



# Students' perceptions of their digital citizenship and practices

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## Abstract

Students today need to become good digital citizens in order to operate successfully when reading, writing, learning, and interacting socially online. Digital citizenship depends on online access, mastery of technical skills for using digital devices, guidance from parents and teachers, and applying established social norms for online behavior. To investigate each of these aspects of digital citizenship, we examined the survey responses of 2,005 Grades 4 to 9 students (56% were female) who were randomly selected from 3,286 schools in Chongqing China. Virtually all students (96%) reported having internet access at home, and spent an average of 28 min online at home ( $SD = 25.42$ ) and 17 min at school ( $SD = 28.94$ ). Ninety-five percent of students were positive about their digital capabilities; 89% of them indicated online responsibilities and rights were taught at school; and 58% noted parents guided their internet use. On average, students slightly agreed that being online was important, but averaged moderate agreement they liked to read and write online for academic and social purposes, with reading online occurring weekly and writing online monthly. On average, students moderately agreed that they followed norms of digital netiquette, practiced safe online privacy behaviors, managed their digital footprint appropriately, balanced digital media use in healthy ways, and approached digital media in a literate manner. Nevertheless, 24% of students agreed they had been cyberbullied, 73% shared passwords with friends, 68% befriended strangers, 39% reshared posts, 78% used false personal information to register online, and 24% copied text directly from online sources when doing homework. Measures of digital citizenship were statistically related to student characteristics, internet use, and beliefs about online engagement. Implications for practice and future research are presented.

**Keywords** Digital citizenship · Internet access · Digital devices · Primary school students · Middle school students

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## Students' perceptions of their digital citizenship and practices

The use of the internet and digital devices in and outside of school is now common for many students as they use these tools to read, write, learn, and interact socially with others. While not all youngsters have access to such tools (United Nations Children's Fund and International Telecommunication Union, 2020), students' online activity has increased significantly during recent years. For example, in a 2017 report from the Organization for Economic Cooperation and Development (OECD), 95% of the 15-year-old students interviewed from 38 countries indicated they had internet access at home—up from 70% in 2006. The average student also had access to multiple internet connected devices: smartphone (92% of students), portable laptop (74%), desktop computer (60%), and a tablet (55%).

The average student in the 38 OECD countries made considerable use of internet connectivity in the 2021 assessment (OECD, 2023). On an average school day, students who were 15 years old in these countries spent 3.4 h using digital devices for learning at school and another 3 h a day (week days and weekend days) using digital devices for learning when not at school. The average OECD student also spent 2.5 h, 3.8 h, and 5.2 h using digital devices for leisure at school, at home on week days, and at home on weekend days, respectively. The frequent use of the internet means that adolescents today spend much of their reading and writing time online (Twenge et al., 2019).

Mainland China, where the current study took place, was not one of the 38 OECD countries included in the 2022 OECD assessment. However, in the 2015 Assessment (OECD, 2017), four Chinese provinces provided data as OECD partners. This included Beijing, Shanghai, Jiangsu, and Guangdong. Collectively these four provinces account for 18% of the population in China. Assuming data for these four provinces are representative of China broadly, 15-year-old Chinese students spend 42 min online outside of school each weekday and 99 min online each day of the weekend. This is considerably less than the time reported by students in other countries in either the 2015 or 2011 OECD assessments (OECD, 2017, 2023).

Most of the 15-year-old students in the 2017 OECD study were positive about the time they spent online. Five out of every six students indicated the internet provided a useful tool for obtaining information and a means for accessing online social networks. Because use of online resources is increasingly connected to work, home, civic, and school success (Milenkova & Lendzhova, 2021), including how frequently students' read and write (Twenge et al., 2019), it is essential students learn to use these tools competently and strategically. Students who fail to do so are likely to experience economic and social disadvantages (Park, 2017; Ragnedda & Muschert, 2013), making them less able to participate in society as fully as those who use online tools skillfully (Choi et al., 2017; Tangul & Soykan, 2021).

While the internet and digital devices are critical to students' current and future success (e.g., Becker et al., 2020), online activities pose a number of

threats. For the 15-year-olds in the 2017 OECD report, students who spent more time online reported greater loneliness, less satisfaction with life, more instances of being bullied, and less school engagement. The OECD reported also warned that excessive use of the internet may result in less physical activity, sleep disorders, and weight gain because of time spent in sitting in front of a screen. The report further cautioned that extensive online gaming may negatively impact concentration and motivation. Students who are less engaged in school, experience social difficulties, and physiological challenges such as a lack of sleep are more likely to experience literacy difficulties than students not confronting these issues (Graham, 2018).

Other risks that may occur from online misuse and abuse include using the internet or digital devices in a rude, threatening, or intimidating manner as well as downloading copyrighted material illegally, plagiarizing material found on-line, and using smartphones or other digital devices at inappropriate times, such as unsanctioned use during class time (Ribble et al., 2004). Internet and digital device users face other challenges including fake or alternative facts, maintaining digital privacy, managing what is shared with others online, and understanding their own and others' online identities (Martin et al., 2018, 2020; Ribble, 2008, 2011). To minimize such problems, students need to become good digital citizens right from the start who use the internet and digital tools in an appropriate, responsible, safe, ethical, legal, and healthy manner (International Society for Technology in Education, 2018; Ribble, 2014). This includes when students use internet connected devices to read and write. To this end, the primary purpose of this study was to determine if Chinese students in Grades 4 to 9 believed they use acquired knowledge and online skills to act in an appropriate and conscientious manner. Consequently, over 2000 randomly selected students from 3,386 schools in the Chongqing municipality were surveyed about their internet use and digital citizenship practices.

## **Digital citizenship: conceptualization, prior research, and predictors**

### **Conceptualization**

There have been multiple attempts to define digital citizenship and the characteristics underlying the concept (Martin et al., 2020). Choi and colleagues (2017) indicated a key issue to becoming a digital citizen is access to the internet and digital devices. This includes access and use at home and school, including how much time is spent online. Choi and colleagues (2017) also reported digital citizenship depends on mastering the technical skills needed to use these tools effectively (see also Trakhman et al., 2018). This includes the ability to obtain greater local and global awareness by acquiring, analyzing, and thinking about online information as well as experiences in becoming part of internet communities.

While online access, mastery of technical skills, acquiring greater awareness of local and global concerns, and participating in online communities facilitate digital citizenship development, students also need to learn to use the internet and digital devices responsibly. This is represented in a normative perspective, where digital

citizenship is defined through social norms for how to act in an appropriate manner online (Kim & Choi, 2018; Martin et al., 2020; Ribble, 2008, 2011). The use of normative rules helps ensure students understand the rights and responsibilities of being a good digital citizen. This includes acting in responsible, safe, ethical, and healthy ways when online (Gleason & Gillern, 2018; ISTE, 2018). Parents and teachers bear responsibility for teaching their charges to act in such a manner, and it is assumed that students who become good digital citizens are supportive and respectful when online, exhibit responsible behavior, and intervene when others are not responsible (Jones & Mitchell, 2016).

The conceptualization of digital citizenship that guided the present study included internet and digital device access and use (Choi et al., 2017), students' capabilities to use these tools (Choi et al., 2017), education in online rights and responsibilities at school (Jones & Mitchell, 2016), and parental control and guidance of youngster's online activities (Jones & Mitchell, 2016). It also included students' perceptions of digital citizenship constructs (Martin et al., 2020) including cyberbullying (bullying that occurs over digital devices), digital footprint (trail of data created when using digital devices), digital privacy (privacy of digital information shared), digital netiquette (formal and informal rules of online politeness and courtesy), digital identity (perceptions of a person based on their online activity), balanced media use (healthy and strategic use of digital devices), and media literacy (knowledge of how to navigate online environments including safe websites, legal and educational restrictions, advertisements, and inaccurate information). To address the attributes of digital citizenship, we surveyed students to assess their perceptions of these constructs.

## Prior research

*Online access* To date, studies examining digital citizenship mostly involve college students (e.g., Al-Abdullatif & Gameil, 2020; Al-Zahrani, 2015; Ananto & Ningsih, 2023; Choi et al., 2017; Isman & Canan Gungoren, 2014; Kara, 2018; Kim & Choi, 2018; Milenkova & Lendzhova, 2021). Research with school-aged students is less common. A study sponsored by the United Nations (United Nations Children's Fund and International Telecommunication Union, 2020) found that there was considerable variability in internet access among children and young adults. In rich countries (gross national income per person of \$12,615 or more), 87% of children and young adults had internet access at home, whereas in poor countries (gross national income per person of \$1,035 or less) the proportion was 6%. Time spent on the internet also varied greatly in a 2017 and 2021 OECD studies with 15-year-olds students (OECD, 2017, 2023). For example, in Sweden and Spain, students spent about 1.5 h online outside of school each weekday, whereas students in South Korea and the four Chinese provinces of Beijing, Shanghai, Jiangsu, and Guangdong spent 55 and 42 min each weekday online, respectively (OECD, 2017). Swedish students spent close to 3 h a day on the weekend online, but students in the four Chinese provinces above spent about 1.5 h online each weekend day.

