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<b>Author(s)</b>	<b>Lu, J; Hao, Q</b>
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# What Factors Impact on Primary School Students' Online Engagement for Learning and Entertainment at Home

Jingyan Lu<sup>1\*</sup>, Qiang Hao<sup>2</sup>

<sup>1</sup> *Faculty of Education, The University of Hong Kong, Pokfulam road, Hong Kong,*

<sup>2</sup> *Learning, Design and Technology, The University of Georgia, Room 110, 850 College Station Road River Crossing, Athens, GA, 30605, USA,*

*jingyan@hku.hk, neohao@uga.edu*

## What factors impact on primary school students' online engagement for learning and entertainment at home

**Abstract:** Informed by the difference of children's Internet use in formal and informal contexts, this study aims to move away from studying children's more predictable Internet use in school settings to learning how children use the Internet at home, and what factors impact their online behavior in such contexts. Students from grade 3 to 6 from a school in a medium sized city in China participated in the study. The data reveals that children use the Internet for both entertainment and learning purposes and these two factors are correlated. However, factors influencing Internet use for the two purposes are to some extent different. The study suggests that there is a need to zoom in and analyze children's Internet use in informal contexts, rather than assume that learning at home is just an extension of learning at school. Policy makers and educators may use information about how children use the internet at home to improve pedagogy to bridge the gap between school and home.

*Keywords:* Internet use, primary students, informal context, China, online learning, online entertainment

## **1. Introduction**

With the increasing popularity and affordability of Information Communication Technology (ICT), children can now access the internet from home via multiple devices, including desktop computers, laptops, and mobile devices. At the same time, improvements in formal and informal education have enabled young children to steadily improve their information literacy skills. It is no longer surprising to see primary school and even pre-school children using computers and mobile devices to play games, watch videos or listen to music online. In developed countries, earlier concerns about a 'digital divide' among children due to inequalities in access to ICT have been replaced by concerns of ways in which they use it in school to learn (Bingimlas, 2009; Webb, 2005; Kerawalla & Crook, 2002). However, school and home settings are constituted of different ecologies with different cultures (Stevenson, 2011; Stephen, McPake, Plowman, & Berch-Heyman, 2008), it is too soon to judge that one is inferior to the other and to assume that children should use ICT at home in the similar way as they use it in school.

Given the importance of ICT use at home, this study adopts an exploratory approach to investigate how primary school students in China use internet at home and the individual and contextual factors that influence their online activities. School and home internet use would not be compared as there is evidence that responses of students to using the internet for lessons at school is becoming well established (Pelgrum, 2008; Hayes, 2007; Becta, 2002). Policy makers, educators and researchers have a more pressing need to better understand how and why students use the internet outside school in order to bridge the gap between school and home learning environments and to leverage opportunities for inspiring students to learn in both settings.

## **2. Background**

### *2.1 Using the internet in non-school contexts*

While earlier studies have shown that differences in the availability and use of ICT in schools are correlated with inequalities in family socio-economic status (SES), these differences have been narrowed down by ICT becomes less expensive and more popular in daily life. However, as concerns over an impending digital divide have waned, concerns over an emerging learning divide, i.e., differences in how children use ICT and new media to learn, have grown (OECD, 2012). Given that how students use ICT in school is largely determined by their teachers, the types of media students use, and how and why they use them are to a certain extent predictable. Consequently, sources of this divide may be found in non-school settings.

Compared with the many studies focussing on how students use ICT in school settings, significantly fewer have focused on their use of ICT in non-school settings and most of these have focused on how students should use ICT and media at home (Rideout, Foehr, & Roberts, 2010; Roberts, Foehr, & Rideout, 2005). However, large variations have been found in how students use ICT outside of school due to different kinds of factors. A number of individual factors, e.g., age, gender, and academic performance, and context factors, e.g., SES have been intensively investigated. Although a great deal of efforts has been directed to supporting internet use of students at home, primary schools students have received much less attention than their older counterparts. It could be assumed that the use of the internet is less popular among younger children. This has been found to be the case in developed countries, such as the UK (Selwyn, Potter, & Cranmer, 2009).

### *2.2 Factors related to students' internet use*

### *2.2.1 Individual factors*

Most relevant studies have reported gender differences in internet use. Many have identified a gender gap in computer use with boys generally spending more time on computers than girls. Due to this boys have been found to have stronger computer skills and to be more motivated to get involved in computer-related activities than girls (Losh, 2004; OECD, 2007; Rideout et al., 2010). Further, boys and girls have been found to engage in different types of online activities. Boys spend more time playing computer games and watching online videos (Luckin et al., 2008; Rideout et al., 2005; Roberts et al., 2010) while girls spend more time participating in online social networks. Rideout, and colleagues (2010) found that 95% of teenage girls participated several times a week in at least one online communication activity as compared to 84% of teenage boys. Gender difference in online activities tends to increase among older teenagers (15-18 year old) as opposed to their younger counterparts (9-14 year old) (Lenhart, Madden, Macgill, & Smith, 2007). Despite the differences found in most studies, some studies report little or no gender differences in the online activities of boys and girls (Broos, 2006; Livingstone & Bober, 2004).

