66.7%), of all the students who have a tablet PC. Interestingly, the remaining 6 (2.3%) students claimed that the main reason they bought a tablet PC was to "follow the crowd and get what everyone has to fit in".

Generally, tablet PCs are often used for learning-related resource searching, electronic resource reading, entertainment, language assistance and email access (Fig 1). We explored the purposes of tablet PC use in class (Fig 2). For academic purposes, respondents used tablet PCs mainly for online resource searching, class-related reading, language assistance, and taking notes. For non-academic purposes, students utilized PCs mainly for reading non-academic related materials, chatting, watching videos, listening to music and playing games.

We further explored whether and when tablet PCs are used for non-academic purposes in class. Among 283 respondents with tablet PC, 14 (4.8%) and 60 (21.4%) respondents reported to use tablets PC only and mostly for academic-related purposes in class respectively. In contrast, as many as 190

(67.1%) students mostly while the other 20 (7.1%) always used tablets PC for non-learning related purposes in class. Additionally 195 (69.0%) declared using their tablet PC for non-academic purposes in short-intervals between two sections of class learning; 170 (59.9%) reported using their tablet PCs when they found the lecture unattractive; and 60 (21.1%) declared use whenever they wanted to.

We also investigated the respondents' attitudes towards tablet PC use in class. Most of them believed that the use of tablet PC in class had both advantages and disadvantages. Of these students, 175 (61.9%) students reported that using tablets PC during class time is distracting. However, 222 (78.6%) students still believed that the use of tablets PC in class has more pros than cons, and none of them agreed that the use of tablet PC only brought harm. Lastly, 155 (54.8%) respondents expect implementation of tablets PC in medical curricula.

At least one learning-related app was used by every respondent regularly, (with figure 3 showing apps that were often used). Popular apps fell into the category of electronic literature and textbooks reading, interactive medical imaging, language assistance, electronic medical resources searching, medical skills training and taking notes. Regarding medical apps that the respondents need besides what are available, many of them expected to have apps for electronic textbooks in Chinese or English for medical curricula, 3D imaging of anatomy, radiology and other courses, online lectures for medical curricula, updated medical journal reading, board exam study, and training for medical skills (like electrocardiography or auscultation). Only 34 (11.9%) respondents were willing to pay for learning-related applications, while the vast majority of students preferred to use free apps.

Discussion and Conclusion

This study concerns current use of tablet PC and apps by medical students in China, showing that students in a medical school in China have widely adopted tablet PCs for academic- and non-academic-related purposes, with 94.3% owning tablet PCs in this study. It raised our concern that 67.1% of students use tablet PCs mostly for non-academic related purposes in the class, and 61.9% admitted that using tablet PCs in the class is distracting. Most respondents, however are still positive towards the use of tablet PCs in class. These findings indicate that adaptive strategies and proper guidance is required to make medical students minimize the drawbacks of using tablet PC in medical education in this era of information.

A surprisingly high proportion of medical students use tablet PCs in the medical school in China, even though tablet PCs are not essential for any of the courses. Among these respondents, iPad is the most popular tablet PC (88.1%) that is used. To the best of our knowledge, there is only one study published in 2013 that investigated tablet PC use in China⁹. It showed that about 30% of K-12 students in a developed area, among whom 90% were in high school, had their own tablet PCs. Subjects at different stages and from different areas may be the main reasons that our study had much higher tablet PC ownership. A few studies have investigated the nature of tablet PCs usage by medical students outside China. An early study conducted in 2006 in the United Kingdom found that no of medical students had tablet PCs, even though most of them owned desktop PCs or laptops¹⁰. Another research published in 2013 showed 48.5% of American medical students used tablet PCs, with iPad being the most popular type (41.8%)⁸. Even though China is a developing country, tablet PC and iPad use amongst medical students is much higher than that in America. This may be due to the reason that most tablet PCs were purchased with financial support from students' family in our study, and college students in America are usually financially independent. These studies indicate that tablet PCs are not only widely used in developed countries, but also in developing countries such as China. Mobile device use changes over time, but no researches have reported a dynamic change of tablet PC usage by medical students. We think a rapid increase in tablet PC usage has occurred in recent years, since the launch of iPad in 2010, and almost 90% of students owning tablet PCs had iPad in this study. Therefore, comprehensive researches are urgently needed to understand questions that have not been asked before, such as how tablet PC use is influencing medical education in China, and what are their pros and cons.