Studies conducted in the United States (U.S.) revealed that most students in secondary grades had online access. Surveying a sample of 237 middle school students in a small school district in a rural community in the U.S., Martin and colleagues (2020) found that 94% of students had internet access at home, and the most commonly used digital device at home was a smartphone (60% of students). Further, in a study by Jones and Mitchell (2016), with a sample of 979 Grade 6 to 10 students in a single school district in the U.S., 37% of respondents indicated they were online one hour or less a day, whereas 31% were online for one to two hours, 15% for two to three hours, and 17% for more than three hours.

*Parental and school guidance* The available evidence suggests that schools and parents (at least in the U.S.) could direct more attention to teaching youngsters about digital citizenship. In the study by Martin et al. (2020) cited above, only 37% of students indicated they were taught digital citizenship at school, and only 55% of students indicated parents monitored online behavior. Parental involvement was even lower in a study by Lyons (2012), which was conducted with a sample of 829 Grade 5, 7, 9, and 11 students in a metropolitan school district in the U.S. Just 44% of students indicated parents discussed online safety or monitored online access (see also Martin et al., 2018; Symons et al., 2017).

*Applying accepted social norms for online behavior* In terms of acting in an appropriate and responsible manner online, 73% of the middle school students in the study by Martin et al. (2020) indicated they had not experienced cyberbullying personally. Even so, almost one-half of the respondents knew someone who had been cyberbullied. A slight majority of students (57%) indicated they practiced digital netiquette online, and only 16% of respondents indicated their online behavior was rude, mean, or unfair. Less than one-half of students (42%) indicated they reshared someone else's post, and 28% had their post reshared. Most students (87%) indicated they knew someone's online identity can differ from their face-to-face identity. While 89% of students in this study indicated they knew how to make sure online passwords were safe, about one-third of respondents reported sharing passwords with friends. Even more concerning, close to one-half of students followed or allowed a stranger to follow them online.

In another study by Martin and colleagues (2018), 40% of 593 Grade 6 to 8 students reported allowing a stranger to follow them online. However, only a small minority of Grade 5, 7, 9, and 11 students (11%) in the study above by Lyons (2012) indicated they practiced unsafe online behavior with strangers. Likewise, only a small percentage of these students (18%) indicated they broke one or more digital netiquette or footprint norms. Similarly, most of the Grade 6 to 10 students in the investigation above by Jones and Mitchell (2016) reported they commonly acted in a respectful manner when online.

*Summary* To summarize, there is considerable variability in online access and use across the globe. At least in the U.S., students mostly reported they were not taught digital citizenship at school, and only about one-half of students or less indicated parental oversight of online behavior. While many U.S. students indicated they adhered to the social norms of digital citizenship, concerning behaviors were reported in terms of cyberbullying, password sharing, and resharing posts.

The present study replicated and extended previous research by conducting a contemporary examination of digital citizenship in China with Grades 4 to 9 students. Like the studies reviewed above, it examined online access, guidance from parents and teachers, and students' application of established social norms for online behavior. It extended this prior research by examining students' mastery of the technical skills needed for using digital devices, literary and social purposes for online engagement, attitudes toward digital reading and writing, and beliefs about the importance of online engagement for learning and social reasons. Consequently, this investigation provides a more comprehensive look at digital citizenship than prior investigations with school-aged youngsters. In the Discussion, we will specifically compare the findings of this study with findings from U.S. studies.

## Predictors

The most frequently studied correlates of students' beliefs about digital citizenship are gender and grade. Both of these variables have accounted for statistically significant variability in digital citizenship scores in studies. In terms of the investigations reviewed above, girls were more likely than boys to act in a respectful manner online (Jones & Mitchell, 2016), use smartphones at home, and make their passwords safe (Martin et al., 2020). However, girls were more likely than boys to share passwords with friends (Martin et al., 2018, 2020). Boys were more likely than girls to play games online (Martin et al., 2020) and practice unsafe online behavior or disregard norms concerning digital etiquette and footprint (Lyons, 2012). Students in higher grades were less likely than those in lower grades to act in a respectful manner (Jones & Mitchell, 2016), be taught digital citizenship at school (Martin et al., 2020), or experience parental online oversight (Lyons, 2012). Students in higher grades also reported an increase in the use of all CAPS when messaging, and they were more likely to engage in risky online behaviors as well as break social norms for digital netiquette and footprint (Martin et al., 2020).

In the current study, we also examined if students' perceptions of digital netiquette, digital privacy, digital footprint, balanced media use, and media literacy were predicted by gender and grade, but we extended the number of predictors to also include reported home internet access, time spent online (home and school), as well as perceived capabilities to use digital devices, importance of online engagement, purposes for engaging in online activities, and attitudes towards digital reading and writing. To our knowledge, this is the first study, with school-aged or college students, to examine such a wide range of predictors.

## Theoretical framework

The current study was guided by the theoretical conception of social norms. Social norms represent shared standards of acceptable behavior adopted by a particular group such as internet users (Lapinski & Rimal, 2005). It is assumed that social norms guide behavior, providing a mental representation of what is acceptable,

which in turn promotes prosocial actions (Aarts & Dijksterhuis, 2003). Social norms can constitute informal understandings of acceptable behavior (e.g., gaining permission before putting a photo of someone online) or codified rules (e.g., rules concerning plagiarism of online material). Social norms, like the norms that have developed around digital citizenship, emerge when norm influencers seek to persuade others to adopt ideas about acceptable and appropriate behavior, these norms become broadly accepted, and they ultimately become taken-for-granted. At the present time, social norms for online behavior are not so established, they can be ignored (e.g., Jones & Mitchell, 2016; Martin et al., 2020).

Our decision to focus on digital citizenship in a particular country was guided by the view that the formation and actions of a community are situated and influenced by cultural, social, institutional, political, economic and historical factors pertinent to that locale (Goncu & Gauvain, 2012). This is illustrated in the Writer(s)-Within-Community model (Graham, 2018), where these factors result in variations in how local communities in a country operate but also in differences in how distinct countries operate as well, especially for countries that do not share a common heritage and history. In contrast to Western Countries for example, Chinese culture places greater emphasis on a communications style that is less direct, avoids confrontation and disagreement, and maintains speakers' and listeners' dignity and reputation (Yijie, 2023). Chinese culture also places great emphasis on collectivism rather than individualism. Such differences mean that how a construct such as digital citizenship is actualized in China cannot be accurately determined by studying digital citizenship in other countries (and vice versa). Accordingly, access, use, and digital citizenship norms must be studied with this in mind.

The need to study digital citizenship as if it was a localized rather than a generalized construct across countries is reflected in the large differences in home internet access and use across countries (OECD, 2017; United Nations Children's Fund and International Telecommunication Union, 2020). It is also evident in attempts by some countries (or organizations in them) to regulate online time. For example, in the U.S., the American Academy of Pediatrics in 2024 recommended no more than one hour a day of non-educational screen time for children two to five years of age. South Korea enacted a law in 2011 that made playing online games illegal from midnight to 6:00 a.m. for youngsters under the age of 16 (United Nations Children's Fund, 2018). In China where this study occurred, online game enterprises were ordered to restrict services to one-hour of access to minors from 8 p.m. to 9:00 a.m. on Friday, Saturday, Sunday, and holidays (National Press and Publication Administration, 2021).

## Research questions and predictions

The study was designed to answer the following questions:

1. Do students have online access at home and school? (RQ1)
2. Are perceptions of online importance, purposes, and attitudes towards digital reading and writing related to student grade and gender? (RQ2)



3. Do student characteristics, access and time spent on the internet, and beliefs about online engagement account for variance in reported digital citizenship? (RQ3)

For RQ1, we asked students if they had internet access at home and how much time was spent at home and school online. To more fully understand their access and use of the internet, we asked students what digital device they most often used, if they played online games, and the effect of the law in China aimed at limiting the playing of online games. We further asked them about parental oversight of online activities, teaching of online rights and responsibilities at school, and their capabilities to use digital devices. Gender and grade-level differences were examined for four of these variables. We did not anticipate gender differences for time online at school or the teaching of online rights and responsibilities (we assumed these would be whole class activities), but we did expect that older students would be more positive about their online capabilities than younger ones (as older students had more time to learn) and this would result in more time online at school in higher grades. At home, we predicted older students would spend more time online, as parental oversight would be less for older students (see Lyons, 2012). No predictions were made for gender difference for perceived capabilities or online activity at home.