Age is the other factor influencing the online activities of students. Studies in the US and Europe have generally found that younger students (9-12 years old) and older students (15-18 years old) have different patterns of Internet use. Older students tend to spend more time on the Internet, and to engage in more types of online activities such as, watching video clips, chatting on Instant Message, or browsing news items than their younger counterparts (Lenhart et al., 2007; OECD, 2012; Rideout et al., 2010; Roberts et al., 2005; Steeves, 2005). Especially, online communication activities (e.g., visiting social network

sites, chatting on Instant Message) become more obviously popular as students enter adolescence (Livingstone, Haddo, Görzig, & Ólafsson, 2010).

Academic performance has always been a focal point of ICT studies as there has always been a concern that the more time students spend engaged in non-school related online activities the less time they will have for study. This will in turn have a negative impact on their academic performance. The Kaiser Family Foundation has confirmed these concerns by reporting a negative relationship between non-school internet use and academic performance: heavy computer users generally have lower grades and lower levels of confidence (Rideout et al., 2010; Roberts et al., 2005). Wainer and colleagues (2008) found that this negative relationship was more evident among younger students (9-13 years old) than among older ones (15-17 years old). However, some studies report a positive relationship between ICT use and specific skills (O'Hara, 2008; Subrahmanyam, Kraut, Greenfield, & Gross, 2000). Inconsistent findings concerning correlations between Internet use and academic performance could be due to different types of internet use. Thus, to get a better understanding of internet use and academic performance it would be useful to categorize online activities and examine relationships among those that are more relevant to academic performance.

### *2.2.2 Context factors*

The context factors examined in this study include family social-economic status (SES; including family income and parental education) and offline home activities such as watching TV, reading books, and communicating with other family members.

Family income is assumed to be related to home internet access. Livingstone and Bober (2004) found that 88% of middle class children had home internet access while only 61%

of working class children did. However, as ICT devices have become more affordable, this gap has narrowed. OECD (2012) reported that in Europe more than 95% of teenagers have at least one internet connected device at home. While Internet access is no longer an issue for most people, one study (Wainer et al., 2008) found that in Brazil low SES children spent more time on the Internet than high SES children. One explanation could be that families with lower income cannot afford the cost of their children participating in other extracurricular activities and thus the internet is a feasible alternative.

Level of family education has also been found to be related to children's internet use (Zhao, 2009). Broos (2006) found that mothers' level of education was significantly related to the types of online activities (e.g. learning, social networking) of their adolescent daughters. Lenhart and colleagues (2007) reported that children from high SES and well-educated families were more likely to try new Internet activities, such as downloading podcasts or contributing to video sharing sites.

It is generally believed that new and traditional media are in competition. When TV was introduced, parents and educators worried that students would spend less time reading. Similar concerns were expressed when the internet was introduced. Ten years ago, students spent more time watching TV than they did online (Livingstone, & Bober, 2004). Recent studies show that students spend more time on the internet than watching TV (Lenhart et al., 2007; Rideout et al., 2010). However, this does not necessarily mean that teenagers will spend the time they used to spend watching TV surfing the internet. According to the Kaiser Family Foundation, heavy internet users reported that they spent the same amount of time watching TV as light internet users (Rideout et al., 2010; Roberts et al., 2005). Similarly, it was thought that children would spend less time reading print



material as they spent more time surfing the internet. However, it has been found that heavy and light internet users spend the same amount of time reading print material (Rideout et al., 2010).

A paradox of social-connected isolation exists for students using internet (OECD, 2008). The Internet has often been characterized as a “devil” that drives individuals to spend most of their time away from family and friends (Bargh & McKenna, 2004). As ICT devices and Internet access become more popular among teenagers, concerns are growing that they may spend less time in face-to-face communication with family and friends. However, it has also been reported that as more students share videos or pictures on the new social media or communicate on social networks, they are opening new channels of communication with friends and people they don’t know (OECD, 2008).

Previous studies have provided valuable information on the influence of computer and Internet use on three types of activities: watching TV, reading books, and communicating with family and friends. However, the correlation between Internet use and the three types of activities has not been thoroughly explored. If Internet use does not necessarily displace these activities, may it merge with or stimulate them? Similar questions remain to be answered.

### *2.3 Young children and internet in China*

Since the beginning of the 21<sup>st</sup> century, ICT has achieved great progress in primary and secondary schools in China (Wang et al, 2005). Recently, China has identified the development of ICT in education as a major goal in its 2010-2020 plan for educational reform and development (Ministry of Education of China, 2012). China’s ICT policy is transforming its schools into digital-campus and ICT is being integrated into more and

more classes. More Chinese students are integrating ICT and internet into both their formal learning at school and their informal learning at home (Center for Preventing Youth Internet Addiction, 2013). With the spread of ICT to everyday life, children are learning how to use the internet at an earlier age. According to a 2011 national survey (Centre of Young Pioneers of China, 2011), 82% of Chinese families with 10-17 year old children had internet access and 87.5% of Chinese families with younger children had internet access. Students rated social interaction and entertainment as their primary reasons for going online, but they also said that the internet made learning easier. Comparing this data with data from the US and Europe (Lenhart et al., 2007; Luckin et al., 2008), it could be seen that the Internet access gap between Chinese children and children from developed countries has narrowed significantly. However, there is little research investigating how Chinese children use the internet at home and what factors impact their home online activities.

