

**OWNERSHIP, ACCESS AND USE OF COMPUTERS, INFORMATION
TECHNOLOGY AND OTHER E-TECHNOLOGIES
BY STUDENTS IN SUBURBAN BEIJING SCHOOLS**

A REPORT TO ADOBE SYSTEMS

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Problem

Computing and information technologies hold great promise to enhance learning in under-resourced schools and communities (see “A Brief Summary of a Review of Computing and Education”). Yet in China, little is known about the ownership, access and use patterns of computing, information and other electronic technologies among disadvantaged students and their families. For both policy makers and market actors, this lack of knowledge remains a barrier to closing the digital divide to allow disadvantaged students to realize the potential educational benefits of using technology. While not understanding what subsets of the population have access to computing and information technology confounds any public effort to extend access to those without such access, limited insight about the consumption patterns of underserved markets is also a challenge to technology providers.

Goal

Our goal is to fill in the knowledge gap concerning the ownership, access and use of computing, information and other technologies for Beijing migrant and non-migrant students.

Approach

To achieve this goal, we conducted two surveys of students in two sets of elementary public schools in non-central districts of Beijing. The first dataset (Urban) comes from 1458 fourth grade students at 9 public schools in the Changping, Haidian and Chaoyang Districts of Beijing. (For more details, see Table 1a). The location of the districts in Beijing is shown in the map of Figure 1. The schools in the Urban dataset include students with official “Beijing” residency (non-migrant students) and students who have migrated to and live in Beijing, but who are officially “non-Beijing” residents (migrant students).

The second dataset (Suburban) was collected from 412 fourth grade students in 4 public schools in the Changping, Haidian and Daxing Districts (see Table 1b, at the end). Likewise, the

schools in this dataset include both non-migrant and migrant students. As Figure 1 shows, the Suburban dataset comes from schools that are somewhat less centrally located in Beijing compared to the Urban set of schools, due to the inclusion of Daxing in the Suburban dataset (versus Chaoyang, included in the Urban dataset).

Compared to other public schools across Beijing, the public schools represented in both datasets are “lower middle” in terms of school quality and “lower middle” to simply “lower” in terms of the wealth levels of the students. The schools certainly do not represent the “best” public elementary schools in Beijing, which tend to be more centrally located. Similarly, the wealthiest Beijing students are unlikely to attend these schools.

However, as public schools, all the schools in both datasets receive public funds and thus are not as under-resourced as typical private migrant schools. Migrant students generally only attend migrant schools when they have no other choice. In both datasets, the migrant students surveyed are those who were able to enroll, and therefore are likely not as poor as those in the private migrant schools.

Figure 1, Beijing Central Districts (Xicheng, Dongchen, Chongwen, Xuanwu) and Surrounding Areas (including Changping, Haidian, Chaoyang, Daxing)



Summary of Findings

Demographic Statistics for Students in Urban (Suburban) Public Schools

[Table 2a (Table 2b, Table 2c)]

- Noteworthy is the high enrollment [64% (69%)] of migrant students.¹
- The gender balance tilts toward males at 57% (52%) of enrolled 4th graders.
- The average education of the students' fathers is 10.5 (10.7) years, only slightly higher than that of the students' mothers.
- 66% (39%) of student fathers and 61% (27%) of student mothers are manual laborers;
- 20% (27%) of student fathers and 15% (27%) of student mothers hold white collar jobs.
- 4% (5%) of fathers and 15% (18%) of mothers do not have a job.
- Only 32% of the students had at least one parent who earned more than the average salary for Beijing residents of roughly \$440 / month (Table 2c).

Family Ownership and Use of Electronic Products by Urban (Suburban) Students

[Table 3a (Table 3b)]

The reported ownership levels for electronics are high.

- 69% (75%) of students reported that their family owned at least one desktop, laptop or netbook.
- 55% (54%) had one or more USB drive.
- 46% (25%) reported having some type of "game machine." (11% and 6% reported having a Sony and Nintendo.)
- 45% (29%) reported having an MP3/4/5
- 82% (85%) can play DVDs with their televisions, i.e. have audio/video inputs

Moreover, students in families that own computing devices use them. Over 70% of students with families that own netbooks use the netbooks; 80% of students from families owning desktops use the desktops.