For RQ2, students completed scales measuring their perceptions of the importance of online engagement, purposes for engaging in online activities, and attitudes towards digital reading and writing. We did not anticipate gender differences for the importance of online engagement, but we did expect older students would view online engagement as more important than younger students (as older students would be online more often). We also expected gender and grade-level differences in terms of purposes for engaging in online activities, as such purposes are likely to change over time and differences in what girls and boys like to do are common (e.g., Gracia et al., 2022). We anticipated that girls would express more positive attitudes towards digital reading and writing than boys and younger students would be more positive than older ones about such literacy activities. Such differences have been observed in prior studies involving reading and writing attitudes (Graham et al., 2018).

For RQ3, we examined students' perceptions of the following aspects of digital citizenship: digital netiquette, digital privacy, digital footprint, balanced media use, and media literacy. We further tested whether student characteristics (gender, grade, and perceived capabilities), internet access (at home and with mobile devices) and time spent on the internet (home and school), and beliefs about online engagement (importance of online engagement, purposes for engaging in online activities, and attitudes towards digital reading and writing) accounted for variance in these five aspects of digital citizenship. We anticipated that these variables would predict each of the five specific aspects of digital citizenship assessed. Students with greater internet access, those who spend more time online (school and home), and older students have more opportunities to acquire the knowledge and skills needed to act in an appropriate and conscientious manner online. Similarly, students who view online engagement as more important, reportedly engage in online purposes more frequently, are more positive about digital reading and writing, and are likely to be online more often, generating more opportunities to learn how to be a good digital



citizen. Additionally, students who receive school instruction about online rights and responsibilities are more likely to engage in these social norms than students who do not receive such instruction. Finally, observed difference in online behaviors between girls and boys (e.g., online game playing; Martin et al., 2020) should impact what they view as appropriate online behavior.

## Methods

### Setting and student selection

This study took place in Chongqing, China. Chongqing is the largest 'city proper' in the world (see <https://citymonitor.ai/guides/most-populous-city-proper-in-the-world>), and it is one of the four direct-administered municipalities in mainland China (the others are Beijing, Tianjin and Shanghai). The city is located in Southwestern China.

A total of 3,386 public and private schools served 11,011,389 students in Chongqing. We focused specifically on students in Grades 4 to 9 (9 to 15 years of age). Grades 4 to 6 include the last three years of primary school, whereas Grades 7 to 9 cover the middle school grades.

A random sampling procedure, stratified by region of the City (i.e., urban, suburban, and rural) and grade level, was used to identify 51 schools (we used Excel software to random sample with no duplicated). Of these schools, 55% served middle school students, 43% primary grade students, and 2% both types of students. We randomly selected 2,379 Grades 4 to 9 students from the 51 identified schools. This involved randomly selecting 15 students at each grade-level in each school. Because this resulted in just 2,340 students, it was necessary to randomly select 37 additional students in order to obtain the desired number of participants.

We purposefully selected 2,371 students, because a sample of this size would result in a sampling error of less than 3% for the most common type of Likert-item in the survey (which contained six response options), assuming a confidence interval of 95% and a return rate of 25% (see Dillman, 2000). Sampling did not include students receiving special education services.

Of the 2,371 students who were asked to complete the survey, 2,363 (99.7%) students responded to it. We eliminated 358 of the returned surveys because 50% of the survey was not completed. This resulted in a return rate of 84.6%, narrowing the sampling error to  $\pm 1.8\%$ .

### Participating students

Of the 2,005 students who returned usable surveys, 56% were female and 44% male. Forty-eight percent of students were in the primary grades and 52% in middle school. Eleven percent of students attended private schools (89% were in public schools). Students were mostly educated in urban schools (46%), followed by suburban schools (31%) and rural schools (23%).

## Survey

One section of the survey collected the following basic information: grade, gender, type of school attended (i.e., private or public), school location (i.e., urban, suburban, rural), internet access at home (yes, no), access to mobile devices for connecting online (yes, no), played online games (yes, no), time in minutes spent online during school, time in minutes spent online after school, and ability to use digital media (rated as very poor [score of 1], poor [score of 2], average [score of 3], good [score of 4], and very good [score of 5]). This section also included questions about parental involvement in child's online activity at home (checked as no limitations, monitor and discuss time spent online, a limit set on time online, and/or online activities prohibited), whether they controlled their child's access to websites (yes, no), whether time spent playing online games was influenced by the law limiting minors access to online gaming (rated as less than before the law, same as usual, more than before; National Press and Publication Administration, 2021). They were further asked if they were taught online rights and responsibilities at school (yes, no), and to identify which digital device used most often to go online (smartphone, tablet, laptop, desktop computer, or smart watch). The questions about whether they were taught online rights and responsibilities, types of digital device used most often, parental involvement, and internet access at home were taken from Martin et al. (2020).

## Perceived importance of online engagement

The survey also assessed why students thought online activities were important using the following items (taken from Wu, 2012): helps learning, does not impede learning, makes reading more enjoyable, writing online is more enjoyable than writing with paper and pencil, makes it possible to write more, makes me popular, makes me more confident, more interaction with parents, can say anything you want, and makes me tired (see Table 1). The first 5 items focused on learning rationales, whereas the second 5 items centered mostly on social rationales. For each item, students indicated agreement using a six-point Likert-type scale: strongly disagree (score of 1), moderately disagree (score of 2), slightly disagree (score of 3), slightly agree (score of 4), moderately agree (score of 5), and strongly agree (score of 6).

A factor analysis of the 10 items revealed 5 items evidenced low communality scores ( $<0.200$ ). Once these items were removed (does not impede learning, writing online is more enjoyable than writing with paper and pencil, more interaction with parents, can say anything you want, and makes me tired), a one factor solution with an eigenvalue of 2.66, accounting for 43% of the variance was obtained. All 5 items (helps learning, more chances to express written ideas, enjoy reading, more confidence, more popular) had a factor loading from 0.400 to 0.786. This factor was labeled as Perceived Importance of Online Engagement. Coefficient alpha was 0.78.

**Table 1** Perceived importance of online engagement

| Items  | 1     | 2     | 3     | 4     | 5     | 6     | <i>M</i> | <i>SD</i> |
|--|-------|-------|-------|-------|-------|-------|----------|-----------|
| Importance of online engagement<br>( <i>n</i> = 2004)                |       |       |       |       |       |       | 3.6      | 1.1       |
| Help learning ( <i>n</i> = 1997)                                     | 3.3%  | 2.1%  | 7.6%  | 38.8% | 25.4% | 22.9% | 4.5      | 1.2       |
| Have more chances to express written<br>ideas ( <i>n</i> = 1991)     | 9.5%  | 6.7%  | 13.2% | 31.5% | 19.9% | 19.1% | 4.0      | 1.5       |
| Make me enjoy reading ( <i>n</i> = 1993)                             | 13.3% | 9.0%  | 18.6% | 28.9% | 16.1% | 14.1% | 3.7      | 1.5       |
| Make me have more confidence ( <i>n</i> = 1996)                      | 21.6% | 11.6% | 19.3% | 28.1% | 10.6% | 8.8%  | 3.2      | 1.6       |
| Make me more popular ( <i>n</i> = 1999)                              | 28.2% | 13.1% | 23.7% | 24.2% | 5.2%  | 5.6%  | 2.8      | 1.5       |
| Others   |       |       |       |       |       |       |          |           |
| Prefer to write with paper and pencil<br>( <i>n</i> = 1982)          | 4.1%  | 2.2%  | 6.8%  | 17.0% | 27.7% | 42.2% | 4.9      | 1.3       |
| Do not let the internet influence my<br>learning ( <i>n</i> = 1999)  | 7.2%  | 3.2%  | 7.4%  | 13.2% | 19.8% | 49.2% | 4.8      | 1.5       |
| Feel tired after spending too much time<br>online ( <i>n</i> = 1990) | 7.2%  | 3.6%  | 7.3%  | 20.4% | 22.8% | 38.7% | 4.6      | 1.5       |
| Interact with my parents through social<br>media ( <i>n</i> = 1999)  | 21.4% | 9.5%  | 13.5% | 26.4% | 16.4% | 12.9% | 3.5      | 1.7       |
| Can say anything you want online<br>( <i>n</i> = 1998)               | 64.8% | 14.1% | 11.6% | 6.2%  | 1.6%  | 1.9%  | 1.7      | 1.2       |

Students responded to a scale with 6-points: strongly disagree (1), moderately disagree (2), disagree slightly (3), agree slightly (4), moderately agree (5), and strongly agree (6)

### Purpose for online activities

The survey asked students how often they went online to engage in the following purposes (items adapted from Ke & Yao, 2011): read, write, watch news, solve problems, finish learning tasks, complete extracurricular courses, watch videos, listen to music, play online games, interact socially, shop, manage own website, and provide fan support (see Table 2). The first 6 items were designed to assess purposes related to learning, whereas the last 7 items focused on social purposes. For each item, students indicated how frequently they engaged in the activity using an eight-point Likert-type scale: never (score of 0), several times a year (score of 1), monthly (score of 2), several times a month (score of 3), weekly (score of 4), several times a week (score of 5), daily (score of 6), and several times a day (score of 7).