### **3. Research questions**

This study investigates individual and contextual factors that influence internet use by primary school students at home. Thus, it is concerned with how these individual and context factors relate to students' different online activities at home. The study poses two questions:

- 1) Whether and how individual and context factors are related to students' online learning activities at home?
- 2) Whether and how individual and context factors are related to students' online entertainment activities at home?

### **4. Methods**

#### 4.1 *Participants*

One public school in a medium sized city in eastern China was selected as the sample for this study. More than 56% cities in China are medium sized (Editorial committee of annual report on development of small and medium-sized cities in china, 2010), so students from such a city are comparatively more representative of children receiving education in urban areas than their counterparts living in big or small cities. The selected school ranks among the best primary schools in the city's local ranking system. Surveys were sent to all students in grades 3 through 6. 846 students (response rate: 95.7%) responded to the surveys.

#### 4.2 *Survey design*

We investigated how young students used internet at home based on three Individual factors: Grade, Gender, Academic Scores (average scores in mathematics and Chinese from the last semester), Offline Activities (including time on reading, watching TV, and communicating with family members), and Context factors: SES (including parental education and family income).

As the lines between using different types of media/technology blur, it is becoming more complicated to differentiate, count and categorize types of media used (e.g., students watch TV programmes on mobile phones rather than on TV). Thus, it is difficult to clearly describe what students do by specifying the devices they use. Consequently, we categorized what they used Internet for, such as looking for information, reading news, watching videos, no matter what device they used e.g., computer, mobile phone, or tablet. The survey consisted of seven items which are divided into two categories, one about using the internet for learning and the other about using the internet for social and entertainment

purposes (See Appendix A for the Survey).

The 7 items were designed with four point Likert-scale formats in which never, occasionally, sometimes, and often were assigned to 0, 1, 2, and 3 respectively. Exploratory factor analysis indicates all items have high loadings on the two factors (Table 1). Confirmatory factor analysis was run to test if the two-category model is fit: CFI is .97 and RMSEA is .045, which prove good model fit. The Cronbach alpha for the Learning and Entertainment subscale are 0.56 and 0.76 respectively.

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Insert Table 1 about here  
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#### *4.3 Data sources and data Analysis*

Two types of data were collected for data analysis: (1) Exam scores (mathematics and Chinese scores) from the previous semester and (2) Survey data including individual and context factors, and items on how students use internet. Students were asked to answer the survey items together with their parents. Since exam items differed for different grades, raw scores were transformed into standardized Z scores. Averages were calculated on mathematics and Chinese scores to represent the academic performance of students. For survey items, averages were calculated on the items in two categories each and transformed into two new variables: Using internet for learning and Using Internet for Entertainment.

Independent variables are context factors and individual factors. Context factors included education levels of father and mother, and family income. Individual factors included gender, grade, academic performance, and time spent reading books, watching

TV and communicating with parents. Hierarchical multiple regression was used to examine the relationship between context and individual factors with two dependent variables respectively: using Internet for learning and using Internet for entertainment. The context factors were entered into the regression model in the first step and the individual factors were entered in the second step. The purpose is to differentiate the prediction of the two types of factors.

## **5. Results**

### *5.1 Descriptive analysis*

Data from 846 students were collected and 36 of them were excluded from analysis due to missing major information in the survey. Among all students, 40.3% were girls and 59.7% were boys.

Table 2 gives a descriptive summary of all survey items. It can be seen that the average family annual income of most students is between RMB 20,000 and RMB 50,000 [Mean= 2.52]. The fathers and mothers of most students had high school degrees [Mean (father) = 3.13, Mean (mother) = 2.87]. With respect to traditional activities at home, most students invested about the same amount of time in reading (Mean = 2.58) and communication with parents (Mean = 2.50), but relatively less time on watching TV (Mean = 1.69). For activities relevant to Internet use, students generally reported that they used Internet more frequently for learning (Mean = 1.63) than for entertainment (Mean = 1.22). They used networks more often to seek information (Mean= 2.07) relevant to learning than to other online activities. Students reported that they rarely visited social network communities (Mean= 0.68). There were no significant differences in network engagement for other purposes. Table 3 shows the correlations among major variables. Using internet for

learning and entertainment has significant positive correlation ( $r = .19, p < .01$ ).

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Insert Table 2 about here

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Insert Table 3 about here

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## 5.2 Multiple regression

Multiple regression analyses were run to examine the impact of independent variables on the two dependent variables—*using internet for learning and using internet for entertainment* respectively.

In the regression model predicting *Using internet for learning*, all independent variables accounted for about 11% of variance. The context factors were significant predictors ( $R^2 = .027, p < .01$ ), among which mother's level of education was the only significant predictor ( $t = 2.52, p < .01$ ). When students personal information was added to the model, there was a significant change of variance (adjusted  $\Delta R^2 = .083, p < .001$ ). Exam scores ( $t = 2.52, p < .05$ ), Time spent reading ( $t = 2.57, p < .05$ ), Grade level ( $t = 6.03, p < .001$ ), and Time spent watching TV ( $t = -2.36, t < .05$ ) were significant predictors for *Using internet for learning* (Table 4).