¹ While the actual percentage of migrant students enrolled in public schools overall in Beijing is unknown, interviews with local NGOs focused on the issue suggest that only 30% of migrant students are able to attend public schools.

Family Ownership and Use of Electronic Products, Non-Migrants vs. Migrants in Urban (Suburban) Schools

[Table 4a (Table 4b)]

Non-migrant family ownership is significantly higher than migrant family ownership of:

- desktops,
- USB drives,
- study machines (any other electronic device used for educational purposes),
- e-dictionaries,
- game machines (including by Sony and Nintendo) and
- MP3/4/5s.

It is important to note that this trend in ownership is observable in both our Urban and Suburban samples of public schools, which include relatively high migrant student enrollment and (possibly more well-established) migrant students who were able to attend public schools.

Family Ownership and Student Use, by Monthly Income, Suburban

[Table 5]

Not surprisingly, electronic device ownership increases as incomes increase.

- Comparing “below \$440” per month in household income to “\$440-\$880” and “above \$880”, we see an increase in or an equal level of ownership over nearly every category.
- The one exception is the “game machine,” for which the ownership estimates are lower for the income categories above \$440. It may be that consumers substitute from generic game machines to Nintendo and Sony game machines as incomes increase.

On the other hand, electronic device use (among those who own devices, as Table 5 shows) does not appear to be strongly associated with higher income categories. However, one caveat in attempting to observe use trends associated with income levels in Table 5 is the low number of observations for student use for some types of devices. The observations are reduced further as we categorize by the three income levels.

Recent Electronics Purchases by Families in Suburban Schools

[Table 6]

Parents of students appear motivated to purchase items in support of their child's education. In the past year:

- 44% purchased reference books;
- 67% purchased extra-curricular books;
- 30% purchased a computer.

Internet Access at Home, Urban (Suburban) Students

[Table 7a (Table 7b)]

For families that own computers, internet access is common and appears high-speed.

- 70% (81%) have access to internet.
- Of these, 78% (76%) have internet access via cable.

Frequency of Computer Use at Home for Study, Urban (Suburban) Students

[Table 8a (Table 8b)]

Among students with families that own a computer, a sizeable number of the students access the computer fairly regularly for study.

- 47% (30%) use their home computer 4 times or more per week for study.
- Only 5% (27%) use their family home computer less than 1 time per week for study.

Frequency of Internet Use at Home for Study, Urban Students

[Table 9]

- 96% of students who have access at home use the internet at home at least 1 time per week for study.
- 41% of students who have access at home use the internet at home at least 4 times per week for study.

Time of Computer Use at Home For Study, Suburban Students

[Table 10]

- 37% of students use their home computer more than 1 hour per week for study.
- 18% of students use their home computer more than 2 hours per week for study.

Time of Computer Use at Home (All Uses), Suburban Students

[Table 11]

- 45% of students use their home computer more than 1 hour per week in total use.
- 25% of students use their home computer more than 2 hours per week in total use.

Computers at School, Urban (Suburban) Students

[Table 12]

- 56% of students (89%) reported using a computer at school.

Frequency and Time of Use at School, Urban (Suburban) Students

[Table 13a (Table 13b), (Table 14)]

- A high proportion, 90% (99%), of those who reported use of a computer at school, use computers 1 to 3 times per week at school.
- However, (74%) of those who reported use of a computer at school use a computer at school less than 1 hour per week.

Internet Access Outside of Home and School, Suburban Students

[Table 15]

- 36% reported accessing the internet through other family members/friends.
- Only 1% access the web at internet cafés.

Conclusions

Our two samples of public schools from non-central districts of Beijing—each a sample of students from schools which are, by varying degree, suburban—reveal several insights about the ownership, access and use of computing, information and other electronic technology by a population of lower and lower middle income, migrant and non-migrant students.