A factor analysis of the 13 items revealed 5 items evidenced low communality scores (0.200). Once these items were removed (watch news, finish learning tasks, solve problems, complete extracurricular courses, and provide fan support), two factors (using an oblique rotation) produced eigenvalues greater than 1.0 (i.e., 2.906 and 1.347), accounting for 39% of the variance. One factor included 6 items (watch video, listen to music, play online games, social interactions, manage website, and shopping), with an eigenvalue of 2.906 (variance accounted for = 28%), factor loadings from 0.477 to 0.647, and a coefficient alpha of 0.74. This factor was labeled Online Purpose to Engage in Social Activities. A second factor included 2 items (online reading and writing), with an eigenvalue of 1.347 (variance accounted

**Table 2** Online purposes

| Items                                   | 0     | 1     | 2     | 3     | 4     | 5     | 6     | 7     | M   | SD  |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-----|-----|
| Literacy ( $n = 1974$ )                 |       |       |       |       |       |       |       |       | 3.0 | 2.0 |
| Online reading ( $n = 1967$ )           | 16.8% | 8.3%  | 6.3%  | 10.4% | 14.3% | 18.6% | 14.0% | 11.4% | 3.7 | 2.3 |
| Online writing ( $n = 1956$ )           | 31.1% | 11.6% | 10.6% | 10.0% | 18.4% | 9.3%  | 5.5%  | 3.5%  | 2.4 | 2.2 |
| Social ( $n = 2003$ )                   |       |       |       |       |       |       |       |       | 2.9 | 1.4 |
| Listening to music ( $n = 1971$ )       | 7.2%  | 6.1%  | 5.0%  | 10.0% | 15.7% | 28.0% | 13.6% | 14.3% | 4.3 | 2.0 |
| Watching videos ( $n = 1977$ )          | 6.3%  | 8.1%  | 9.5%  | 11.8% | 26.2% | 23.4% | 6.1%  | 8.5%  | 3.8 | 1.9 |
| Social interaction ( $n = 1933$ )       | 20.8% | 8.4%  | 7.3%  | 9.4%  | 15.6% | 20.7% | 7.7%  | 10.1% | 3.3 | 2.3 |
| Playing online games ( $n = 1974$ )     | 34.4% | 10.7% | 8.6%  | 6.4%  | 19.0% | 12.2% | 4.3%  | 4.4%  | 2.4 | 2.2 |
| Managing website ( $n = 1980$ )         | 50.7% | 5.9%  | 6.5%  | 5.5%  | 12.9% | 9.7%  | 4.0%  | 4.8%  | 1.9 | 2.3 |
| Shopping ( $n = 1976$ )                 | 36.8% | 14.2% | 17.3% | 14.2% | 10.0% | 5.6%  | 0.8%  | 1.2%  | 1.7 | 1.7 |
| Others                                  |       |       |       |       |       |       |       |       |     |     |
| Finishing learning tasks ( $n = 1977$ ) | 7.8%  | 8.2%  | 7.1%  | 10.5% | 21.8% | 16.2% | 16.0% | 12.3% | 4.0 | 2.1 |
| Solving problems ( $n = 1979$ )         | 7.2%  | 7.3%  | 8.6%  | 15.8% | 19.1% | 26.9% | 9.5%  | 5.7%  | 3.8 | 1.9 |
| Watching news ( $n = 1970$ )            | 11.7% | 9.0%  | 10.7% | 11.8% | 25.5% | 16.9% | 11.8% | 2.5%  | 3.4 | 1.9 |
| Extracurricular courses ( $n = 1949$ )  | 33.7% | 11.6% | 8.0%  | 7.6%  | 20.2% | 11.6% | 4.1%  | 3.2%  | 2.4 | 2.2 |
| Fan support ( $n = 1976$ )              | 86.1% | 4.1%  | 2.2%  | 1.8%  | 2.4%  | 1.7%  | 1.0%  | 0.8%  | 0.4 | 1.3 |

Students responded to a scale with 8-points: never (0), several times a year (1), once a month (2), several times a month (3), once a week (4), several times a week (5), daily (6), and several times a day (7)

for = 11%), factor loadings greater from 0.741 to 0.755, and a coefficient alpha of 0.74. We labeled this factor Online Purpose to Learn.

### Attitude towards digital reading

The following 6 items from Graham et al. (2018) assessed attitude towards reading digitally: reading online for class, looking up information online for class, reading book online for class, reading text messages from friends in free time, reading emails from friends in free time, and reading material on social websites in free time (see Table 3). The first 3 items focused on online reading at school, whereas the last 3 items concentrated on non-school online reading activities. Students indicated their agreement with these items using a six-point Likert-scale, with scores ranging from feeling very bad when engaging in these activities (score = 1) to very good (score = 6).

A factor analysis of the 6 items yielded two factors with eigenvalues greater than 1.0, accounting for 62% of the variance. The first factor, Attitude Towards Social Online Reading, included 3 items (reading text messages from friends in free time, reading emails from friends in free time, and reading material on social websites in free time), with an eigenvalue of 3.22 (; variance accounted for = 48%), factor loadings from 0.662 to 0.870, and a coefficient alpha of 0.84. The second factor, Attitude Towards Online Reading at School, included 3 items (reading online for

**Table 3** Attitudes toward digital reading and writing

| Items   | 1     | 2    | 3     | 4     | 5     | 6     | <i>M</i> | <i>SD</i> |
|---|-------|------|-------|-------|-------|-------|----------|-----------|
| Digital reading   |       |      |       |       |       |       |          |           |
| Social ( <i>n</i> = 2005)                                 |       |      |       |       |       |       | 4.2      | 1.1       |
| Read text messages in free time ( <i>n</i> = 1992)        | 5.0%  | 2.9% | 11.1% | 36.4% | 24.7% | 19.8% | 4.3      | 1.3       |
| Read material on social websites ( <i>n</i> = 1988)       | 5.6%  | 3.3% | 13.6% | 34.2% | 24.2% | 19.1% | 4.3      | 1.3       |
| Read e-mails in free time ( <i>n</i> = 1984)              | 5.9%  | 3.6% | 14.1% | 37.3% | 23.3% | 15.8% | 4.2      | 1.3       |
| School ( <i>n</i> = 2004)                                 |       |      |       |       |       |       | 4.3      | 1.0       |
| Read online ( <i>n</i> = 2003)                            | 1.7%  | 1.5% | 11.2% | 39.1% | 26.8% | 19.6% | 4.5      | 1.1       |
| Look up information online ( <i>n</i> = 2001)             | 1.5%  | 2.1% | 9.6%  | 36.6% | 28.2% | 21.9% | 4.5      | 1.1       |
| Read a book online ( <i>n</i> = 1992)                     | 6.2%  | 5.0% | 21.9% | 32.9% | 17.1% | 16.8% | 4.0      | 1.4       |
| Digital writing ( <i>n</i> = 2004)                        |       |      |       |       |       |       | 4.3      | 1.0       |
| Share something written online ( <i>n</i> = 1987)         | 3.1%  | 2.3% | 7.4%  | 28.4% | 28.7% | 30.1% | 4.7      | 1.2       |
| Do research using online materials ( <i>n</i> = 1986)     | 4.4%  | 2.9% | 10.3% | 34.0% | 25.9% | 22.6% | 4.4      | 1.3       |
| Text friends in free time ( <i>n</i> = 1981)              | 5.0%  | 3.4% | 12.2% | 34.0% | 24.4% | 21.0% | 4.3      | 1.3       |
| Write something online ( <i>n</i> = 1983)                 | 5.5%  | 4.3% | 16.1% | 37.0% | 20.3% | 16.7% | 4.1      | 1.3       |
| Write e-mails in free time ( <i>n</i> = 1940)             | 8.0%  | 4.2% | 16.6% | 35.5% | 18.2% | 17.4% | 4.0      | 1.4       |
| Post something written on social media ( <i>n</i> = 1986) | 10.8% | 5.4% | 14.5% | 31.4% | 16.5% | 21.5% | 4.0      | 1.5       |

Students responded to a scale with 6-points: very bad (1), somewhat bad (2), a little bad (3), a little good (4), somewhat good (5), and very good (6)

class, looking up information online for class, and reading book online for class), with an eigenvalue of 1.19; variance accounted for = 14%), factor loadings from 0.460 to 0.938, and a coefficient alpha of 0.78.