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Insert Table 4 about here

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In the regression model predicting *Using internet for entertaining*, all independent variables accounted for about 28% of variance. The context factors were significant predictors ( $R^2 = .024, p < .001$ ). Unlike the model predicting *Using internet for learning*, family income ( $t = 3.97, p < .001$ ) was the significant predictor. When individual factors were added to the model, family income factor remained and there was a significant change of variance (adjusted  $\Delta R^2 = .258, p < .001$ ). Time spent watching TV ( $t = 5.39, p < .001$ ), Grade level ( $t = 11.27, p < .001$ ), and Gender ( $t = -5.55, p < .001$ ) were significant predictors for *Using internet for entertaining* (Table 5).

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Insert Table 5 about here  
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## 6. Discussion

This study explored the factors and patterns of factors explaining home internet use for learning and entertainment by primary school students in China. Results showed that home internet use for these two purposes were related but there were major differences in patterns of factors predicting the two.

### 6.1 *Online learning and entertainment at home: connections*

Both context and personal factors have a significant impact on children using internet for learning and entertainment though different predictors were found to have effects on learning and entertainment. Using the internet for learning and entertainment are positively correlated which implies that students who spent more time using the internet to learn also tended to spend more time using internet for entertainment or vice versa.

This finding goes against the assumption that using internet for learning and for entertainment compete with each other (Eynon & Malmberg, 2011; Lee, Cheung, & Chen, 2005). It suggests that there might be a synergy between online learning and entertainment in informal contexts. More studies are needed to examine the connections between using Internet for learning and entertainment in informal context.

Age has been found to be a significant factor for both online learning and online entertainment. The finding that older students spend more time learning online is consistent with earlier studies on the effect of age but with details on how such change happens among primary school students (Lenhart et al., 2007, OECD, 2012; Ofcom, 2007). This positive correlation implies that students might be asked to use more media or the internet to look for information or to communicate with classmates for school work as they move to higher grade; or their increased information literacy skills gained with age enable them to use internet to learn. Age is also the most significant factor in the entertainment model. Older students engage in more social interaction and entertainment activities. This is also consistent with most western survey findings on the effect of age (Lenhart et al., 2007; OECD, 2012). Comparatively, age showed larger effects on entertainment than on learning. As students age, they will have more accessibility, motivation, and skills that enable them to socialize online. However, learning online seems to be only affected by age at a moderate level and this effect might be limited to the nature of school tasks. Thus, instructional design might want to borrow ideas from online entertainment, to motivate students and amplify the impact of learning.

## *6.2 Online learning and entertainment at home: different patterns*

The two regression models are different in the other predictors except for age. In the



model that explains how children use internet for learning, five significant predictors accounted for 11% variance: the older students are (discussed earlier), the better their academic performance, the more time they spend on reading print material and the higher their mothers' education level, the more time they would invest in online learning; more time they put on TV, less time they invest on online learning

- 1) Time spent reading on print media and students' academic performances are found to be positively related to using networks for learning. Considering that students' academic performances are also positively correlated with time spent on print media (see Table 3), the possible explanation could be that students who performed academically better are more likely to develop the reading habit, and they tend to extend the learning behaviour (e.g., reading books) to network use. The positive correlation between students' academic performance and time spent on print media was also identified by some literature (Rideout et al., 2010; Roberts et al., 2005). As for the reason why this correlation is limited to print media, it could be that media for knowledge acquisition in schools largely remains print, especially in developing countries.
- 2) Mothers' education level is also found to be positively related to students' network use for learning while fathers' is not. This result is consistent with most studies on parents' education in which mothers play a more important role in children's education than fathers (Beller, 2009; Johnston, Ganzeboom, & Treiman, 2005; Korupp, Ganzeboom, & Van Der Lippe, 2002).
- 3) Time on TV is negatively correlated with online learning. The more time students watch TV, the less time they spend on learning online. Thus, watching TV is a

competitor for students using internet for learning

In the model explaining using internet for entertaining, four significant predictors account for 28% of variance, which makes the model stronger than the one explaining using *internet for learning*. Except for the age effect, the other three factors in using internet for entertainment model are different from the factors in using *internet for learning* model: gender, time spent on TV, and family income. Time spent on TV and family income are positively related with using internet for entertainment.

- 1) The finding that children from families with higher income spend more time online for entertainment is consistent with findings in the literature (Livingstone, & Bober, 2004; OECD, 2012). Families with higher income could afford their children more devices with internet access, and these children are more likely to have their own computers, laptops or mobile phones, which allows them more time to explore or relax online.
- 2) It is interesting to note that watching TV plays opposite roles in the two regression models. The more time students spend watching TV, the less inclined they are to using Internet for learning, but more possible for entertainment. Consistent with previous studies on the role of TV (Ofcom, 2007; Rideout et al 2010), this finding provides a new perspective on the role of the Internet and TV. TV is mainly an entertainment medium, while the Internet plays a more complex role even in the lives of primary school students: they go online not only for entertainment, but also for social interaction and learning.
- 3) Gender is found to have a significant effect on using the Internet for entertainment. Boys use the internet more intensively than girls for entertainment purposes.

When the types of online activities are checked, boys are found to engage in all four types of entertainment activities, including consuming multimedia, playing games, chatting online, and visiting SNS. This finding is similar to the finding of Hasebrink and his colleagues (Hasebrink et al. 2011) in the UK, but goes against some previous studies (Lenhart et al., 2007; Livingstone et al., 2010; OECD, 2012) in which gender was found to have little influence on teenagers' Internet use.

