Innovation in Language Learning and Teaching, 2015
Vol. 9, No. 2, 143–162, http://dx.doi.org/10.1080/17501229.2014.882929

Routledge
Taylor & Francis Group

Urban adolescent students and technology: access, use and interest in learning language and literacy

Jia Li[a,b]*, Catherine Snow[a] and Claire White[c]

[a]*Harvard Graduate School of Education, Harvard University, Cambridge, MA, USA;* [b]*Faculty of Education, University of Ontario Institute of Technology, Oshawa, Ontario, Canada;* [c]*Strategic Education Research Partnership, Washington, DC, USA*

(*Received 19 November 2013; accepted 6 January 2014*)

Adolescents today have vastly different opportunities to learn and process information via pervasive digital technologies and social media. However, there is scant literature on the impact of these technologies on urban adolescents with lower socioeconomic status. This study of 531 urban students in grades 6–8 used a self-reported survey to collect information about (1) students' access to and frequency of using desktop, laptop and tablet computers, and mobile phones, (2) their ownership of mp3 players, iPods, touch pads, cellphones, and smartphones, (3) whether they had accounts with any of 10 communication and social media platforms, and (4) their interest in using Facebook, Twitter, YouTube, and text messaging for language and literacy learning purposes. Students reported significantly more access to these technologies at home than school. Grade 8 students had the most access to cellphones and laptop computers, and were most likely to own smartphones. English language learners indicated a significantly higher interest in using social media for language and literacy learning than their native English-speaking peers. The results indicate a great potential to integrate technology strategically with language instruction for urban adolescent students with linguistically diverse backgrounds. The educational implications of these findings are discussed.

Keywords: social media; computers; digital and mobile technologies; language and literacy learning; urban middle school students; English language learners

Introduction

Digital technologies and social media have proven to be intrinsically attractive to youth, as shown by the time they spend in the virtual space, juggling multiple devices, and using software applications (i.e., apps). Findings from a survey of social media use showed that 80% of 799 teens in the USA between the ages of 12 and 17 used social media; 93% of them had a Facebook account; 77% owned a cellphone; 23% reported having a smartphone; and 88% of cellphone users texted to their friends and family. The average teen also owned 3.5 devices, including computers, cellphones, mp3 players, game consoles, and portable gaming devices (Lenhart, Ling et al. 2010; Lenhart, Purcell et al. 2010; Purcell 2010). 'Literacy demands have increased and changed as the technological capabilities of our society have expanded and been made widely available; concomitantly,

*Corresponding author. Email: Jia.li@utoronto.ca

the need for flexible, self-regulated individuals who can respond to rapidly changing contexts has also increased' (Biancarosa and Snow 2006, 9).

Some evidence has shown a positive relationship between technology and media use and improved language and literacy skills. For example, Kuppens' (2010) study of Flemish Dutch-speaking students in grade 6 showed that long-term exposure to subtitled English television programs, movies, and computer games had significant positive impact on the students' incidental English language acquisition. Kemp and Bushnell's (2010) study with 10–12-year-old Australian students found that their better literacy skills were associated with greater reading speed and accuracy of textese, phonologically based spelling abbreviations.

Meanwhile, emerging mobile and digital technologies and their convergence have provided extraordinary immersive educational opportunities reaching across disciplines, distance, and time. In the past decade, a growing body of research has reported efforts to use technology-assisted instruction to support adolescents struggling to acquire literacy skills by the onset of the middle grades (Carnegie Council on Advancing Adolescent Literacy, 2010). Technology-supported instruction that incorporates research-driven learning principles can engage adolescents in learning vocabulary knowledge (e.g., Li 2010; O'Hara and Pritchard 2008), reading (e.g., Dalton et al. 2002), and writing skills (e.g., Warschauer 2009; Watts and Lloyd 2004). Some findings have shown that well-designed technology-assisted instruction can provide language minority students and those of lower socioeconomic status (SES) with more opportunities for in-depth learning, as well as raise their test scores (e.g., Warschauer 2006). Educators have recommended that schools effectively integrate information and communication technology (ICT) into adolescent literacy programs (Biancarosa and Snow 2006). In the interest of informing literacy instructional strategies and improving academic outcomes for urban adolescent students, we need to identify the affordances of technology integration for these students with lower SES backgrounds.

SES and age factors in predicting technology access and use

The 'digital divide' has been widely invoked to suggest that some school-aged youth – those of lower SES in urban settings and new immigrants – have little access to the new ICTs whose use by mainstream students is growing rapidly. Earlier studies have indicated that those who are from low-income backgrounds, less educated, older, and Latino or African-American are less likely to have technology access at home, including computers, Internet or an email address (e.g., US Department of Commerce 1995; Mossberger, Tolbert, and Stansbury 2003; Lenhart 2003). Clearly one could project a detrimental impact on access to and familiarity with technology-mediated interventions for the children of these groups.

However, recent surveys of the demographic differences among youth in their use of and experiences with technology devices and social media indicate a shift in the conventional digital divide (e.g., Zickuhr and Smith 2012). As a result of rapid advances in mobile technology, Internet connectivity is increasingly moving off computers and into the mobile and wireless environment, particularly for lower income and minority teens. There is a steady growth in overall cellphone ownership among teens from lower income areas. Of teens in households earning less than $30,000 annually, 59% have a cellphone, and they are more likely to use social media sites and Twitter than teens from higher income households (Lenhart 2012; Lenhart, Purcell, et al. 2010).

Research on differences in the adoption of technology and social media by race and ethnicity revealed that there were also no racial or ethnic differences in many areas of technology use. For example, 'there are no differences in ownership of smartphones vs. regular cellphones by race, ethnicity or income' (Lenhart 2012, 3). Minority youth aged 8–18 in the USA spent about 1.5 hours more each day using their phones for activities such as watching videos and television than White youth, and 81% of Hispanic youth used a video-sharing site, as compared with 76% of African-Americans and only 69% of non-Hispanic Whites (Rideout, Foehr, and Roberts 2010). Studies showed that minority students have crossed over to the other side of the digital divide in many aspects of technology access and use. Furthermore, 'the digitally disadvantaged' have been found to share many of the same beliefs as their more privileged counterparts and to be even more interested in using technology. An early survey showed that African-Americans, for instance, were more positive in their attitudes toward technology than Caucasian-Americans, contrary to public assumptions (Mossberger, Tolbert, and Stansbury 2003). Low- and middle-income students were found to use computers for academic purposes at equal rates (e.g., Eamon 2004).