### Attitude towards digital writing

The following 6 items from Graham et al. (2018) assessed attitude towards writing digitally: sharing something written online for class, conducting research for class paper using online materials, writing something online for class, texting friends in free time, emailing friends in free time, and posting on social media in free time (see Table 3). The first 3 items focused on online writing at school, whereas the last 3 items concentrated on non-school online writing activities. Students indicated their agreement with these items using a six-point Likert-scale, with scores ranging from feeling very bad when engaging in these activities (score = 1) to very good (score = 6).

A factor analysis of the 6 items, yielded a single factor with an eigenvalue greater than 1.0 (i.e., 3.136), accounting for 43% of the variance. Coefficient alpha for this factor, Attitude Towards Digital Writing, was 0.96 and all items had factor loadings from 0.564 to 0.745.

### Digital citizenship

Items assessing perceptions of digital citizenship were designed to assess seven constructs. Items for five of these constructs were taken from Martin et al. (2020), although we added six items and changed the wording in two items. These five constructs included: cyberbullying (have been cyber bullied, know someone who has been cyber bullied, do you know how to collect proof of cyber bullying, what to do when cyber bullying occurs), digital netiquette (follow digital netiquette when online; post or said something online that is mean, rude, or unfair; posted a picture online without permission; liked or shared a mean comment or post; liked or shared a comment or post online about someone's personal characteristics), digital footprint (reshared someone's post; someone has reshared my posts; know that online actions are tracked; think carefully before I leave information online), digital privacy (make sure online passwords are safe, edit security settings for online accounts, share password with a friend, share online information with strangers, added a stranger as a friend, allowed a stranger to follow me online, I know strategies to limit individual data collection by companies), and digital identity items (online identity can be different from their face-to-face identity, use real personal information to register online, what I see online may not be real).

We also included as part of the survey, two other digital citizenship constructs (items taken from Huang et al., 2014; James et al., 2021; Martin et al., 2020; Tian et al., 2021). This included balanced media usage (chose which digital media to use, aware of feelings when using different media, know when and why to take breaks when using digital devices, control time spent on the internet, plan for healthy and balanced media use) and media literacy (teachers discuss websites to visit or not to visit, copy text directly from website when doing homework; watch out for online sponsored

**Table 4** Digital citizenship

| Items  | 1     | 2    | 3     | 4     | 5     | 6     | M   | SD  |
|--|-------|------|-------|-------|-------|-------|-----|-----|
| Digital netiquette ( <i>n</i> = 2004)  |       |      |       |       |       |       | 1.7 | 1.2 |
| Posted or said something online mean, rude, or unfair ( <i>n</i> = 1990)           | 69.1% | 7.7% | 5.4%  | 7.7%  | 4.2%  | 5.8%  | 1.9 | 1.5 |
| Shared or liked a post about someone's personal characteristics ( <i>n</i> = 2001) | 69.5% | 8.4% | 6.6%  | 6.7%  | 4.4%  | 4.2%  | 1.8 | 1.4 |
| Posted pictures without permission ( <i>n</i> = 1996)                              | 75.5% | 6.2% | 4.8%  | 5.9%  | 3.6%  | 4.1%  | 1.7 | 1.4 |
| Liked or shared a mean comment or post ( <i>n</i> = 1998)                          | 76.9% | 7.0% | 4.3%  | 5.0%  | 3.9%  | 3.0%  | 1.6 | 1.3 |
| Media literacy ( <i>n</i> = 2005)  |       |      |       |       |       |       | 4.7 | 1.2 |
| Choose which digital media used ( <i>n</i> = 2004)                                 | 4.0%  | 3.7% | 7.5%  | 17.5% | 24.2% | 43.1% | 4.8 | 1.4 |
| What I should do when cyber bullying occurs ( <i>n</i> = 1981)                     | 6.2%  | 3.7% | 8.3%  | 18.5% | 20.3% | 43.0% | 4.7 | 1.5 |
| Aware of feelings when using different media ( <i>n</i> = 1987)                    | 7.0%  | 4.5% | 12.7% | 23.0% | 22.3% | 30.4% | 4.4 | 1.5 |
| Digital privacy ( <i>n</i> = 2005)   |       |      |       |       |       |       | 4.9 | 1.0 |
| Make sure online passwords are safe ( <i>n</i> = 1994)                             | 2.0%  | 2.0% | 4.9%  | 9.5%  | 16.6% | 65.0% | 5.3 | 1.2 |
| Edit security settings for online accounts ( <i>n</i> = 1988)                      | 4.0%  | 2.1% | 3.9%  | 11.1% | 17.6% | 61.5% | 5.2 | 1.3 |
| What I see online may not be real ( <i>n</i> = 1977)                               | 6.7%  | 2.3% | 5.7%  | 11.4% | 17.9% | 56.0% | 5.0 | 1.5 |
| Follow copyright laws when I use online material ( <i>n</i> = 1976)                | 7.7%  | 3.1% | 6.8%  | 15.8% | 16.1% | 50.4% | 4.8 | 1.6 |
| Know that online actions are tracked ( <i>n</i> = 2000)                            | 13.2% | 4.5% | 8.0%  | 15.7% | 14.2% | 44.5% | 4.5 | 1.8 |
| Online identity can be different from face-to-face identity ( <i>n</i> = 1975)     | 14.0% | 3.9% | 5.9%  | 13.3% | 17.2% | 45.7% | 4.5 | 1.8 |
| Balanced media use ( <i>n</i> = 2005)  |       |      |       |       |       |       | 4.9 | 1.1 |
| Know when and why to take breaks when using digital devices ( <i>n</i> = 2000)     | 2.6%  | 1.8% | 4.9%  | 19.0% | 26.0% | 45.9% | 5.0 | 1.2 |
| Plan for healthy and balanced media use ( <i>n</i> = 1991)                         | 2.5%  | 1.9% | 8.2%  | 21.9% | 24.2% | 41.3% | 4.9 | 1.2 |
| Control the time spent on the internet ( <i>n</i> = 1996)                          | 2.9%  | 3.2% | 10.2% | 19.7% | 22.6% | 41.4% | 4.8 | 1.3 |
| Digital footprint ( <i>n</i> = 2005)   |       |      |       |       |       |       | 4.0 | 0.7 |
| Share information with strangers ( <i>n</i> = 1997)                                | 4.2%  | 5.1% | 6.3%  | 6.6%  | 8.6%  | 69.4% | 5.2 | 1.4 |
| Shared password with a friend ( <i>n</i> = 1987)                                   | 9.7%  | 7.3% | 10.0% | 8.3%  | 9.2%  | 55.5% | 4.7 | 1.8 |
| Added a stranger as a friend ( <i>n</i> = 1998)                                    | 10.3% | 7.8% | 13.8% | 8.5%  | 7.5%  | 52.2% | 4.5 | 1.8 |



Table 4 (continued)