- Students in these schools appear to be generally familiar with basic computing, internet and electronic technologies.
- Ownership rates for electronic devices in these schools are generally high. Ownership is highest among families who earn above the Beijing average income.
- Owning some form of a computer appears to be a higher priority compared to other devices.
- Students in families that own computers generally use the computers on a regular basis to enhance their study.
- Families with a home computer tend to have internet access; access is predominantly supplied via cable (versus dial-up); students report using the internet fairly regularly in connection with school study.
- Migrant students have less access to many devices, including home desktop computers and the internet.
- There are computers (of some form) in the sampled schools, and students have what appears to be occasional, but limited use of computers at school.
- The market for internet and computing for these non-centrally located students is *not* being met outside of home and school by internet cafes/centers.

In summary, our findings suggest two general trends. First, we observe that the majority of non-centrally located students have at least a basic knowledge of computers and the internet, and regular access to electronic devices. Many families of students own computers. Students whose families have computers and internet access generally use both to regularly enhance their academic studies.

Second, students with lower family incomes have more limited access to computers and internet, as observed by lower home ownership of computers, little time spent using computers at school, and little use of computers and internet outside of school and home. Based on the positive correlation with income, our results suggest that higher family incomes (such as among many students in central Beijing public schools) are generally associated with increased

ownership, access and use. Conversely, lower family incomes (such as among private migrant school students) are linked to even more limited and infrequent ownership, access and use.

The nature of this study only allows us to observe levels of ownership, access and use of technology and some initial correlative trends among students in suburban schools. We are unable to explain the causal relationships that restrict ownership, access and use of technology. To identify means by which computer, information and other electronic technologies may better reach students—particularly migrant and other disadvantaged students—further research into the constraints on student ownership, access and use of these technologies is needed.

In order to contribute to the broader debate in China on the importance of computers and information technology for education, further investigation is needed to identify the relationship between student ownership, access and use of technology and student learning. This work provides us a first look at the ownership, access and use of technology for a subset of the student population in China, an understanding of which is essential to gauging the potential needs for new policy and potential opportunities for market actors.

TABLES

Table 1a, Fourth Grade Students Surveyed by District in Beijing (Urban Schools)

District	students	percentage
Changping	485	33
Chaoyang	498	34
Haidian	475	33
Daxing	0	0
Total	1458	100

Table 1b, Fourth Grade Students Surveyed by District in Beijing (Suburban Schools)

District	students	percentage
Changping	141	34
Chaoyang	0	0
Haidian	196	48
Daxing	75	18
Total	412	100

Table 2a, Demographics of Urban School Students and Their Parents

Variables	Obs	Mean	Std	Min	Max
<i>Students</i>					
Age	1446	10.4	0.6	9	14
Male	1458	0.57	0.50	0	1
Whether his/her hukou is in Beijing (0= no, 1=yes)	1458	0.31	0.46	0	1
Whether he/she has siblings (0= no, 1= yes)	1457	0.48	0.50	0	1
Whether he/she has older siblings (0= no, 1= yes)					
<i>Student's Father</i>					
Father's age					
Father's education—years	1451	10.5	3.4	0	19
Whether father's hukou is in Beijing (0=no, 1= yes)					
Percentage of fathers doing manual labor	1441	0.66	0.47	0	1
Percentage of fathers with white collar jobs	1441	0.20	0.40	0	1
Percentage of fathers that are self employed	1441	0.11	0.31	0	1
Percentage of fathers that do not have a job	1441	0.04	0.19	0	1
Percentage of father's income is below \$220 per month					
Percentage of father's income is between \$220 and \$440 per month					
Percentage of father's income is higher than \$440 per month					
<i>Student's Mother</i>					
Mother's age					
Mother's education—years	1454	9.8	3.7	0	19
Whether mother's hukou is in Beijing (0=no, 1= yes)					
Percentage of mothers doing manual labor	1453	0.61	0.49	0	1
Percentage of mothers taking white collar jobs	1453	0.15	0.36	0	1
Percentage of mothers that are self employed	1453	0.09	0.29	0	1
Percentage of mothers that do not have a job	1453	0.15	0.36	0	1
Percentage of mother's income is below \$220 per month					
Percentage of mother's income is between \$220 and \$440 per month					
Percentage of mother's income is higher than \$440 per month					