Age, not income and ethnicity, has become the most important determining factor in many aspects of technology access and use. For example, older teens have the highest cellphone and smartphone ownership. Researchers involved in the Pew Internet & American Life Project conducted telephone interviews with a nationally representative sample of about 800 teens aged 12–17 and their parents in 2009 and 2011. Their results showed that in 2009, 83% of 17-year-olds have a mobile phone, compared with 58% of 12-year-olds and 73% of 13-year-olds (Lenhart, Ling et al. 2010). As of 2011, 31% of teens aged 14–17 had a smartphone, compared with just 8% of teens aged 12–13 (Lenhart 2012). Older teens also are found to use cellphones much more frequently than younger teens; and this pattern progresses over time. In 2009, teen texters aged 14–17 sent and received 60 text messages a day, compared with teen texters aged 12–13, who sent and received an average of 20 texts a day (Lenhart, Ling et al. 2010). The number of texts sent on a typical day by teens aged 14–17 went from a median of 60 texts a day to a median of 100 from 2009 to 2011, while teen texters aged 12–17 rose from 50 in 2009 to 60 in 2011 (Lenhart 2012). Their studies also found that older teens were more likely to use social media than younger teens; for example, 10% of Internet teen users aged 14–17 used Twitter vs. 5% of those aged 12–13 (Lenhart, Purcell et al. 2010).

The stratification of access, ownership, and use of technology has evolved, and is becoming more multidimensional than originally characterized. Public education further complicates the situation as the digital divide between schools and the students' home environment overrides demographic and geographic boundaries (Warschauer 2003). Much of the research has been focused on socioeconomic differences between users and non-users (e.g., Ferro, Helbig, and Gil-Garcia 2006; Fong et al. 2001). While this has been valuable, there is an urgent need to identify which groups of students use what kind of technology, so we can develop effective educational interventions, capitalizing on the learning styles of this generation of students.

Research questions

Therefore, this research examines urban adolescents' access to technology and their interest in using technology to acquire literacy skills and to receive literacy instruction. There are five research questions.

(1) What access and ownership do urban middle school students have to technology devices and social media platforms?
(2) Are there any differences in their access to technology devices and frequency of technology use at home and in school?
(3) Do different grade groups differ in their access to social media, frequency of technology use, and ownership of technology devices?
(4) Do native English speakers (NESs) and English language learners (ELLs[1]) differ in their access to social media, frequency of technology use, and ownership of technology devices?
(5) Are adolescents interested in using social media for literacy learning and instruction particularly for vocabulary learning, and are there any differences in their interest in using social media to learn vocabulary by grade and first language background (NESs vs. ELLs)?

Methods

Participants

The study was conducted in an urban middle school in the Northeastern USA with 623 students in grades 6–8. Their ages range for each grade was 11–12, 12–13, and 13–14. All students at the school were invited to participate in the study. Based on information from the Massachusetts Department of Elementary and Secondary Education (2012), 75.6% of the students at the school received free lunch and 9.8% received reduced-price lunch. The federal National School Lunch Program, which aims to help students from lower income families, operates in public and non-profit private schools and residential childcare institutions. English was not the first language of 34% of the students, and 21.7% had limited English proficiency. A total of 531 students at the school participated in the study. Among the participants, 55% were male (n = 290), and 45% female (n = 234); about 34% of the respondents were in grade 6 (n = 176), 35% in grade 7 (n = 185), and 31% in grade 8 (n = 161). Seven students did not indicate their gender while nine students did not report their grade level. About 21% of these students (n = 110) were born outside the USA and 25% (n = 133) were identified by the school as ELLs. The ELLs spoke 17 native languages, including Spanish, French, Vietnamese, Mandarin, Cantonese, Portuguese, German, Arabic, Hindi, Swahili, Yoruba, Serbian, Greek, Somali, Creole (Cape Verdean and Haitian), Nigerian Igbo, and Jamaican Patwa.

Design of the survey

A five-page self-reported survey was developed to collect information about six domains: (1) students' access to and frequency of home use of desktop, laptop/netbook and tablet computers, cellphones, and game platforms; (2) students' access to and frequency of in-school use of desktop, laptop/netbook and tablet computers, and cellphones; (3) students' ownership of mp3 players, iPods, cellphones and smartphones; (4) students' accounts with 10 popular communication and social media platforms (e.g., Facebook, YouTube); (5) student interest in using social media platforms for literacy learning (i.e., academic vocabulary acquisition); and (6) student background information, including grade, age, gender, birthplace, and first language (see Appendix).

The project was conducted while a data-driven academic language instructional program, Word Generation (WG), was implemented school wide. This program provides students with sustained exposure to frequently occurring academic words in subject

content areas. The preliminary results of the WG study showed that 12 weeks of WG instruction trumped two years of incidental learning for academic words that are crucial to understanding academic texts. Improvements in participating students' vocabulary knowledge were particularly strong for language minority students (Snow, Lawrence, and White 2009). Thus, one motivation for this study was to explore the feasibility of providing WG instruction using technology for urban middle school students in and outside the school environment, as many of those with linguistically diverse backgrounds are unable to receive adequate literacy support in their home environments. Our survey thus included questions about WG instructional activities in the section that focused on students' interest in using social media for literacy learning purposes.

To ensure content validity of the survey, our research team worked through 11 rounds of revisions based on feedback from 8 team members, researchers, and teachers working closely with urban adolescent populations. The final version of the survey attempted to ensure that the survey questions were (1) relevant to adolescent participants' lives; (2) specific enough to generate authentic responses; and (3) phrased in a way that is comprehensible for these middle school students, given their general lower literacy levels as indicated in their annual literacy test scores. We also added pictures, logos, and icons to increase the readability of the survey.

Procedures and data analysis

The survey was distributed to all students at the school by their teachers following a brief explanation of the format. Some students in grade 6 and ELLs were organized into small groups so teachers could help them complete the questions step by step. It typically took students 20–30 minutes to complete the survey during the class. All the questionnaires were collected in the 2011–2012 academic year. We excluded seven questionnaires that omitted significant amounts of information, and analyzed 524 surveys. The research team coded data with an overall inter-rater reliability of $r = 0.98$. There were five first-round coders and two second-round coders.

Data from Question 5 in Section A and Questions 2–3 in Section C of the survey have been reported previously (Li et al. forthcoming). This article reports the original data from other sections of the survey to answer the five research questions. The internal reliability for each survey item was tested and deemed acceptable. For Section A, Cronbach's alpha ranges from 0.73 to 0.75, and the overall Cronbach's alpha is 0.73; for Section B, Cronbach's alpha ranges from 0.74 to 0.77, and the overall Cronbach's alpha is 0.76. These indicated that there is internal consistency among the items tested in the survey for students' use and ownership of technology devices, and the items tested for students' interest in using social media for learning purposes.

The surveys were analyzed using descriptive statistics, *t*-tests, repeated measures analysis of variance (ANOVA), and post-hoc analysis. To profile an overview of these urban students' technology access, frequency of use, and ownership of different types of technology devices and social media, descriptive analyses, such as the computation of mean (*M*), standard deviation (*SD*), and frequency (percentage) were conducted for each survey item. Next, we conducted five *t*-tests to examine whether there were any differences in their access, frequency of use, and ownership of these technologies between home and school, and between NESs and ELLs, as well as the difference between NESs and ELLs' interest in using social media to learn vocabulary. Five one-way ANOVAs and four post-hoc pairwise analyses were conducted to examine whether there were any differences in students' home and school access, frequency of use, and

ownership of these technologies and their interest in using social media to learn vocabulary across the 6th–8th grade groups.