- 4) Different from prior studies in US or Europe, parents' education does not have a significant effect on children's use of internet for entertainment. This might be explained by culture factor. Educated Chinese parents might focus on guiding their children to be more involved in learning activities, but somewhat neglect children's social or entertainment activities.

Although online learning and entertainment are correlated, they are predicted by different factors. Understanding what these factors are and how they are related with online learning and entertainment at home is of great value. For instance, academic performance and reading are found to be related with online learning but not to online entertainment, which implies that online learning might be an extension of offline learning, and online entertainment might not to be blamed for children's poor academic performance.

Prior concerns about a digital divide (Livingstone, & Bober, 2004) caused by inequalities in SES, have more recently been replaced by concerns about a learning divide (Hasebrink et al., 2011; OECD, 2012). This study found that family income has no impact on using internet for learning while parents' education does. However, family income has an impact on using the internet for entertainment while parental education does not. This difference implies that using the internet at home involves different activities which

should be scrutinized as they are predicted by different factors. Parents' education can teach children how to use the internet for learning but not enough to guide them for socialization and entertainment. On the other hand, family income might ensure children access facilities for entertainment but not be helpful for learning.

TV time has been a major factor in most studies of the relationship between old and new media, but findings of these studies vary: some found that new media displaced the time of old ones (Subrahmanyam et al., 2000; Marketingcharts, 2013), and some suggested that there is a combination effect between the two kinds of media (Ofcom, 2007; Rideout et al., 2010). In our study, by differentiating the purpose of using internet, we identified different relationships of the two activities with TV time. Using the internet for learning competed with watching TV while using internet for entertaining has combination effect with watching TV. In Recent years, as the boundary between old and new media blurs (Rideout et al., 2010; Subrahmanyam et al., 2000), more and more people are choosing watching videos or reading online, we might need new perspectives to interpret the relationship of new and old media.

It has been a concern that children might have less time for communicating with their parents as they spend more time online (OECD, 2008). In this study, we did not find such a correlation, either in online learning or online entertainment.

### *6.3 Using internet at home and at school: Understanding and Building connections*

Though our study focuses on using the internet at home, it was stimulated by studies comparing ICT use at school and at home (Grant, 2011; Jewitt, & Parashar, 2011; Selwyn, et al., 2009; Stevenson, 2011; Kent & Facer, 2004). We would also like to see whether our findings have implications for teaching and learning with ICT in school settings. For a long

time, it has been assumed that use of ICT in the home should replicate or extend its use in school settings (Kerawalla & Crook, 2002). However, most studies have identified discrepancies between school and home ICT use. Some researchers have thought that this might be due to inequalities in Internet access and thus have implemented programmes to reduce such difference so as to improve students access and use ICT at home with the hope to improve their learning and motivation in general (Jewitt, & Parashar, 2011). However, some studies have also revealed cultural differences between home and school use of ICT and the tension between the expected and actual ICT use among students (Stevenson, 2011). This urges us to take a practical perspective or bottom up method to study ICT use in the home, e.g., ICT use is multifaceted and determined by multiple factors, rather than take a confirmatory perspective that home ICT should be guided for learning or towards school like activities.

Formal and informal learning are used to characterize the learning that usually happens in and out of school. When it refers to learning with ICT, it is difficult to differentiate between “formal” and “informal” as students might gain more experience in learning with ICT out of school context. Thus, to reinforce the disconnection between school and home ICT use or to overemphasize the model of school ICT use might create difficulty for communication between the two settings. Though students might spend much time using internet for entertainment purposes, their report on the preference of specific tools (e.g., SNS) should be taken seriously by schools as what should be counted as effective use of technology for learning (Jewitt, & Parashar, 2011).

## 7. Limitations

All the sample students come from the same school due to resource limits of this study.

Therefore, whether the findings could be generalized to a broader context needs further examination in future studies. Stratified sampling on a larger scale could be adopted in the future study (i.e. sampling from different schools in different cities).

Survey is the only tool used in this study to explore how students use internet for learning and entertainment at home. The level of realism may be negatively affected since participants are studied outside of the context where they use Internet.

Ethnographical research or field study could be employed to zoom into the students' online activities at home to explain the findings from current study.

## **8. Conclusions**

Application of educational ICT in China is still in its early stage. Since 2000, the Chinese government has invested billions of dollars in setting up basic ICT infrastructures, using ICT to improve teaching and learning and in reducing inequalities between urban and rural schools. However, in light of the immense amount of time, money and efforts that western countries have been investing in the ICT in education, China has a lot of catching up to do.

According to the data collected in this survey, inequalities of Internet access, at least in urban areas of China, is no longer a big problem. This implies that educational policy makers should shift their focus from basic ICT infrastructures construction to the emerging learning divide.

The empirical data presented in this paper brings out the possibility that students' ICT use in informal contexts is an important contributor to the emerging learning divide, which necessitates further research in students' home ICT use in China. To connect to home learning and improve school learning efficiency, schools need to understand students' own

preference and online activities.

The data also reveals that online entertainment is not necessarily a negative factor in improving students' learning. The boundary between online learning and entertainment is getting blurry, and it should be taken seriously whether borrowing elements in students' favoured online entertainment would improve their learning efficiency. This field needs more research in future.