Table 2b, Demographics of Suburban School Students and Their Parents

Variables	Obs	Mean	Std	Min	Max
<i>Students</i>					
Age	406	10.4	0.71	9	14
Male	405	0.52	0.50	0	1
Whether his/her hukou is in Beijing (0= no, 1=yes)	409	0.36	0.48	0	1
Whether he/she has siblings (0= no, 1= yes)	412	0.48	0.50	0	1
Whether he/she has older siblings (0= no, 1= yes)	403	0.28	0.44	0	1
<i>Student's Father</i>					
Father's age	332	37.8	4.2	28	58
Father's education year	333	10.7	3.4	0	19
Whether father's hukou is in Beijing (0=no, 1= yes)	330	0.30	0.46	0	1
Percentage of fathers doing manual labor	320	0.39	0.49	0	1
Percentage of fathers with white collar jobs	320	0.27	0.45	0	1
Percentage of fathers that are self employed	320	0.29	0.45	0	1
Percentage of fathers that do not have a job	320	0.05	0.21	0	1
Percentage of father's income is below \$220 per month	319	0.37	0.48	0	1
Percentage of father's income is between \$220 and \$440 per month	319	0.34	0.48	0	1
Percentage of father's income is higher than \$440 per month	319	0.29	0.45	0	1
<i>Student's Mother</i>					
Mother's age	338	35.9	3.8	28	55
Mother's education year	340	10.0	3.5	0	19
Whether mother's hukou is in Beijing (0=no, 1= yes)	331	0.27	0.44	0	1
Percentage of mothers doing manual labor	326	0.27	0.44	0	1
Percentage of mothers with white collar jobs	326	0.27	0.45	0	1
Percentage of mothers that are self employed	326	0.27	0.45	0	1
Percentage of mothers that do not have a job	326	0.18	0.39	0	1
Percentage of mother's income is below \$220 per month	276	0.54	0.50	0	1
Percentage of mother's income is between \$220 and \$440 per month	276	0.30	0.46	0	1
Percentage of mother's income is higher than \$440 per month	276	0.16	0.37	0	1

Table 2c, Distribution of Parents' Monthly Income, Suburban Students

Father's income per month	Mother's income per month			
	Below \$220	\$220-\$440	Above \$440	Total
Below \$220	0.35	0.02	0.01	0.39
\$220-\$440	0.12	0.18	0.02	0.32
Above \$440	0.06	0.10	0.13	0.29
Total	0.53	0.30	0.16	1.00 (n=263)

Table 3a, Family Ownership and Use of Electronic Products, 4th Grade Students in Urban Schools

Product	Obs	Ownership (Percentage)	Use, conditional on ownership (Percentage)
Desktop, Laptop or Netbook	1457	69	
Desktop	1455	59	81
Laptop	1446	30	76
Netbook	1454	23	71
USB	1450	55	69
Study machine	1455	50	92
E-dictionary	1455	28	91
Game machine	1457	46	68
MP3/MP4/MP5	1455	45	70
Recording pen	1452	21	76
Digital video camera			
Mobile phone			
Mobile phone with camera			
Sony game machine			
Nintendo game machine			
Other game machine			
Can play DVD through TV (ie. have audio/video input)	1457	82	

Table 3b, Family Ownership of Electronic Products, 4th Grade Students in Suburban Schools

Product	Obs	Ownership (percentage)	Use, conditional on ownership (Percentage)
Desktop, Laptop or Netbook	408	75	
Desktop	406	60	91
Laptop	406	39	79
Netbook	402	19	79
USB	405	54	81
Study machine	404	51	92
E-dictionary	403	27	93
Game machine	404	25	80
MP3/MP4/MP5	404	42	73
Recording pen	404	18	79
Digital video camera	399	53	70
Mobile phone	394	42	68
Mobile phone with camera	391	84	80
Sony game machine	400	13	82
Nintendo game machine	399	9	88
Other game machine	396	14	76
Can play DVD through TV (ie. have audio/video input)	405	85	