Results

Students' access and ownership of technology devices and social media platforms

To answer research question 1, descriptive analyses were conducted on (1) students' overall access to three type of computers and cellphones; (2) ownership of four portal technology devices (i.e., cellphone, smartphone, iPod, and mp3 player); and (3) their accounts with 10 communication and social media platforms (i.e., email, Facebook, YouTube, Twitter, MSN, MySpace, Skype, Flickr, Wiki, and Picasa). The results indicated that most of the student participants had access to cellphones (91.23%), desktop (84.2%), laptop computers (76.12%), and 34.64% of the students also had access to tablet and netbook computers, such as iPads. This included students who had access to these computers or cellphones either at home or in school. About one-third of the students (32.31%) also reported having gaming platforms at home.

As to the ownership of four portable devices, 58% of participant students owned a cellphone; 45.95% owned an mp3 player; 36.35% owned an iPod; and 23.73% owned a smartphone. In addition, most of the students had an account with Facebook (72.88%), YouTube (59.32%), and email (57.25%), including many 6th graders, despite the fact that they had not reached the minimum age of 13 required for Facebook registration. More than one-third of the students had a Twitter account (37.1%). About a quarter of the students had an account with MSN (30.75%), MySpace (24.86%), and Skype (27.92%), and a small number of students had an account with Flickr (3.39%), Wiki (2.07%), and Picasa (1.51%).

Differences in students' technology access and frequency of technology use in school and at home

To answer research question 2, descriptive analyses showed that there was a much higher percentage of students with access to desktop, laptop, tablet computers, and cellphones at home than at school. This is most apparent in laptop computer and cellphone use, with a 50% of difference; however, it is worth noting that the school board had a cellphone ban in place at the time of the data collection. Students' access to desktop computers is relatively similar at home and school (69.55% vs. 59.80%), which may be because the school provided 115 desktop computers for students' use (see Table 1).

The results of the descriptive analysis also showed that a large number of students, including 74.42% of NESs and 64.12% of ELLs, used a cellphone every day at home. About one-third of students, including 27.82% of NESs and 29.69% of ELLs used a

Table 1. Percentage of students with access to desktop, laptop and tablet computers and cellphones.

	Home access (%)	School access (%)
Desktop	69.55	59.80
Laptop	75.44	9.12
Tablet	33.73	4.46
Cellphone	91.23	24.65
Game platform	32.31	n/a

desktop computer at home every day; 35.36% of NESs used a laptop computer at home every day; and 27.69% of ELLs used a laptop computer at home once every 2–3 days. A majority of the students, including 90.3% of NESs and 92.74% of ELLs, reported that they never used a laptop computer at school; 75.13% of NESs and 76% of ELLs never used cellphone at school. A small number of students, including 2.36% of NESs and 2.33% of ELLs reported using a desktop computer at school every day (see Table 2).

The results of *t*-tests showed that the differences in students' frequency of using these technology devices between home and school were statistically significant ($p < 0.000$; see Table 3). Students used three types of computers and cellphones much more frequently at home than at school. On average, students reported using desktop and laptop computers about once or twice a week at home vs. either 'never' or 'once a month' at school; they reported using a cellphone once every couple of days at home vs. 'never' or 'once a month' at school; and they also reported using a tablet computer about 'once a month' at home but 'never' at school.

Variations in frequency of students' technology use, ownership of technology devices, and access to social media by grade

To answer research question 3, there were some differences between grades in (1) the frequency of students' use of three types of computers and cellphones (and game platforms at home only); (2) their ownership of four portal technology devices (i.e., cellphone, smartphone, iPod, and mp3 player); and (3) their account with 10 communication and social media platforms (i.e., email, Facebook, YouTube, Twitter, MSN, MySpace, Skype, Flickr, Wiki, and Picasa). In most cases, 8th graders had more

Table 2. Frequency of students' computer and cellphone use between school and home.

Frequency of use	First language background	Never	Once a month	Once a week	Once every 2–3 days	Every day
Desktop (home)	NESs (%)	31.50	11.29	10.76	18.64	27.82
	ELLs (%)	27.34	8.59	8.59	25.78	29.69
Desktop (school)	NESs (%)	41.99	37.01	16.27	2.36	2.36
	ELLs (%)	34.88	39.53	17.83	5.43	2.33
Laptop (home)	NESs (%)	21.37	7.65	15.05	20.58	35.36
	ELLs (%)	33.85	3.85	17.69	27.69	16.92
Laptop (school)	NESs (%)	90.30	2.70	2.16	1.89	2.96
	ELLs (%)	92.74	1.61	2.42	1.61	1.61
Tablet (home)	NESs (%)	63.71	7.26	8.06	9.41	11.56
	ELLs (%)	73.81	6.35	7.14	6.35	6.35
Tablet (school)	NESs (%)	95.66	1.08	0.81	0.81	1.63
	ELLs (%)	95.16	0.00	2.42	0.81	1.61
Cellphone (home)	NESs (%)	7.67	1.54	5.12	11.26	74.42
	ELLs (%)	16.03	3.82	5.34	10.69	64.12
Cellphone (school)	NESs (%)	75.13	1.83	2.36	6.28	14.40
	ELLs (%)	76.00	7.20	0.80	5.60	10.40

Note: This is based on a 5-point Likert scale, indicating frequency of computer and cellphone use.

Table 3. Comparison of students' computer and cellphone use by frequency between school and home.

Tech. devices	Home *M*(*SD*)	School *M*(*SD*)	*t*	*p*
Desktop	3.06(1.63)	1.90(0.96)	14.62	0.000*
Laptop	3.27(1.57)	1.23(0.81)	27.07	0.000*
Tablet	1.90(1.42)	1.12(0.61)	12.26	0.000*
Cellphone	4.33(1.27)	1.79(1.48)	32.95	0.000*

Note: This is based on a 5-point Likert scale. Numbers 1–5 indicate frequency of use, with 1 being 'never use', 2 being 'use once a month', 3 being 'use once a week', 4 being 'use once every 2–3 days', and 5 being 'use every day'.
*$p < 0.001$.

access and used the technologies more frequently than 6th and 7th graders. One-way ANOVA results for grade differences in the frequency of home use of three kinds of computers, cellphones, and game platforms showed a significant effect of laptop ($F = 3.74$, $p = 0.024$) and cellphone ($F = 5.04$, $p = 0.007$) by grade. There were no significant differences in students' access to desktop and tablet computers and game platforms at home by grade. Post-hoc tests using pairwise analysis showed students in grade 8 used cellphones significantly more often at home (outside the school) than students in grades 6 ($p = 0.03$) and 7 ($p = 0.01$). Grade 8 students used laptop computers significantly more frequently than grade 6 students at home ($p = 0.036$), and they also used cellphones significantly more frequently than students in grades 6 ($p = 0.03$) and 7 ($p = 0.01$) at home (see Table 4). There were no differences in students' home use frequency of laptop computers and cellphones between 6th and 7th graders. One-way ANOVA results for grade differences in the frequency of students' school use of computers and cellphones showed that there were no significant differences.