Besides, this study also leads to the understanding that in solving the learning divide problem, some factors should be given more attention than others. Family SES plays an important role in students' online activities. Comparatively, parents' education has a more significant influence in students' online learning, which indicates that further research focusing specifically on parents' education and students' online activities is needed. More exploration in improving students' online learning by educating parents is one of the future research directions.

## References:

- Bargh, J. A., & McKenna, K. Y. A. (2004). The Internet and social life. *Annual Review of Physiology*, 55, 573-590.
- Becta. (2002). ImpaCT2: The Impact of Information and Communication Technologies on Pupil Learning and Attainment. Retrieved July 8, 2013, from <http://dera.ioe.ac.uk/1572/>
- Beller, E. (2009). Bringing intergenerational social mobility research into the twenty-first century: Why mothers matter. *American Sociological Review*, 74, 507-528.
- Bingimlas, K.A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *EURASIA Journal of Mathematics, Science and Technology Education*, 5(3), Special Issue: Australia 235-245.
- Broos, A. R. K. (2006). The digital divide in the playstation generation Self efficiency, locus of control and ICT adoption among adolescents. *POETICS*, 34, 306-317.
- Centre of Young Pioneers of China. (2011). Report of Chinese kids' use of Internet and social media. Retrieved June 13, 2013, from <http://kid.qq.com/zt2012/weichengnian/index.htm> (in Chinese)
- Center of Preventing Youth Internet Addiction. (2013). Summary on 2012 Blue Book of Beijing Primary and Secondary Students Internet Use Investigation. *Primary and Secondary School Information Technology Education*, 3, 10-16. (in Chinese)
- Editorial Committee of Annual Report on Development of Small and Medium-Sized Cities in China. (2010). *Annual Report on Development of Small and Medium-Sized Cities in China*. Beijing: Social Science Academic Press.



- Eynon, R., & Malmberg, L.-E. (2011). A typology of young people's Internet use: Implications for education. *Computers & Education*, 56(3), 585-595.
- Grant, L. (2011). 'I'm a completely different person at home': using digital technologies to connect learning between home and school. *Journal of Computer Assisted Learning*, 27(4), 292-302.
- Hasebrink, U., Görzig, A., Haddon, L., Kalmus, V., Livingstone, S., & network, M. o. t. E. K. O. (2011). Patterns of risk and safety online. In-depth analyses from the EU Kids Online survey of 9-16 year olds and their parents in 25 countries. London: LSE EU Kids Online.
- Hayes, D. N. (2007). ICT and learning: Lessons from Australian classrooms. *Computers & Education*, 49(2), 385-395.
- Ito, M., Horst, H. A., Bittanti, M., Boyd, d., Herr-Stephenson, B., Lange, P. G., & al., e. (2008). Living and Learning with New Media: Summary of Findings from the Digital Youth Project. Chicago: The John D. and Catherine T. MacArthur Foundation.
- Jewitt, C., & Parashar, U. (2011). Technology and learning at home: findings from the evaluation of the Home Access Programme pilot. *Journal of Computer Assisted Learning*, 27(4), 303-313.
- Johnston, A., Ganzeboom, H., & Treiman, D. (2005). *Mothers' and Fathers' Influences on Educational Attainment*. Paper presented at the RC28 conference, Oslo, Norway.
- Kent, N., & Facer, K. (2004). Different worlds? A comparison of young people's home and school ICT use. *Journal of Computer Assisted Learning*, 20(6), 440-455.
- Kerawalla, L. & Crook, C. (2002). Children's Computer Use at Home and School:

- Context and Continuity. *British Educational Research Journal*, 28(6), 751-771.
- Korupp, S., Ganzeboom, H., & Van Der Lippe, T. (2002). Do Mothers Matter? A Comparison of Models of the Influence of Mothers' and Fathers' Educational and Occupational Status on Children's Educational Attainment. *Quality and Quantity*, 36, 17-42.
- Lee, M. K. O., Cheung, C. M. K., & Chen, Z. (2005). Acceptance of Internet-based learning medium: the role of extrinsic and intrinsic motivation. *Information & Management*, 42, 1095-1104.
- Lenhart, A., Madden, M., Macgill, A. R., & Smith, A. (2007). Teens and social media The use of social media gains a greater foothold in teen life as they embrace the conversational nature of interactive online media. Washington, DC.
- Livingstone, S., & Bober, M. (2004). UK children go online: Surveying the experiences of young people and their parents. London: London School of Economics and Political Science. Retrieved May 10, 2013, from <http://www.children-go-online.net>
- Livingstone, S., Haddo, L., Görzig, A., & Ólafsson, K. (2010). Risks and safety on the internet: The perspective of European children. LSE, London: EU Kids Online.
- Losh, S.C. (2004). Gender, educational, and occupational digital gaps. *Social Science Computer Review*, 22(2), 152-166.
- Luckin, R., Clark, W., Graber, R., Logan, K., Mee, A., & Oliver, M. (2008). Learners' use of Web 2.0 technologies in and out of school in Key Stages 3 and 4.
- MarketingCharts. (2013). Are Young People Watching Less TV? (Updated – Q1 2013 Data). Available from MarketCharts. Retrieved July 9th, 2013 <http://www.marketingcharts.com/wp/television/are-young-people-watching-less-t>