Table 4a, Family Ownership and Student Use, Non-Migrants vs. Migrants in Urban Schools

Product	Obs	Student's Official Residency (<i>Hukou</i>)		Difference	P-Value
		Beijing (non-migrant)	Non-Beijing (migrant)		
Desktop	1455	0.68	0.55	0.13	0.0000
Laptop	1446	0.28	0.31	-0.03	0.1899
Netbook	1454	0.22	0.24	-0.02	0.3233
USB	1450	0.60	0.53	0.07	0.0103
Study machine	1455	0.56	0.48	0.08	0.0079
E-dictionary	1455	0.32	0.27	0.05	0.0346
Game machine	1457	0.54	0.42	0.12	0.0000
MP3/MP4/MP5	1455	0.51	0.43	0.08	0.0039
Recording pen	1452	0.24	0.19	0.05	0.0266
Digital video camera					
Mobile phone					
Mobile phone with camera					
Sony game machine					
Nintendo game machine					
Other game machine					

Table 4b, Family Ownership and Student Use, Non-Migrants vs. Migrants in Suburban Schools

Product	Obs	Student's Official Residency (<i>Hukou</i>)		Difference	P-Value
		Beijing (non-migrant)	Non-Beijing (migrant)		
Desktop	403	0.72	0.54	0.18	0.000***
Laptop	403	0.39	0.39	0.00	0.956
Netbook	399	0.22	0.17	0.05	0.226
USB	402	0.69	0.46	0.23	0.000***
Study machine	401	0.60	0.46	0.15	0.004***
E-dictionary	400	0.35	0.22	0.13	0.006***
Game machine	401	0.27	0.24	0.02	0.592
MP3/MP4/MP5	401	0.52	0.37	0.15	0.003***
Recording pen	401	0.17	0.18	0.01	0.719
Digital video camera	396	0.60	0.49	0.11	0.044**
Mobile phone	391	0.40	0.43	0.04	0.481
Mobile phone with camera	388	0.84	0.83	0.01	0.828
Sony game machine	397	0.18	0.09	0.09	0.010***
Nintendo game machine	396	0.12	0.06	0.06	0.050**
Other game machine	393	0.13	0.13	0.00	0.996

***statistically significant at 1% level, **statistically significant at 5% level

Table 5, Family Ownership and Student Use, Suburban, by Monthly Income

	Family ownership (if family owns device)				Student use (if student uses device regularly)			
	Obs.	Below \$440	\$440-\$880	Above \$880	Obs.	Below \$440	\$440-\$880	Above \$880
Desktop, Laptop, or Netbook	176	0.60	0.90	0.89	127	0.75	0.71	0.69
Desktop	175	0.47	0.77	0.59	100	0.93	0.86	0.89
Laptop	174	0.27	0.63	0.57	72	0.80	0.70	0.88
Netbook	173	0.18	0.28	0.23	37	0.75	0.64	1.00
USB	175	0.41	0.71	0.69	93	0.84	0.71	0.81
Study machine	174	0.48	0.60	0.51	90	0.87	0.90	0.94
E-dictionary	174	0.24	0.23	0.31	43	0.91	1.00	0.90
Game machine	175	0.33	0.25	0.29	50	0.77	0.92	0.75
MP3/MP4/MP5	174	0.37	0.46	0.49	72	0.68	0.86	0.81
Recording pen	174	0.17	0.21	0.26	34	0.88	0.70	0.63
Digital video camera	175	0.50	0.63	0.57	95	0.70	0.60	0.68
Mobile phone	174	0.43	0.40	0.46	74	0.73	0.74	0.53
Mobile phone with camera	170	0.78	0.96	0.85	142	0.75	0.82	0.75
Sony game machine	175	0.12	0.15	0.23	26	0.64	0.86	0.88
Nintendo game machine	174	0.08	0.08	0.18	17	0.86	1.00	0.67
Other game machine	174	0.14	0.13	0.12	23	0.77	1.00	0.50
Can play DVD through TV (ie. have audio/video input)	176	0.83	0.88	0.83				