| Items   | 1     | 2     | 3     | 4     | 5     | 6     | M   | SD  |
|---|-------|-------|-------|-------|-------|-------|-----|-----|
| Allowed a stranger to follow me online ( <i>n</i> = 1992)                     | 13.1% | 9.0%  | 16.5% | 10.2% | 8.7%  | 42.5% | 4.2 | 1.9 |
| Re-shared someone's posts ( <i>n</i> = 1998)                                  | 45.5% | 7.0%  | 8.7%  | 16.6% | 10.3% | 12.0% | 2.8 | 1.9 |
| Someone has re-shared my posts ( <i>n</i> = 1994)                             | 47.4% | 7.8%  | 8.9%  | 16.6% | 8.0%  | 11.3% | 2.6 | 1.8 |
| Others  |       |       |       |       |       |       |     |     |
| Follow digital netiquette when online ( <i>n</i> = 1974)                      | 2.3%  | 1.2%  | 3.1%  | 11.9% | 21.5% | 60.0% | 5.3 | 1.1 |
| Think carefully before I leave personal information online ( <i>n</i> = 1995) | 3.6%  | 2.3%  | 5.0%  | 12.3% | 18.1% | 58.7% | 5.2 | 1.3 |
| Watch out for online sponsored content and advertisements ( <i>n</i> = 1987)  | 7.8%  | 4.2%  | 7.8%  | 17.1% | 17.2% | 45.9% | 4.7 | 1.6 |
| Teachers discuss websites to visit or not to visit ( <i>n</i> = 1988)         | 13.2% | 3.8%  | 6.7%  | 14.1% | 14.7% | 47.5% | 4.6 | 1.8 |
| Verify the accuracy of information online ( <i>n</i> = 1987)                  | 7.1%  | 4.2%  | 10.2% | 23.6% | 19.4% | 35.5% | 4.5 | 1.5 |
| Know how to collect proof of cyber-bullying ( <i>n</i> = 1993)                | 7.5%  | 5.8%  | 13.9% | 23.4% | 20.3% | 29.2% | 4.3 | 1.5 |
| Know someone who has been cyberbullied ( <i>n</i> = 1993)                     | 20.6% | 4.3%  | 6.4%  | 14.6% | 14.9% | 39.2% | 4.2 | 1.9 |
| Know the consequences of immediately checking messages ( <i>n</i> = 1970)     | 11.5% | 7.0%  | 15.4% | 24.2% | 15.0% | 26.9% | 4.1 | 1.6 |
| Know strategies to limit data collection by companies ( <i>n</i> = 1991)      | 24.4% | 8.0%  | 13.6% | 18.2% | 12.6% | 23.2% | 3.6 | 1.9 |
| Always use real personal information to register online ( <i>n</i> = 1964)    | 32.4% | 11.5% | 16.7% | 18.0% | 9.4%  | 12.1% | 3.0 | 1.7 |
| Copy text directly from website for use doing homework ( <i>n</i> = 1972)     | 50.3% | 14.0% | 11.8% | 13.5% | 5.2%  | 5.3%  | 2.3 | 1.6 |
| Have been cyberbullied ( <i>n</i> = 1998)                                     | 62.5% | 7.3%  | 6.9%  | 9.4%  | 7.1%  | 7.0%  | 2.1 | 1.7 |

Students responded to a scale with 6-points: strongly disagree (1), moderately disagree (2), disagree slightly (3), agree slightly (4), moderately agree (5), and strongly agree (6)

content and advertisements; follow copyright laws when I use online material, know the consequences of immediately checking online messages; verify the accuracy of information online). Students indicated their agreement with the 34 items assessing the seven proposed constructs with the six-point Likert-scale used to assess Perceived Importance of Online Engagement.

Because the 34 items were designed to assess seven constructs, we ran a factor analysis with a forced seven factor solution using an oblique rotation. Twelve items did not load at 0.40 or greater on any factor (see Table 4; items labeled as Other). As a result, we reran the factor analysis without these items. The 22-item scale yielded five factors with eigenvalues greater than 1.0, accounting for 49% of the variance. One factor, Digital Netiquette (eigenvalue=5.113; variance accounted for=21%) included 4 items with factor loadings from 0.670 to 0.887, and a coefficient alpha of 0.87. The second factor, Media Literacy (eigenvalue=3.618; variance accounted for=14%) included 3 items with factor loadings from 0.421 to 0.843, and a coefficient alpha of 0.77. The third factor, Digital Privacy (eigenvalue=2.194; variance accounted for=8%) included 6 items with factor loadings from 0.407 to 0.628, and a coefficient alpha of 0.73. Factor four, Balanced Media Use (eigenvalue=1.194; variance accounted for=4%) included 3 items with factor loadings from 0.444 to 0.860, and a coefficient alpha of 0.80. The final factor, Digital Footprint (eigenvalue=3.618; variance accounted for=2%) included 6 items with factor loadings from 0.479 to 0.785, and a coefficient alpha of 0.79. Items for each construct are presented in Table 4.

## Procedures

Before the start of the study, two teachers and a university professor provided feedback on the items on the survey, resulting in some minor changes in wording. Once the study began, students received a packet from project staff that included an introductory letter indicating we were conducting a survey to learn about students' experience in online reading and writing as well as experience in digital citizenship instructional practices. The letter asked participants to answer questions honestly. The packet also included an informed consent form emphasizing that the responses would not be shared with other school personnel and would remain anonymous. Both students and their parents were requested to sign the form if they agreed to participate in the study. Finally, the packet included the survey and an envelope. Participants were asked to return the completed survey and consent form in a sealed envelope to their teachers. The schools returned the surveys with a stamped envelope.

All survey data were entered into an excel file independently by two trained graduate students. Inter-coder agreement was 99.99%. All differences were resolved by the first author.

## Analysis

For RQ1, which examined if gender and grade were related to students' online activities, four ANOVAs were conducted to determine if gender and grade were related to the following four activities: online time at school, online time at home,

perceived capabilities to use digital media, and teaching of online rights and responsibilities at school. Alpha was set at 0.0125 (i.e., Bonferroni adjustment to control for Type 1 errors; 0.05 divided by 4).

For RQ2, which examined perceptions of online importance, purposes, and attitudes in relation to student grade and gender, we reported means and standard deviations. We also conducted six ANOVAs to determine if perceptions of online importance, purposes, and attitudes were related to grade, gender, and their interaction. Alpha was set at 0.008 for these analyses (i.e., Bonferroni adjustment; 0.05 divided by 6).

For RQ3, which examined if student characteristics, access and time spent on the internet, and beliefs about online engagement account for variance in reported digital citizenship, we conducted a regression analyses for each of the following scales: Digital Netiquette, Digital Literacy, Digital Privacy, Balanced Digital Media Use, and Digital Footprint. In each analysis, 13 predictors were entered as a block, allowing us to determine the collective contribution of all predictors as well as the unique contribution of each predictor (after variance for the other predictors were controlled). The predictors were student grade, gender, internet access at home, access to mobile devices for connecting to the internet, time spent online during school, time spent online after school, perceived capabilities to use digital media as well as scores from the following scales: Perceived Importance of Online Engagement, Online Purpose to Learn, Online Purpose to Engage in Social Activities, Attitude Towards Social Reading Online, Attitude Towards Online Reading at School, and Attitude Towards Digital Writing. The alpha value was set at 0.01 for these analyses (i.e., Bonferroni adjustment; 0.05 divided by 5).

## Results

### Do students have online access at home and school? (RQ1)

#### Online access and use

As a group, the participating students indicated they had online access. More specifically, 96% of students stipulated they had internet access at home, whereas 77% noted they were able to connect to the internet using mobile devices. They further indicated they were online about 45 min a day: 16.51 min at school ( $SD=25.42$ ) and 28.20 min at home ( $SD=28.94$ ). The equipment they most often used to go online were smart phones (61%), followed by smart watches (17%), tablets (13%), television (4%), laptop (2%), and desktop computer (2%).

#### Digital capabilities and instruction

Students were generally positive about their capabilities to use digital media (internet and social media), with only 5% indicating their abilities to do so were very poor or poor. Forty-seven percent indicated their capabilities were average, 29% reported good capabilities, and 19% stated very good capabilities. They further

agreed they were taught online rights and responsibilities at school, with 55% strongly agreeing, 21% moderately agreeing, and 14% slightly agreeing. Only, 11% of students disagreed to any extent with this statement.

### Parental guidance

In terms of parental involvement in online use, 62% of students indicated their parents controlled the websites they were allowed to use (32% of students reported this was not the case and 4% of students did not complete this question). More than half of the students (58%) indicated their parents monitored and discussed the time spent online at home, with 30% of parents limiting online time, and 4% of parent prohibiting any time online. Seven percent of students reported their parents placed no limit on online activities.

### Online games

When asked about whether they played online games, just over one-quarter of the students did not answer this question. Of the 73% of students who did answer it, 71% indicated they did play such games. Somewhat similarly, 14% of students did not answer the question about the effect of the law designed to limit online game playing by minors. For the 86% of students who did answer this question, 78% of them indicated they were playing online games less, 12% reported no difference, 2% stated they were playing more frequently, and 8% noted they were unfamiliar with the law (56% of students unfamiliar with law were in Grades 6 to 9).

### Grade and gender differences in minutes

At school, Grades 4 to 6 students ( $M=20.13$ ;  $SD=24.67$ ) spent more time online than Grades 7 to 9 students ( $M=13.28$ ;  $SD=25.72$ ),  $F(1,1951)=36.407$ ,  $p<0.001$ . It was just the opposite at home, as Grades 7 to 9 students ( $M=31.87$ ;  $SD=32.46$ ) spent more time online than Grades 4 to 6 students ( $M=24.10$ ;  $SD=23.81$ ),  $F(1,1968)=36.167$ ,  $p<0.001$ . Time spent online at school and home were not statistically related to gender and the interaction between gender and grade was not statistically significant.