With respect to students' ownership of four portable devices, the results of descriptive analysis showed that 8th graders had more ownership of three of four devices: 65% of 8th graders vs. 57% of 7th graders and 53% of 6th graders owned a cellphone (including smartphone); 42% of 8th graders vs. 34% of 6th graders and 34% of 7th graders owned an iPod; and 29% of 8th graders vs. 24% of 6th graders and 18% of 7th graders owned a smartphone. The exception was that more 6th graders (51%) than 8th (47%) and 7th (39%) graders owned an mp3 player.

One-way ANOVA results of grade differences in students' ownership of four devices indicated there were no significant grade-related differences in students' ownership of mp3 players, iPods, and cellphones, but there was a significant effect of the smartphone ownership by grade ($F = 3.13$, $p = 0.04$). Post-hoc tests showed that there were

Table 4. Pairwise analysis of grade differences in home use frequency of laptop computers and cellphones.

Tech. devices	Grade 6 *M*(*SD*)	Grade 7 *M*(*SD*)	Grade 8 *M*(*SD*)	*N*	6×7, *p*	7×8, *p*	6×8, *p*
Laptop	3.13(1.62)	3.18(1.58)	3.57(1.42)	500	0.999	0.074	0.036*
Cellphone	4.25(1.34)	4.20(1.37)	4.61(1.26)	513	0.999	0.01**	0.03*

Note: This is based on a 5-point Likert scale. Number 1–5 indicate frequency of use, with 1 being 'never use', 2 being 'use once a month', 3 being 'use once a week', 4 being 'use once every 2–3 days', and 5 being 'use every day'.
*$p < 0.05$; **$p < 0.01$.

significantly more students in grade 8 owning a smartphone than students in grade 7 (p = 0.039); that is, 29.81% of 8th graders vs. 18.38% of 7th graders owned a smartphone.

One-way ANOVA results of grade differences in students' accounts with 10 communication and social media platforms showed six significant effects of grade. These include email (F = 7.71, p = 0.0005), instant message (F = 5.52, p = 0.004), Facebook (F = 12.76, p = 0.0001), Flickr (F = 4.10, p = 0.017), Skype (F = 9.38, p = 0.0001), and Twitter (F = 3.12, p = 0.045). The results of post-hoc tests showed that there were significantly more students in grade 8 than students in grade 7 with email, instant message, Facebook, Flickr, Skype, and Twitter accounts. There were significantly more students in grade 8 than students in grade 6 with email, instant message, Facebook, and Skype accounts. For instance, 68% of 8th graders vs. 54% of 6th graders and 48% of 7th graders had an email account; 86% of 8th graders vs. 68% of 7th graders and 64% of 6th graders had a Facebook account; and 48% of 8th graders vs. 28% of 6th graders and 25% of 7th graders had an instant message account (see Table 5). There were no grade differences in the incidence of accounts with MySpace, YouTube, Wiki, and Picasa; for example, 65% of 8th graders vs. 59% of 6th graders and 52% of 7th graders had an account YouTube. Small percentages of students had accounts with Wiki (1–4%) and Picasa (0–3%).

Variations in frequency of students' technology use, ownership of technology devices, and access to social media by first language background

To answer research question 4, there were some differences between NESs and ELLs in (1) the frequency of their use of three types of computers, cellphones (and game platforms at home only); (2) their ownership of four portal technology devices (i.e., cellphone, smartphone, iPod, and mp3 player); and (3) their accounts on 10 communication and social media platforms (i.e., email, Facebook, YouTube, Twitter, MSN, MySpace, Skype, Flickr, Wiki, and Picasa). The results of t-tests showed that NESs had significantly higher frequency of using laptop (p = 0.01) and tablet computers (p = 0.02), cellphones (p = 0.01), and game platforms (p = 0.000) at home than ELLs. ELLs had higher frequency of using desktop computers at home than NESs, but this difference was not statistically significant (see Table 6).

With respect to the two student groups' ownership of four portable devices, the results of t-tests show that there were significantly more NESs owning mp3 players (p = 0.0001), iPods (p = 0.005), and smartphones (p = 0.003) than ELLs. For example, 51% of NESs vs. 32% of ELLs owned an mp3 player; 40% of NESs vs. 26% of ELLs owned an iPod;

Table 5. Pairwise analysis of grade differences in students' accounts with six communication and social media platforms.

Communication and social media	Grade 6 *M(%)(SD)*	Grade 7 *M(%)(SD)*	Grade 8 *M(%)(SD)*	*N*	6×7, *p*	7×8, *p*	6×8, *p*
Email	55(0.50)	49(0.50)	69(0.46)	522	0.76	0.000***	0.022*
Inst. message	28(0.45)	26(0.44)	48(1.04)	521	0.999	0.007**	0.019*
Facebook	64(0.48)	69(0.47)	87(0.34)	522	0.999	0.000***	0.000***
Flickr	2(0.15)	02(0.13)	07(0.25)	522	0.999	0.024*	0.065
Skype	22(0.42)	23(0.42)	41(0.49)	521	0.999	0.001***	0.000***
Twitter	39(0.49)	31(0.46)	43(0.50)	522	0.30	0.046*	0.999

Note: Inst. message means instant message.
*p < 0.05; **p < 0.01; ***p < 0.001.

Table 6. Comparisons of frequency of NESs and ELLs' computer and cellphone use at home and school.

Computers and cellphones	NESs *M(SD)*	ELLs *M(SD)*	*t*	*p*
Desktop (home)	3.00(1.64)	3.22(1.61)	1.31	0.19
Desktop (school)	1.86(0.94)	2.00(0.98)	1.51	0.13
Laptop (home)	3.41(1.54)	2.90(1.53)	3.25	0.01**
Laptop (school)	1.25(0.84)	1.18(0.70)	0.83	0.41
Tablet (home)	1.98(1.46)	1.65(1.23)	2.26	0.02*
Tablet (school)	1.12(0.60)	1.14(0.64)	0.32	0.75
Cellphone (home)	4.43(1.17)	4.03(1.52)	3.17	0.01**
Cellphone (school)	1.83(1.52)	1.67(1.35)	1.05	0.29
Game platform (home)	3.63(1.40)	3.02(1.51)	4.23	0.000***

Note: This is based on a 5-point Likert scale. Numbers 1–5 indicates frequency of use, with 1 being 'never use', 2 being 'use once a month', 3 being 'use once a week', 4 being 'use once every 2–3 days', and 5 being 'use every day'.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

and 27% of NESs vs. 14% of ELLs owned a smartphone. There was no difference in their ownership of cellphones (see Table 7).

As to the differences between NESs and ELLs in their accounts within the 10 communication and social media platforms, the results of descriptive analyses showed that NESs had more accounts than ELLs on 9 of the 10 platforms, except that ELLs (3%) had slightly more accounts than NESs (2%) on Wiki. The top three platforms where both groups of students had an account were Facebook, YouTube, and email. About 74% of NESs and 68% of ELLs used Facebook; 61% of NESs and 53% of ELLs had an account on YouTube; and 59% of NESs and 52% of ELLs owned at least one email account. The results of *t*-tests showed that significantly more NESs than ELLs had an account on MSN ($p = 0.0003$), Skype ($p = 0.0001$), and Twitter ($p = 0.0001$), there were no significant differences between the two groups in their accounts with email, Facebook, Flickr, Myspace, Wiki, YouTube, and Picasa (see Table 8).