Table 6, Electronic Purchases by Suburban School Families in the Previous Year

Products	Obs	Percentage
Reference books	404	44
Extra-curriculum books	404	67
Cassette /CD	404	35
Game machine	404	14
Study machine	404	25
Computer	404	30
Others	404	4
Nothing	404	0.3

Table 7a, Internet Access at Home, Urban Students

Type of Internet Service Provider	Obs	Percentage of Users
Internet access at home (if own a desktop, laptop, netbook)	1042	70
<i>Access to internet is via standard telephone connection</i>	780	4
<i>Access to internet is via cable</i>	780	78.08
<i>Wireless internet access</i>	780	25.38
<i>Access to internet through mobile phone</i>	780	7.31

Table 7b, Internet Access at Home, Suburban Students

Type of Internet Service Provider	Obs	Percentage of Users
Internet access at home (if own a desktop, laptop, netbook)	293	81
<i>Access to internet is via standard telephone connection</i>	234	4
<i>Access to internet is via cable</i>	234	76
<i>Wireless internet access</i>	234	26
<i>Access to internet through mobile phone</i>	234	4

Table 8a, Frequency that Urban Students Use a Computer for Study at Home (if family owns a computer)

Frequency of use per week	Number of students	Percent
Less than 1 time	31	5
1-3 times	334	49
3-5 times	142	21
5-7 times	77	11
More than 7 times	100	15

Table 8b, Frequency that Suburban Students Use a Computer for Study at Home (if family owns a computer)

Frequency of use per week	Number of students	Percent
Less than 1 time	78	27
1-3 times	125	43
4-5 times	45	15
6-7 times	16	5
More than 7 times	30	10

Table 9, Frequency that Urban Students Use Internet for Study at Home (if family owns a computer)

Frequency of use per week	Number of students	Percent
Less than 1 time	18	4
1-3 times	279	55
3-5 times	100	20
5-7 times	42	8
More than 7 times	64	13

Table 10, Time Suburban Students Use Computers for Study at Home (if family owns a computer, if student uses it)

Time per week	Number of students	Percent
1-30 minutes	78	36.28
31-60 minutes	59	27.44
61-120 minutes	40	18.60
121-180 minutes	15	6.98
More than 180 minutes	23	10.70

Table 11, Time Suburban Students Use Computers (All Uses) at Home (if family owns a computer, if student uses it)

Time per week	Number of students	Percent
1-30 minutes	68	23.29
31-60 minutes	75	25.68
61-120 minutes	50	17.12
121-180 minutes	25	8.56
More than 180 minutes	37	12.67

Table 12, Computers at School

Computers at School	Obs	Percentage of Users
Urban school students reporting computers at school	1456	56
Suburban school students reporting computers at school	409	89

Table 13a, Frequency that Urban Students Use Computers for Study at School (if uses at school)

Frequency per week	Number of students	Percent
Less than 1 time	40	5
1-3 times	730	90
3-5 times	17	2
5-7 times	6	1
More than 7 times	14	2

Table 13b, Frequency that Suburban Students Use Internet for Study at School (if uses at school)

Frequency per week	Number of students	Percent
1-3 times	354	99
4-5 times	3	1
6-7 times	1	0.3
More than 7 times	1	0.3

Table 14, Time per week that Suburban Students Use Computers for Study at School

Time per week	Number of students	Percent
1-30 minutes	55	15.28
31-60 minutes	212	58.89
61-120 minutes	85	23.61
121-180 minutes	6	1.67
More than 180 minutes	2	0.56
Total	360	100.00

Table 15, Internet Access Outside of Home and School, Suburban Students

Access to Internet Outside of Home and School	Obs	Percentage of Users
Internet access at homes of other family members/friends	397	36
Internet access at internet cafe	401	1