We showed that online resource searching, electronic resource reading, language assistance, and taking notes were common reasons of general and in-class tablet PC use for academic-related purposes for these medical students. Advantages of tablet PCs enable these tasks to be more efficient and enhance productivity¹¹. Similar to our study, a study conducted amongst college students in a technical college in the United States showed that iPad was frequently used for reading, taking notes, online exploration of additional course materials, and interaction with other students, but not for language assistance¹². Language assistance is perhaps popular amongst students who're non-native English speakers.

Most of the respondents in this study claimed that they benefited from tablet PC use. A few studies have explored benefits of tablet PC implementation in school. In a series of surveys investigating the impact of iPad use in class throughout a semester, most students reported that iPad encouraged exploration of additional course-related materials, helped with time management, opened new horizons in terms of accessing knowledge, and made the courses more interesting thereby boosting their motivation to learn¹³. In addition, several studies demonstrated that tablet PCs enhanced in-class interaction, students' note-taking ability, facilitate group learning as well as organization of notes and slides, and improving exam performance^{7,14,15}. Therefore, tablet PC use does benefit students in many ways while learning. Several medical schools in USA have already adopted tablet PC implementation in medical education, and distributed iPads to medical students⁶. Tablet PC incorporation can be considered by some medical schools in China with the advantage that most medical students already have tablet PC devices and are familiar with its usage.

Despite the positive elements, our findings raised serious concerns as tablet PCs are mostly used for non-learning relevant purposes in class. Most students agreed that tablet PC use in class lead to distraction, and entertainment is one of the main motives to purchase a tablet PC. These results are consistent with other studies that reported digital distraction as a major negative consequence of mobile device use in class^{15,16}. A study showed that during a lecture-style class, students kept non-class related software apps open and active on laptops during 42% of time¹⁷. Several researches have demonstrated that multitasking behaviors on laptop in class lead to poorer academic performance¹⁷⁻¹⁹. In addition, one recent study²⁰ found that multitasking on laptops distracted fellow students sitting nearby. However, most medical students in our study are of the opinion that tablet PC usage brought more benefits than harms. In this information era, widespread usage of tablet PC is inevitable, and banning tablet PC use in higher education may be inappropriate. Therefore, adaptive strategies and proper guidance are important and are urgently required to maximize benefits of tablet PCs use in medical education and to minimize possible drawbacks, such as distraction. One strategy that has been used in Veterinary Medical Education is to block non-study related resources in class by using DyKnow, a software only allowing students to use applications like office, course management system, language assistance and PubMed site¹⁵.

Apps enable users to have easy access to updated and integrated information in a personalized

manner. High prevalence of medical app use was found in our study and by others. A study presented that 76% of medical students with smart phones used medical apps in a medical school in Australia²¹. The pattern of medical apps used in this study was different from ours, since commonly used medical apps were medications guide, discipline-specific guide, clinical handbook, clinical textbooks, exam preparation and clinical skills guide. The study included students at different stages, among whom the majority were in their rotation phase. In contrast, our study only enrolled third year medical students, prior to their rotation. More patient contact and clinical exposure amongst these participants may be the reason why clinical practice associated apps were more frequently used than that in our study. These findings suggest that using medical apps on tablet PC to support study is widely adopted.

Even though there are large numbers of medical apps available now, most of them were designed for medical professionals or the public. As our study shows, for medical students before rotation, there is still a gap between the available apps and the students need. Specific learning related apps are expected, especially those about medical courses and clinical skills. In addition, most of the medical apps are in English, which limits their usage amongst Chinese medical students. Software companies usually decide whether or not and how to develop a new app depending on the potential profit. Our study showed that only a few medical students are willing to pay for their desired apps. For better incorporation of tablet PCs into medical education in China, we believe it important for educational departments, either of government or medical schools, to develop high-quality and free apps for medical students in China. We also found that over half of our respondents expect teachers to recommend good apps for specific courses. With the widespread use of tablet PC among medical students, teachers should shift from recommending extracurricular reading materials to both reading materials and valuable apps.

The major limitation of this study is that only third year medical students from a medical school located in a developed area in China were included, which does not represent tablet PC usage amongst medical students of different stages in China.

In conclusion, the usage of tablet PC and medical apps amongst third year medical students in China is widespread. Most medical students are positive towards tablet PC use, even though non-academic related use and distraction are high in class. Thus, adaptive strategies and proper guidance by medical schools and faculty members are needed urgently to

minimize drawbacks, and to tap beneficial aspects of tablet PCs. More high-quality and free medical apps are needed to help with education among medical students in China.

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