Students' interest in using social media for learning vocabulary and its variations by grade and first language background

To answer research question 5, the results of descriptive analysis of data collected using a 6-point Likert scale showed that students expressed only moderate levels of interest in using four social media platforms to learn vocabulary: Facebook ($M = 2.65$, $SD = 1.29$), Twitter ($M = 3$, $SD = 1.45$), YouTube ($M = 3.24$, $SD = 1.89$), and text messages ($M = 3.03$, $SD = 1.65$). They were least interested in Facebook and most interested in YouTube

Table 7. Comparisons between NESs and ELLs in ownership of mp3 players, iPods, cellphones, and smartphones.

Four portable devices	Native *M(%)(SD)*	ELLs *M(%)(SD)*	*t*	*p*
Mp3	51(0.50)	32(0.47)	3.89	0.0001***
iPod	40(0.49)	26(0.44)	2.79	0.005*
Cellphone	60(0.49)	53(0.50)	1.24	0.21
Smartphone	27(0.44)	14(0.35)	2.97	0.003*

*$p < 0.01$; ***$p < 0.0001$.

Table 8. Comparisons between NESs and ELLs' accounts with 10 communication and social media platforms.

Communication and social media	Native *M(%)(SD)*	ELLs *M(%)(SD)*	*t*	*p*
Email	59(0.49)	52(0.50)	1.45	0.15
MSN	39(0.76)	14(0.35)	3.68	0.0003*
Facebook	74(0.44)	68(0.47)	1.34	0.18
Flickr	4(0.18)	3(0.17)	0.28	0.78
MySpace	26(0.44)	23(0.42)	0.71	0.48
Skype	32(0.47)	15(0.36)	3.87	0.0001**
Twitter	42(0.49)	23(0.42)	3.85	0.0001**
Wiki	2(0.13)	3(0.17)	0.87	0.38
YouTube	61(0.49)	53(0.50)	1.61	0.11
Picasa	2(0.14)	00(0.00)	1.65	0.09

*$p < 0.001$; **$p < 0.0001$.

for learning purposes, though they were much more interested in using Facebook for social interaction ($M = 4.58$, $SD = 1.60$) than using it (or any other social media platforms) for learning.

One-way ANOVA results of students' interest in using social media to learn vocabulary showed a significant grade effect when it came to following Twitter users who introduce words in tweets ($F = 3.69$, $p = 0.03$). No grade-level differences in interest in using the other three platforms (Facebook, YouTube, and text messaging) for learning approached statistical significance. Post-hoc tests showed that students in grade 6 had significantly higher interest than students in grade 7 in following Twitter users to learn new words ($p = 0.026$). On average, students in grade 6 had the highest interest in following Twitter users to learn new words ($M = 3.03$, $SD = 1.83$), followed by students in grade 8 ($M = 2.90$, $SD = 1.27$), and students in grade 7 ($M = 2.55$, $SD = 1.65$).

The results of *t*-tests also showed that ELLs were generally more interested in using technology for the learning purpose. These differences were statistically significant for Facebook ($p = 0.0008$), Twitter ($p = 0.022$), and text messaging ($p = 0.023$). Interest in using YouTube for learning ($p = 0.059$) also reached marginal significance (see Table 9).

Table 9. Differences between NESs and ELLs' interest in using social media to learn vocabulary.

	Overall *M(SD)*	Native *M(SD)*	ELLs *M(SD)*	*t*	*p*
Communicating with teachers on Facebook (about WG)	2.22(1.54)	2.09(1.47)	2.60(1.66)	3.36	0.0008**
Discussing important (WG) topics on Facebook	3.09(1.75)	3.10(1.75)	3.05(1.76)	0.30	0.77
Following Twitter users who introduce new words	2.86(1.74)	2.76(1.71)	3.16(1.81)	2.30	0.022*
Tweeting about important (WG) topics	3.16(1.76)	3.23(1.74)	2.92(1.81)	1.74	0.08
Reading text messages about new words	3.16(1.76)	2.93(1.59)	3.31(1.80)	2.28	0.023*
Watching (WG) classroom debate on YouTube	3.24(1.89)	3.15(1.90)	3.51(1.86)	1.89	0.059
Discussing (WG) homework with teachers on the Internet	3.12(1.84)	3.06(1.80)	3.33(1.94)	1.48	0.14

Note: This is based on a 6-point Likert scale. Numbers 1–6 indicate levels of interest in using social media for learning, with 1 being 'not at all interested', 2 being 'a little interested', 3 being 'somewhat interested', 4 being 'fairly interested', 5 being 'very interested', and 6 being 'extremely interested'.
*$p < 0.05$; **$p < 0.001$.

Summary of the findings

To summarize, there are several significant findings from the study that may provide insights into the design and development of technology-enhanced literacy instruction for urban adolescent students.

(1) Contrary to previous beliefs and studies, the majority of these urban adolescent students from lower income areas had access to and frequently used computers, cellphones, and diverse social media platforms.
(2) The students had significantly more access to and significantly higher levels of frequency of using computers and cellphones at home than in school.
(3) Students in grade 8 used laptop computers and cellphones significantly more frequently than 6th and 7th graders, and they owned significantly more smartphones and also reported having significantly more accounts than 6th and 7th graders on email, instant message, Facebook, Flickr, Skype, and Twitter.
(4) NESs used laptop and tablet computers and cellphones significantly more frequently at home, and reported having significantly more ownership of mp3 players, iPods, and smartphones, and more accounts with MSN, Skype, and Twitter than ELLs.
(5) All students in the study expressed moderate levels of interest in using four social media platforms (i.e., Facebook, Twitter, YouTube, and text messages) for vocabulary-focused literacy learning purposes.
(6) ELLs had significantly higher levels of interest in using Facebook, Twitter, and text messaging for learning purposes than NESs.

Discussion

The findings describe a more complex picture of the digital divide than that suggested by previous research, which has consistently shown that adolescents from low-income backgrounds are less likely to have access to computers at home (Eamon 2004). These results indicate a widespread use of computers, cellphones, and social media, as well as frequent access to the Internet among urban adolescents from lower SES families. About 70% of the respondents used cellphones on a daily basis, and over 55% used desktop and laptop computers every day or at least once every 2–3 days. Against a backdrop of the substantial expansion of technology use over the past several years, these results demonstrate an even faster pace of adoption by these urban adolescents than by the general public. The rise of mobile devices such as cellphones and smartphones enabled digitally deprived groups to overcome many hurdles to integrate technology into their lives. Our study with 523 students, of whom 75% were from families living below the poverty line, showed results of their technology access comparable to those from a study of a US nationally representative sample conducted by the Pew Research Center's Internet & American Life Project (Lenhart 2012). In the present study, 56.5% of adolescents owned a cellphone, compared to 77% of teens aged 14–17 and 57% of teens aged 12–13 in 2011 (Lenhart 2012). In the present study, 20.5% of teens aged 11–14 owned a smartphone, compared to 31% of teens aged 14–17 and 8% of 12–13-year-olds in the Lenhart (2012) study. In the national sample, 74% of 12–17-year-olds owned a laptop or desktop computer, and 79% of them owned an mp3 player or iPod (Lenhart, Purcell et al. 2010), while 55% of adolescents in the present study used a desk or laptop computer at home every day, and 74.5% of them owned an mp3 player and/or iPod.