For perceived capabilities to use digital media, there was a statistically detectable interaction between gender and grade,  $F(1,1980)=15.97$ ,  $p<0.001$ . Follow-up analyses found that boys in Grades 7 to 9 ( $M=3.91$ ;  $SD=0.92$ ) were more positive about their capabilities than girls in the same grade ( $M=3.52$ ;  $SD=0.85$ ),  $F(1,949)=44.59$ ,  $p<0.001$ . Additionally, Grades 7 to 9 students ( $M=5.26$ ;  $SD=1.08$ ) more strongly agreed they had been taught online rights and responsibilities at school than students in Grades 4 to 6 ( $M=4.95$ ;  $SD=1.42$ ),  $F(1,1990)=29.19$ ,  $p<0.001$ . This online school instruction was not statistically related to gender, and the interaction between gender and grade was not statistically significant.

## Are perceptions of online importance, purposes, and attitudes related to student grade and gender? (RQ2)

### Importance

Students' mean response to the five-item Perceived Importance of Online Engagement scale was 3.65 ( $SD=1.06$ ), indicating they slightly agreed with items assessing this construct (see Table 1). They agreed that going online is important because it helps learning, makes it possible to write more, and makes reading more enjoyable. They disagreed with statements it makes me more confident and it makes me more popular. Grades 7 to 9 students ( $M=3.90$ ;  $SD=0.96$ ) placed greater emphasis on the importance of online engagement than Grades 4 to 6 students ( $M=3.37$ ;  $SD=1.10$ ),  $F(1,199)=129.276$ ,  $p<0.001$ . The main effect for gender and the interaction between grade and gender were not statistically significant.

For the "Other" items, students agreed writing online is more enjoyable than writing with paper and pencil, it does not impede learning, provides greater interaction with parents, and it does not make me tired (Table 1). They disagreed that you cannot say anything you want online.

### Purposes

For the two-item Online Purpose for Learning scale, the mean response was 3.04 ( $SD=1.06$ ), indicating students used online tools for literacy several times a month. They reportedly read online almost weekly, and writing online occurred almost monthly (Table 2). Girls ( $M=3.19$ ;  $SD=1.97$ ) used online learning purposes of reading and writing more frequently than boys ( $M=2.85$ ;  $SD=1.99$ ),  $F(1,1967)=13.47$ ,  $p<0.001$ . The main effect for grade and the interaction between grade and gender were not statistically significant.

Students' mean response to the six-item Online Purpose for Social Activity scale was 2.92 ( $SD=1.39$ ), revealing they used online social activities several times a month. They reportedly went online for music and videos almost weekly, while using online resources for social interactions several times a month (Table 2). They played online games (monthly), managed websites (slightly less than monthly), and shopped online (less than monthly) infrequently. Students in Grades 7 to 9 ( $M=3.56$ ;  $SD=1.35$ ) went online for social reasons more than students in Grades 4 to 6 ( $M=2.56$ ;  $SD=1.35$ ),  $F(1,1967)=129.81$ ,  $p<0.001$ . Main effects for gender and the interaction between grade and gender were not statistically significant.

For two of the "Other" items (finish learning tasks and solve problems), students went online about weekly (Table 3). They watched news online at least several times a month, but online activity to complete extracurricular activities and provide fan support reportedly occurred monthly or less than several times a year, respectively.

### Attitudes towards digital reading and writing

Students' mean response to the three-item Attitude Towards Social Reading Online scale was 4.24 ( $SD=1.11$ ), showing they moderately liked to read online

for social purposes. They were positive about all three social purposes for reading: text messages, social websites, and emails (Table 3). Students in Grades 7 to 9 ( $M=4.51$ ;  $SD=0.98$ ) had more positive attitudes about reading online for social purposes than students in Grades 4 to 6 ( $M=3.96$ ;  $SD=1.18$ ),  $F(1,1993)=7.28$ ,  $p<0.001$ . Girls ( $M=4.29$ ;  $SD=1.08$ ) were more positive than boys about reading online for social purposes ( $M=4.18$ ;  $SD=1.17$ ),  $F(1,1993)=132.14$ ,  $p=0.008$ . The interaction between gender and grade was not statistically significant.

For the three-item Attitude Towards Online Reading at School scale, the mean response was 4.33 ( $SD=0.98$ ), indicating students moderately liked to read online for school purposes. They were positive about all school online reading purposes: reading online for class, looking up information online for class, and reading a book online for class (see Table 3). Students in Grades 7 to 9 ( $M=4.39$ ;  $SD=0.96$ ) had more positive attitudes about reading online for class than students in Grades 4 to 6 ( $M=4.27$ ;  $SD=1.01$ ),  $F(1,1994)=8.48$ ,  $p<0.001$ . The main effect for gender and the interaction between gender and grade were not statistically significant.

On the six-item Attitude Towards Digital Writing scale, students' mean response was 4.27 ( $SD=0.96$ ), showing students moderately liked writing online. They were positive about all 6 items: sharing writing online, doing research using online materials, texting friends, writing something online, writing emails, and posting something written on social media (Table 3). Students in Grades 7 to 9 ( $M=4.44$ ;  $SD=0.88$ ) had more positive attitudes about writing online than students in Grades 4 to 6 ( $M=4.08$ ;  $SD=1.02$ ),  $F(1,1993)=77.05$ ,  $p<0.001$ . Girls ( $M=4.35$ ;  $SD=0.91$ ) were more positive than boys about writing online ( $M=4.17$ ;  $SD=1.03$ ),  $F(1,1993)=22.06$ ,  $p=0.008$ . The interaction of gender and grade was not statistically significant.

### **Do student characteristics, access and time spent on the internet, and beliefs about online engagement account for variance in reported digital citizenship? (RQ3)**

#### **Digital netiquette**

For the four-item Digital Netiquette scale, the mean response was 1.75 ( $SD=1.20$ ), indicating students moderately agreed they did not break the rules of digital etiquette. They moderately disagreed they said something online that was mean, rude, or unfair; shared or liked a post about someone's personal characteristics, posted pictures without permission, or liked or shared a mean comment or post (Table 4).

The 13 predictors accounted for a statistically significant 6% of the variance in Digital Netiquette scores (Table 5). The following predictors made a statistically significant and unique contribution in variability of scores: grade, gender, time spent online during school, perceived capabilities to use digital media, perceived importance of online engagement, and online purpose to engage in social activities.

**Table 5** Predicting digital citizenship

| Predictor variables                           | Digital netiquette |       |        |          | Digital literacy   |      |        |          |
|---|--------------------|-------|--------|----------|--------------------|------|--------|----------|
|   | B                  | SE    | T      | <i>p</i> | B                  | SE   | T      | <i>P</i> |
| Grade   | -.072              | .018  | -4.043 | .000     | .075               | .017 | 4.327  | .000     |
| Gender  | .222               | .056  | 3.947  | .000     | -.055              | .055 | -1.015 | .310     |
| Internet access at home                       | .272               | .159  | 1.712  | .087     | -.495              | .153 | -3.229 | .001     |
| Internet access with mobile device            | .045               | .069  | .661   | .509     | -.11               | .067 | -.166  | .868     |
| Time spent online at school                   | .003               | .001  | 2.368  | .018     | .002               | .001 | 1.449  | .147     |
| Time spent online at home                     | .002               | .001  | 1.734  | .083     | -.004              | .001 | -4.225 | .000     |
| Perceived capabilities to use digital media   | -.127              | .033  | -3.849 | .000     | .150               | .032 | 4.691  | .000     |
| Perceived importance of online engagement     | .112               | .033  | 3.359  | .001     | -.021              | .032 | -.644  | .526     |
| Online purpose to learn                       | .005               | .015  | .326   | .745     | .037               | .014 | 2.608  | .009     |
| Online purpose to engage in social activities | .130               | .025  | 5.120  | .000     | -.081              | .025 | -3.291 | .001     |
| Attitude towards social reading online        | .013               | .036  | .362   | .717     | -.065              | .035 | -1.873 | .061     |
| Attitude towards online reading at school     | -.033              | .034  | -.983  | .326     | .117               | .033 | 3.541  | .000     |
| Attitude towards digital writing              | -.010              | .044  | -.225  | .822     | .202               | .043 | 4.694  | .000     |
| R square                                      | .060               |       |        |          | .083               |      |        |          |
| F   | 9.043***           |       |        |          | 12.987***          |      |        |          |
|   | Digital privacy    |       |        |          | Balanced media use |      |        |          |
|   | B                  | SE    | T      | <i>p</i> | B                  | SE   | T      | <i>p</i> |
| Grade   | .111               | .014  | 7.904  | .000     | -.053              | .015 | -3.540 | .000     |
| Gender  | -.044              | .044  | -.999  | .318     | .003               | .047 | .061   | .952     |
| Internet access at home                       | -.383              | .125  | -3.078 | .002     | -.550              | .132 | -4.172 | .000     |
| Internet access with mobile device            | .060               | .054  | 1.106  | .269     | .091               | .057 | 1.590  | .112     |
| Time spent online at school                   | -.003              | .001  | -2.995 | .003     | -.001              | .001 | -1.323 | .186     |
| Time spent online at home                     | -.002              | .001  | -2.972 | .003     | -.005              | .001 | -5.473 | .000     |
| Perceived capabilities to use digital media   | .162               | .026  | 6.235  | .000     | .144               | .028 | 5.240  | .000     |
| Perceived importance of online engagement     | .003               | .026  | .101   | .920     | -.017              | .028 | -.622  | .534     |
| Online purpose to learn                       | -.0096             | .012  | -.781  | .435     | .059               | .021 | -5.591 | .000     |
| Online purpose to engage in social activities | -.047              | .020  | -2.334 | .020     | -.118              | .021 | -5.591 | .000     |
| Attitude towards social reading online        | .054               | .028  | 1.915  | .056     | -.109              | .030 | -3.623 | .000     |
| Attitude towards online reading at school     | .126               | .027  | 4.170  | .000     | .152               | .028 | 5.358  | .000     |
| Attitude towards digital writing              | .113               | .035  | 3.242  | .001     | .123               | .037 | 3.307  | .001     |
| R square                                      | .154               |       |        |          | .130               |      |        |          |
| F   | 25.941***          |       |        |          | 21.326***          |      |        |          |
|   | Digital footprint  |       |        |          |                    |      |        |          |
|   | B                  | SE    | T      | <i>p</i> |                    |      |        |          |
| Grade   |                    |       |        |          |                    |      |        |          |
|   |                    | -.042 | .011   | -3.848   | .000               |      |        |          |