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- Ministry of Education of China. (2012). 2011-2020 mid-to-long plan for educational reform Retrieved June 14, 2013, from <http://www.moe.gov.cn/ewebeditor/uploadfile/2012/03/29/20120329140800968.doc> (in Chinese)
- OECD. (2007). PISA 2006: science competencies for tomorrow's world, volume I analysis. Paris: OECD.
- OECD. (2008). *New Millennium Learners. Initial findings on the effects of digital technologies on school-age learners*. Paper presented at the OECD/CERI International Conference "Learning in the 21st Century: Research, Innovation and Policy", OECD, Paris.
- OECD. (2012). *Connected Minds: Technology and Today's Learners*, Educational Research and Innovation. Paris: OECD.
- Ofcom. (2007). Ofcom's Submission to the Byron Review. Annex 5: The Evidence Base - The Views of Children, Young People and Parents. London: Office of Communications.
- Pelgrum, W. J. (2008). School practices and conditions for pedagogy and ICT. In N. Law, W. J. Pelgrum, & T. Plomp, (Eds.). *Pedagogy and ICT use in schools around the world: Findings from the IEA SITES 2006 study* (Vol. 23) (pp. 67-120). Hong Kong: Comparative Education Research Centre, The University of Hong Kong, and Dordrecht: Springer.
- Rideout, V. J., Foehr, U. G., & Roberts, D. F. (2010). *GENERATION M2: Media in the lives of 8-to 18-year-olds*. Menlo Park, CA: Henry J.: Kaiser Family Foundation.

- Roberts, D. F., Foehr, U. G., & Rideout, V. (2005). *Generation M: Media in the Lives of 8-18 Year-Olds*. Menlo Park, CA: Henry J. Kaiser Family Foundation.
- Steeves, V. (2005). *Young Canadians in a wired world phase II: Trends and recommendations*. Retrieved May 10, 2013, from <http://www.media-awareness.ca/english/research/YCWW/phaseII/upload/YCWWII%5ftrends%5frecomm.pdf>
- Wainer, J., Dwyer, T., Dutra, R. S., Covic, A., Magalhaes, V. B., Ferreira, L. R. R., Claudio, K. (2008). Too much computer and Internet use is bad for your grades, especially if you are young and poor: Results from the 2001 Brazilian SAEB. *Computers & Education, 51*(4), 1417-1429.
- Wang, Z., Liu, Y., Huang, H., Zhao, G., & Li, L. (2005). Surveys on Construction and Application of Educational Informalization in Primary and Secondary Schools. *GET China Educational Technology, 22*, 25-32. (in Chinese)
- O'Hara, M. (2008). Young children, learning and ICT: A case study in the UK maintained sector. *Technology, pedagogy and education, 17*(1), 29-40.
- Subrahmanyam, K., Kraut, R. E., Greenfield, P. M., & Gross, E. F. (2000). The Impact of Home Computer Use on Children's Activities and Development. *Children and Computer Technology, 10*(2), 123-144.
- Selwyn, N., Potter, J., & Cranmer, S. (2009). Primary pupils' use of information and communication technologies at school and home. *British Journal of Educational Technology, 40*(5), 919-932.
- Stephen, C., McPake, J., Plowman, L., & Berch-Heyman, S. (2008). Learning from the children exploring preschool children's encounters with ICT at home. *Journal of*

- Early Childhood Research*, 6(2), 99-117.
- Stevenson, O. (2011). From public policy to family practices: researching the everyday realities of families' technology use at home. *Journal of Computer Assisted Learning*, 27(4), 336-346.
- Webb, M. E. (2005). Affordances of ICT in science learning: implications for an integrated pedagogy. *International journal of science education*, 27(6), 705-735.
- Zhao, S. (2009). Parental education and children's online health information seeking: beyond the digital divide debate. *Social science & medicine*, 69(10), 1501-1505.

Table 1: Exploratory factor analysis on the 7 items on using Internet at home.

Items:	Factor 1	Factor 2
Factor 1: Internet_Entertainment		
1. Multimedia	.70	
2. Game	.69	
3. Chatting	.77	
4. SNS	.73	
Factor 2: Internet_Learning		
5. SNS		.74
6. Homework		.72
7. Seek_Info		.60

*Internet\_Entertainment*: Using Internet for entertaining, *Multimedia*: Viewing or downloading music, videos, photos, or pictures, *Game*: Playing games online, *Chatting*: Chatting with friends online, *SNS*: Visiting social network website, *Internet\_Learning*: Using Internet for learning, *Discuss*: Communicating online with classmates on learning, *Homework*: Writing homework or report online, *Seek\_Info*: Searching information online for school work.