Our findings showed that there were subgroup differences in adolescents' access to, ownership of, and frequency of using these technologies. These were related to a combination of factors, including age, language status, and the home vs. school environment; SES, which used to be considered the major cause of the digital divide, also played a role. The most significant differences in students' access to and frequency of using three types of computers and cellphones were between school and home. Students' limited access to cellphones reflect school policies restricting the use of cellphones and other mobile devices; these findings are consistent with some previous findings (e.g., Spires et al. 2008) that students had much more access to technology resources at home than they did at the school. Earlier large-scale surveys showed that students had a 'very real lack of access to the technology' at school (Norris et al. 2003, 5), and opportunities for students to access technology-assisted instruction at school continuously fall behind (see Gray, Thomas, and Lewis 2010) what would be expected by students and parents. This home–school disparity observed across North American public school districts for the past decade has increased, given the recent technological advances and increasing affordability of sophisticated technology for most families. Additionally, the significant gaps observed in urban schools are likely explained by funding. A survey among 2005 public schools in the 50 states and the District of Columbia showed that schools where 75% of the students were eligible for free or reduced-price lunch had a ratio of students to instructional computers with Internet access of 3.2:1; in the school we studied there were 5.41 students to 1 desktop and 57.6 students to 1 instructional laptop.

The second major source of differences occurred between grades. Students in grade 8 had significantly higher frequency of using laptop computers and cellphones at home, significantly more ownership of smartphones, and significantly more accounts with six communication and social media platforms. Noting that Facebook's age restriction policy may explain the higher proportion of older students with Facebook accounts, nonetheless these results confirmed that age plays a role in the adoption of technologies (Lenhart 2012). However, we did not find a linear increase in access along the grade progression. Students in grade 7 did not demonstrate any advantages over grade 6 students stemming from their use or ownership of these technologies. Grade 8 students seemed to be more informed about technology; for example, an 8th grader made a progressive suggestion on her questionnaire: 'I think we should be able to text our teachers for homework assignments and have them inbox us notes on Facebook.' The relative sophistication of the 8th graders may result from their frequent need to use computers and access the Internet for assignments; as a result, more students in grade 8 reported during an in-school focus group that their parents provided access to computers and other technology devices than did students in grades 6 and 7.

The third source of difference was language status. ELLs were from more recently immigrated families, who possibly also had lower incomes than NESs' families. ELLs were less likely to own 'advanced, luxury or trendy' types of technology devices, such as laptop and tablet computers, cellphones, mp3 players, iPods, and smartphones, but ELLs used desktop computers more often than their NES peers at home: 30% of ELLs vs. 28% of NESs used desktop computers every day, and 26% of ELLs vs. 17% of NESs used desktop computers once every 2–3 days. Interestingly, ELLs showed a strong engagement with technology; there were no significant differences between the two groups in their accounts with 7 of the 10 communication and social media platforms. NESs had significantly more accounts than ELLs only on MSN, Skype, and Twitter, which demand more synchronized communications and require more productive language skills, such as speaking and writing.

Students reported less interest than expected in using technology for literacy learning, with mean scores falling in the 'somewhat interested' range of the scale. Despite the popularity of Facebook and students' high interest in using the site to communicate with their peers, they expressed relatively low interest in using Facebook as a learning medium. This result may be related to their concerns of privacy online. Davis and James' (2013) study of middle school students in the USA showed that the adolescents view primarily Facebook as peer spaces, a main venue for youth communication, and they regard, to a certain degree, the presence of adults, and in particular adults they know, on the site as an invasion of privacy. Thus, though students in the present study viewed Facebook positively, they evidently did not see it as a platform for school-related activities. It is also possible that it is not that students do not like using Facebook for learning but rather that they do not like the Facebook-associated learning activities in the survey questionnaires. Future research can focus on exploring more ways of using social media to enhance literacy skills. Students were most interested in using YouTube to learn vocabulary. Their high interest could reflect students' familiarity with learning through videos (during the focus group many of their teachers reported using videos for instruction), the engaging nature of multimodal (i.e., visual and audio) learning, and availability of instructional YouTube videos.

ELLs showed significantly higher interest than NESs in using three social media platforms for learning vocabulary associated with WG instruction and activities, that is, Facebook, Twitter, and text messaging. These results may reflect their motivation to improve their English language skills through multiple exposures across multiple contexts, since these students typically do not have access to English in the home environment. The results may also be related to the initial phase of language and literacy learning when learners acquiring a new language are struggling with language production in natural settings and concentrating more on comprehension and observation of others' interaction (Krashen 1985). This silent period may last from a few days to several years depending on a variety of factors. The fact that these social media platforms do not require face-to-face or instant verbal interaction may relieve students' anxiety and enable them to seek assistance from their peers and teachers. As an ELL student in grade 6 wrote on the questionnaire: 'I use technology to learn English and search for words in class'.

Conclusion

In summary, more data are needed to substantiate our findings with a larger sample size and with students drawn from several different schools, and by investigating the Internet connectivity of different types of computers and mobile devices available to students. Nevertheless, the present results show that there is a great potential to strategically integrate technology with literacy instruction for urban adolescent students. These results inform us about disparities in student access to technology at home and in school, which may have already had a detrimental impact on their learning motivation, given the ubiquity of digital technologies and social media. School administrators need to review policies for technology use in school buildings, for example, reconsidering the ban on mobile technology devices currently in place in many school districts, as well as to optimize Internet connectivity and technology facilities within budget constraints. The development of technology-enhanced literacy interventions via social media during after school hours would appear to be a highly promising approach in light of urban adolescent students' access to computers and strong interest in YouTube and Facebook across the middle grades regardless of NES and ELL background. Interventions using cellphones

and laptop computers may be more easily implemented among students in grade 8, as they have more access than their younger peers.

The high levels of interest in using social media to learn vocabulary with WG instruction expressed by ELLs suggest the appeal of technology-based instruction; such instruction should be evaluated for its effect on their receptive and productive language development in English. For example, as a result of students' high interest in using YouTube for learning, our research team designed an academic vocabulary intervention using video clips of student debates. We documented and edited exemplary debates with annotations, using moviemaking software to highlight words that students need to learn and, most importantly to show them how to use the words meaningfully. It is hoped that these short films showing authentic student debates using academic words will provide a model – a sort of virtual coach inside and outside school – to their peers with weaker literacy skills or at lower grade levels. The model supports mastery of the debate genre that will ultimately enhance their learning of vocabulary, reading of academic texts, and expository writing, with positive consequences for their study of subject content areas.

There is consensus that technology has not had a significant impact on language and literacy teaching and learning in grades K-12 in the USA (e.g., Cuban 2001; Blok et al. 2002; Cheung and Slavin 2012). It is also clear that students would like to have technology experiences at school that are more compatible with what they experience outside school (Lee and Spires 2009). Given these teens' ubiquitous access to the technologies addressed in the study, it would be worthwhile to examine how they might differ in their use of technology and their technology skills from other demographic groups (Bennett and Maton 2010). Future research is needed to ascertain the following: (1) why students prefer to use certain technology devices and applications over others? (2) What features of social media platforms that teachers and students view as particularly desirable and/or undesirable for learning? (3) How teachers and students feel about using text messages as an educational medium, despite the current policy banning cellphone use in many school districts. In this era, when knowledge and information accessibility is being rapidly transformed by technology, leveraging the variety of technologies in which students immerse themselves as supports for their learning seems not only logical, but necessary.

Acknowledgment

We would like to thank the school, teachers and students for their participation in the project. Special thanks go to Dr William J. Hunter for his feedback on the draft of the manuscript. We also thank our research assistants for their contribution to the project, and in particular Jingjing Jiang's assistance in data analysis.

Funding

This work was supported by a Canada–US Fulbright Scholarship (2011–2012) awarded to the first author. The second and third authors were supported during the preparation of this manuscript by US Institute of Education Sciences grants [R305A090555, R305F100026].

Note

1. According to the Massachusetts Department of Elementary and Secondary Education, an ELL is defined as 'a student whose first language is a language other than English and who is unable to perform ordinary classroom work in English.' See http://www.doe.mass.edu/Assess/ for details.

Notes on contributors

Jia Li is an assistant professor at the University of Ontario Institute of Technology, and a Canada–US Fulbright Scholar at the Harvard Graduate School of Education (2011–2012). Her research focuses on data-driven innovative language instruction using new technologies for linguistically diverse urban students.

Catherine Snow is the Patricia Albjerg Graham Professor at the Harvard Graduate School of Education. She focuses on conditions that support the development of language skills related to literacy success, especially for children and youth attending urban schools and those who do not speak the school language at home.

Claire White served as the Strategic Education Research Partnership's program director for Word Generation, a discussion-based academic language program designed to promote deep reading comprehension in grades 4–8. White taught Spanish and English as a second language (ESL) as a former bilingual and ESL teacher. Her research focuses on improving classroom instruction for language minority children.

References

Bennett, S., and K. Maton. 2010. "Beyond the Digital Natives Debate: Towards a More Nuanced Understanding of Students' Technology Experiences." *Journal of Computer Assisted Learning* 26: 321–331. doi:10.1111/j.1365-2729.2010.00360.x.

Biancarosa, G., and C. Snow. 2006. *Reading Next: A Vision for Action and Research in Middle and High School Literacy: A Report to Carnegie Corporation of New York*. Washington, DC: Alliance for Excellent Education. http://www.all4ed.org/publications/ReadingNext/index.html.

Blok, H., R. Oostdam, M. E. Otter, and M. Overmaat. 2002. "Computer-Assisted Instruction in Support of Beginning Reading Instruction: A Review". *Review of Educational Research* 72 (1): 101–130. http://www.jstor.org/stable/pdfplus/3516075.pdf?acceptTC=trueandacceptTC=trueandjpdConfirm=true.

Carnegie Council on Advancing Adolescent Literacy. 2010. *Time to Act: An Agenda for Advancing Adolescent Literacy for College and Career Success*. New York: Carnegie Corporation of New York. http://carnegie.org/publications/search-publications/pub/195/.

Cheung, A., and R. E. Slavin. 2012. "How Features of Educational Technology Programs Affect Student Reading Outcomes: A Meta-Analysis." *Educational Research Review* 7 (3): 198–215. doi:10.1016/j.edurev.2012.05.002.

Cuban, L. 2001. *Oversold and Underused: Computers in the Classroom*. Cambridge, MA: Harvard University Press.

Dalton, B., B. Pisha, M. Eagleton, M. Coyne, and S. Deysher. 2002. *Engaging the Text: Computer-Supported Reciprocal Teaching and Strategy Instruction* (Final Report to the US Office of Special Education Programs). Peabody, MA: Cast.

Davis, K., and C. James. 2013. "Tweens' Conceptions of Privacy Online: Implications for Educators. Learning." *Media and Technology* 38 (1): 4–25, http://dx.doi.org/10.1080/17439884.2012.658404.

Eamon, M. K. 2004. "Digital Divide in Computer Access and Use between Poor and Non-Poor Youth." *Journal of Sociology and Social Welfare* 31 (2): 91–112. http://imet.csus.edu/imet8/leu/251/articles/Article_Eamon_PoorYouth.pdf.

Ferro, E., C. N. Helbig, and J. R. Gil-Garcia. 2006. *The Digital Divide Metaphor: Understanding Paths to IT Literacy*. Amherst, MA: National Center for Digital Government, University of Massachusetts Amherst. http://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1026&context=ncdg.

Fong, E., B. Wellman, M. Kew, and R. Wilkes. 2001. *Correlates of the Digital Divide: Individual, Household and Spatial Variation*. Unpublished manuscript. Toronto, ON: Department of Sociology, University of Toronto.

Gray, L., N. Thomas, and L. Lewis. 2010. *Educational Technology in US Public Schools: Fall 2008 (NCES 2010–034)*. Washington, DC: US Department of Education, National Center for Education Statistics. US Government.

Kemp, N., and C. Bushnell. 2010. "Children's Text Messaging: Abbreviations, Input Methods and Links with Literacy." *Journal of Computer Assisted Learning* 27: 18–27. doi:10.1111/j.1365-2729.2010.00400.x.

Lee, J., and H. Spires. 2009. "What Students Think About Technology and Academic Engagement in School: Implications for Middle Grades Teaching and Learning." *AACE Journal* 17 (2): 61–81. http://editlib.org/p/27007/.

Lenhart, A. 2003. *The Ever-Shifting Internet Population: A New Look at Internet Access and the Digital Divide*. Washington, DC: Project Pew Research Center. http://www.pewinternet.org/.

Lenhart, A. 2012. *Teens, Smartphones and Texting*. Washington, DC: Project Pew Research Center. http://pewinternet.org/Reports/2012/Teens-and-smartphones.aspx.

Lenhart, A., R. Ling, S. Campbell, and K. Purcell. 2010. *Teens and Mobile Phones*. Washington, DC: Project Pew Research Center. http://www.pewinternet.org/~/media//Files/Reports/2010/PIP-Teens-and-Mobile-2010-with-topline.pdf.

Lenhart, A., K. Purcell, A. Smith, and K. Zickhur. 2010. *Social Media and Mobile Internet Use among Teens and Young Adults*. Washington, DC: Project Pew Research Center. http://pewinternet.org/~/media//Files/Reports/2010/PIP_Social_Media_and_Young_Adults_Report_Final_with_toplines.pdf.

Li, J. 2010. "Learning Vocabulary via Computer-Assisted Scaffolding for Text Processing." *Computer Assisted Language Learning* 23 (3): 253–275. doi:10.1080/09588221.2010.483678.