Table 2: Descriptive analysis on the items in the survey

	Range	Min	Max	Mean	SD	Skewness	Kurtosis
Exam_Score	88.50	11.00	99.50	83.96	13.72	-1.69	3.92
<b>Individual Factors</b>							
Time_TV	3	1	4	1.69	0.88	1.21	0.68
Time_Commu	4	1	5	2.50	1.20	0.71	-0.32
Time_Read	4	1	5	2.58	0.97	0.90	0.37
<b>Context factors</b>							
Edu_Father	5	1	6	3.13	1.17	0.21	-0.59
Edu_Mother	5	1	6	2.87	1.18	0.36	-0.46
Income	5	1	6	2.52	1.15	0.84	0.64
<b>Online Activities</b>							
Factor 1: Internet_Entertainment	3	0	3	1.22	0.79	0.40	-0.71
Multimedia	3	0	3	1.29	1.12	0.29	-1.27
Game	3	0	3	1.61	0.92	0.04	-0.90
Chat	3	0	3	1.27	1.13	0.27	-1.34
SNS	3	0	3	0.68	0.93	1.15	-0.21
Factor 2: Internet_Learning	3	0	3	1.63	0.64	-0.14	-0.39
Discuss	3	0	3	1.41	0.94	0.08	-0.90
Homework	3	0	3	1.42	1.07	0.10	-1.24
Seek_Info	3	0	3	2.07	0.81	-0.51	-0.37

*Exam\_Score* Average of math and Chinese exam scores, *Time\_TV* Time spent on watching TV per day, *Time\_Commu* Time spent on communication with families per day, *Edu\_Father* Education level of the father, *Edu\_Mother* Education level of the mother, *Income* Annual family income. (Refer to Appendix about coding rules)

Table 3: Zero-order correlations among major variables (N= 849)

	1	2	3	4	5	6	7	8	9
1. Exam_score									
2. Grade	-.00								
3. Time_TV	-.16**	.16**							
4. Time_Commu	.08**	.03	.01						
5. Time_Read	.14**	.14**	-.08*	.19**					
6. Edu_Father	.33**	.09*	-.11**	.16**	.16**				
7. Edu_Mother	.34**	.08**	-.10**	.17**	.15**	.69**			
8. Income	.07	.14**	.025	.03	.04	.12**	.16**		
9. Internet_Learning	.16**	.24**	-.08**	.11**	.17**	.10**	.14**	.06	
10. Internet_Entertainment	-.05	.45**	.28**	.04	.05	-.02	.00	.16**	.19**

*grade* the grade a student is in.

\*\*  $p < 0.01$



Table 4. Multiple regression analysis in predicting *Using internet for learning*

	R <sup>2</sup>	R <sup>2</sup> <sub>adj</sub>	ΔR <sup>2</sup>	ΔF	β	t
Step 1	.027	.022	.027***	6.04		
Edu_Father					.02	-.36
Edu_Mother					.13*	2.53
Income					.05	1.26
Step 2	.11	.098	.083***	10.21		
Edu_Father					-.04	-.74
Edu_Mother					.10	1.84
Income					.02	.50
Gender					.03	.74
Grade					.23***	6.03
Exam_score					.10*	2.52
Time_TV					-.09*	-2.36
Time_Commu					.04	1.05
Time_Read					.10*	2.57

\*\*\* p < .001, \*\* p < .01, \* p < .05

Table 5. Multiple regression analysis in predicting *Using Internet for entertainment*

	R <sup>2</sup>	R <sup>2</sup> <sub>adj</sub>	ΔR <sup>2</sup>	ΔF	β	t
Step 1	.024	.02	.024**	5.47		
Edu_Father					-.05	-.92
Edu_Mother					.01	.12
Income					.16***	3.97
Step 2	.28	.27	.258***	39.22		
Edu_Father					-.04	-.88
Edu_Mother					.00	.09
Income					.10**	2.83
Gender					-.19***	-5.56
Grade					.39***	11.27
Exam_score					.03	.77
Time_TV					.18***	5.39
Time_Commu					.04	1.08
Time_Read					.03	.72

\*\*\* p < .001, \*\* p < 0.01, \* p < 0.05

## Appendix A

### Survey on primary school students' Internet use activities (translated from Chinese)

1. What is your gender?  
A. Male                      B. Female
2. Which grade are you in?
3. What is your father's education level?  
A. Primary school  
B. Middle school  
C. High school or equivalent  
D. Minor bachelor degree  
E. Bachelor degree  
F. Master degree or above
4. What is your mother's education level?  
A. Primary school  
B. Middle school  
C. High school or equivalent  
D. Minor bachelor degree  
E. Bachelor degree  
F. Master degree or above
5. What is the average annual family income?  
A. Less than 20,000 RMB  
B. Between 20,000 to 50,000 RMB  
C. Between 50,000 to 100,000 RMB  
D. Between 100,000 to 200,000 RMB  
E. Between 200,000 to 500,000 RMB  
F. More than 500,000 RMB
6. How much time do you spend on watching TV per day?  
A. About 30 minutes  
B. About 1 hour  
C. About 2 hours  
D. About 3 hours
7. How much time do you spend on communication with your families?  
A. Less than 10 minutes  
B. About 30 minutes  
C. About 1 hour  
D. About 2 hours  
E. About 3 hours
8. The following questions are about your Internet use behaviour at home (using mobile devices are also considered). Please choose among the four options for each question:  
A. Often                      B. Sometimes                      C. Occasionally                      D. Never
  - 1) Do you discuss with your classmates on doing homework, or other things related to learning online?
  - 2) Do you use Internet to do your homework?
  - 3) Do you search for information or material related to learning online?
  - 4) Do you listen to music, watch movie or view pictures online (Downloading music, movie and pictures is also considered)?
  - 5) Do you play games online?
  - 6) Do you chat with friends online?
  - 7) Do you visit social network sites (e.g., Sina Microblog)?