Li, J., C. Snow, J. J. Jiang, and N. Edwards. forthcoming. "Technology Use and Self-Perceptions of English Language Skills among Urban Adolescents." *Computer Assisted Language Learning*.

Krashen, S. 1985. *The Input Hypothesis: Issues and Implications*. London: Longman.

Kuppens, A. H. 2010. "Incidental Foreign Language Acquisition from Media Exposure." *Learning, Media and Technology* 35 (1): 65–85. doi:10.1080/17439880903561876.

Massachusetts Department of Elementary and Secondary Education. 2012. *Massachusetts School and District Profiles (2011–2012)*. Malden, MA: Massachusetts Department of Elementary and Secondary Education. http://www.doe.mass.edu/.

Mossberger, K., J. C. Tolbert, and M. Stansbury. 2003. *Virtual Inequality: Beyond the Digital Divide*. Washington, DC: Georgetown University Press.

Norris, C., T. Sullivan, J. Poirot, and, E. Soloway. 2003. "No Access, No Use, No Impact: Snapshot Surveys of Educational Technology in K-12." *Journal of Research on Technology in Education* 36 (1): 15–27. http://www.stcloudstate.edu/tpi/initiative/documents/technology/No%20Access,%20No%20Use,%.20No%20Impact.pdf.

O'Hara, S., and R. Pritchard. 2008. "Hypermedia Authoring As a Vehicle for Vocabulary Development in Middle School English as a Second Language Classrooms." *The Clearing House: A Journal of Educational Strategies, Issues and Ideas* 82 (2): 60–65.

Purcell, K. 2010. *Teens, the Internet, and Communication Technology: A Pew Internet Guide to Online Teens*. Washington, DC: Project Pew Research Center. http://pewinternet.org/~/media//Files/Presentations/2010/Jun/Purcell%20YALSA%20pdf.pdf.

Rideout, J. V., G. U. Foehr, and F. D. Roberts. 2010. *Generation M2: Media in the Lives of 8- to 18-Year-Olds*. Menlo Park, CA: Henry J. Kaiser Family Foundation. http://www.kff.org/entmedia/upload/8010.pdf.

Snow, C., J. F. Lawrence, and C. White. 2009. "Generating Knowledge of Academic Language among Urban Middle School Students." *Journal of Research on Educational Effectiveness* 2 (4): 325–344. doi:10.1080/19345740903167042.

Spires, H. A., J. K. Lee, K. A. Turner, and J. Johnson. 2008. "Having Our Say: Middle Grade Student Perspectives on School, Technologies, and Academic Engagement." *Journal of Research on Technology in Education* 40 (4): 497–515. http://editlib.org/p/106110/.

US Department of Commerce, National Telecommunication and Information Administration. 1995. *Falling through the Net: A Survey of the 'Have Nots' in Rural and Urban America*. Washington, DC: US Department of Commerce. http://www.ntia.doc.gov/ntiahome/fallingthru.html.

Warschauer, M. 2003. *Technology and Social Inclusion: Rethinking the Digital Divide*. Cambridge, MA: MIT Press.

Warschauer, M. 2006. *Laptops and Literacy: Learning in the Wireless Classroom*. New York: Teachers College Press.

Warschauer, M. 2009. "Learning to Write in the Laptop Classroom." *Writing and Pedagogy* 1 (1): 101–112. doi:10.1558/wap.v1i1.101.

Watts, M., and C. Lloyd. 2004. "The Use of Innovative ICT in the Active Pursuit of Literacy." *Journal of Computer Assisted Learning* 20: 50–58. doi:10.1111/j.1365-2729.2004.00065.x.
Zickuhr, K., and A. Smith. 2012. *Digital Difference*. Washington, DC: Project Pew Research Center. http://www.pewinternet.org/Reports/2012/Digital-differences.aspx.

Appendix. Survey: Student access and interest in using technologies

(Note: Teachers were given the instruction to inform student participants that learning activities in Section B were related to the WG literacy instruction.)

A. Hey everyone! Which of these do you use?

(You may circle more than one)

1. At home  , I use:

Devices	How often?				
 Desktop	Every day	Once every 2–3 days	Once a week	Once a month	Never
 Laptop/netbook	Every day	Once every 2–3 days	Once a week	Once a month	Never
 Tablet (e.g., iPad)	Every day	Once every 2–3 days	Once a week	Once a month	Never
 Cellphone	Every day	Once every 2–3 days	Once a week	Once a month	Never
 Gaming platform (e.g., playstation, wii)	Every day	Once every 2–3 days	Once a week	Once a month	Never

2. At school 

, I use:

Devices	How often?				
 Desktop	Every day	Once every 2–3 days	Once a week	Once a month	Never
 Laptop/netbook	Every day	Once every 2–3 days	Once a week	Once a month	Never
 Tablet (e.g., iPad)	Every day	Once every 2–3 days	Once a week	Once a month	Never
 Cellphone	Every day	Once every 2–3 days	Once a week	Once a month	Never

3. I have my own (circle all that apply):

MP3 player or iPod	iPod Touch/Touch Pads	Cellphone	Smartphone

4. I have an account for the following sites (circle all that apply):

Email	Instant messaging	Facebook	Flickr	MySpace
Skype	Twitter	Wikis	YouTube	Picasa

B. Learning with Technology, Any Interest?

Please circle the number that best tells how you feel about the questions below.

1	2	3	4	5	6
Not at all (interested)	A little (interested)	Somewhat (interested)	Fairly (interested)	Very (interested)	Extremely (interested)

(1) I would be _____ interested in communicating with my teachers on facebook.
Not at all 1 2 3 4 5 6 Extremely
(2) I would be _____ interested in communicating with my classmates on facebook.
Not at all 1 2 3 4 5 6 Extremely

(3) If there was an online discussion about important topics (e.g., cyber-bullying, the war on terror, steroids in professional sports, etc.) on facebook, I would be _____ interested in sharing my ideas.

Not at all 1 2 3 4 5 6 Extremely

(4) A teacher sends 5 tweets every day, and all these tweets introduce new words that help me to express myself. I would be _____ interested in following this teacher on twitter.

Not at all 1 2 3 4 5 6 Extremely

(5) I would be _____ interested in following tweets about important topics.

Not at all 1 2 3 4 5 6 Extremely

(6) I would be _____ interested in reading text messages that explained new words.

Not at all 1 2 3 4 5 6 Extremely

(7) I would be _____ interested in watching video clips of classroom debates on YouTube.

Not at all 1 2 3 4 5 6 Extremely

(8) I would be _____ interested in discussing homework with my teachers via the Internet.

Not at all 1 2 3 4 5 6 Extremely

C. Please tell us something about yourself!

Gender (please circle): Boy Girl Age: _____

(1) What language(s) do you speak at home? _____

(2) Do you have any good ideas about how to use technology for learning?

If so, please tell us in the space below!

This is the end of the survey, thanks for your help!

For teacher/researcher use

School _____

Teacher name (home class) _____

Grade _____

Date _____