**Table 5** (continued)

|   | Digital footprint |      |        |          |
|---|-------------------|------|--------|----------|
|   | B                 | SE   | T      | <i>p</i> |
| Gender  | .018              | .034 | .541   | .588     |
| Internet access at home                       | .142              | .096 | 1.478  | .140     |
| Internet access with mobile device            | -.105             | .042 | -2.513 | .012     |
| Time spent online at school                   | .000              | .001 | .451   | .652     |
| Time spent online at home                     | -.003             | .001 | -4.170 | .000     |
| Perceived capabilities to use digital media   | .020              | .020 | .983   | .326     |
| Perceived importance of online engagement     | -.067             | .020 | -3.294 | .001     |
| Online purpose to learn                       | .003              | .009 | .305   | .761     |
| Online purpose to engage in social activities | -.067             | .015 | -4.324 | .000     |
| Attitude towards social reading online        | -.029             | .022 | -1.351 | .177     |
| Attitude towards online reading at school     | -.029             | .021 | 1.399  | .162     |
| Attitude towards digital writing              | .066              | .027 | 2.459  | .014     |
| R square                                      | .077              |      |        |          |
| F   | 11.879***         |      |        |          |

\*\*\* $p < .001$

### Digital literacy

On the three-item Digital Media Use scale, the mean response was 4.65 ( $SD = 1.20$ ), indicating students' moderately agreed they were able to make digital literacy choices wisely. They moderately agreed they were able to choose which digital media to use, were aware of the feelings they experienced when using different digital media, and knew what to do if cyber bullying occurred (Table 4).

The 13 predictors accounted for a statistically significant 8.3% of the variance in Digital Literacy (Table 5). These predictors made a statistically significant and unique contribution in variability of scores: grade, internet access at home, time spent online after school, perceived capabilities to use digital media, online purpose to learn, online purpose to engage in social activities, attitude towards online reading at school, and attitude towards digital writing.

### Digital privacy

Students also moderately agreed they knew how to maintain digital privacy, averaging a mean score of 4.88 ( $SD = 1.01$ ) on the six-item Digital Privacy scale. They moderately agreed that not all information online was real, online actions can be tracked, and online identities can be different from face-to-face identities. Similarly, they moderately agreed they knew how to make their passwords safe, edit security settings for online accounts, and follow copyright laws for online materials (Table 4).

The 13 predictors accounted for a statistically significant 154% of the variance in Digital Privacy (Table 5). The following variables made a statistically significant and unique contribution to prediction: grade, internet access at home, time spent online during school, time spent online after school, perceived capabilities to use digital media, online purpose to engage in social activities, attitude towards online reading at school, and attitude towards digital writing.

### Balanced media use

With the three-item Balanced Media Use scale, the mean response was 4.90 ( $SD=1.05$ ), revealing students' moderately agreed they knew how to use media in a balanced and responsible way. They moderately agreed they knew when and how to take breaks when using digital devices as well as how to control the time spent on the internet and plan for a healthy and balanced use of media devices (Table 4).

The 13 predictors accounted for a statistically significant 13% of the variance in Balanced Media Use (Table 5). The following predictors made a statistically significant and unique contribution in variability of scores: grade, internet access at home, time spent online after school, perceived capabilities to use digital media, online purpose to learn, online purpose to engage in social activities, attitude towards social reading online, attitude towards online reading at school, and attitude towards digital writing.

### Digital footprint

For the six-item Digital Footprint scale, the mean response was 3.99 ( $SD=0.74$ ), indicating students moderately agreed they knew how to protect their presence online. They moderately agreed they did not share with strangers online, shared their passwords with friends, added strangers as friends, or allowed a stranger to follow them online (Table 4). They slightly disagreed someone had re-shared something they posted or they re-shared someone else's post.

The 13 predictors accounted for a statistically significant 7.7% of the variance in Digital Footprint scores (Table 5). The following predictors made a statistically significant and unique contribution in variability of scores: grade, access to mobile devices for connecting to the internet, time spent online after school, perceived importance of online engagement, online purpose to engage in social activities, and attitude towards digital writing.

### Other items

Twelve items assessing digital citizenship were eliminated in the factor analysis due to low commonality scores. Responses to the items (Table 4) indicated students moderately agreed with the following statements: followed digital etiquette online, thought carefully before leaving personal information online, watched out for online sponsored content and advertisements, verified the accuracy of online information, knew how to collect proof of cyber bullying, and knew the consequences of immediately checking for online messages. They moderately agreed teachers

discussed which websites to visit. Students slightly agreed they used real personal information to register online and they knew strategies to limit data collection of personal information by companies. Although they moderately agreed they knew someone who had been cyberbullied, they moderately disagreed they had been subject to such bullying. Finally, they moderately disagreed they had copied text directly from websites for their homework.

## Discussion

### Digital access, skills, and parental and school guidance

Becoming a good digital citizen is presumably influenced by students' online access, mastery of essential technical skills for using the internet and digital devices, as well as guidance from parents and teachers on how to use these tools responsibly (Choi et al., 2017; Martin et al., 2020; Ribble, 2008, 2011). One goal of the current study was to determine if Grade 4 to 9 students in China had access to the internet and digital devices, their capabilities to use such tools, parental oversight of online activity, and the teaching of online rights and responsibilities at school. This was determined by directly asking students their perceptions about these issues.

### Digital access

Almost all students in this study (96%) indicated they had internet access at home. They reported the most common device for online connections was a smartphone, followed by smart watches, tablets, television, portable laptops, and desktop computers. This level of online access was similar to the 95% online access rate reported for OECD countries in a 2017 report, as was the use of smartphones as the most common device for connecting online. Even so, Chinese students were much less likely to connect online with portable laptops, desktop computers, or tablets than OECD students in 2017. Sixty-one percent of Chinese students most commonly used smartphones to connect online, whereas another 17% of the participants in this study most commonly used a smart watch to do so. Additional research is needed to determine why certain digital devices for online connections are more popular than others. We suspect the dominance of smartphones for connecting to the internet reflects the fact that the most commonly used internet services in China are messaging apps and instant messaging (Song, 2023).

Time spent online at home by Chinese students in this study (28 min after school) was considerably less than the 2 or more hours that students in the 2017 OECD report spent online after school on weekdays or the 5 h or more they spent online after school on weekend days in 2021 (OECD, 2023). It was also less than the time U.S. students spent online after school, where 63% of them reportedly spent one to three hours online each day (Jones & Mitchell, 2016). Most notably, Chinese students in our study spent less time online after school than the 42 min spent by Chinese students from Beijing, Shanghai, Jiangsu, and Guangdong provinces in the 2017 OECD report. They also spent less time on line after school

than the 2.8 h reportedly spent by Grade 1 to 12 students in Shanghai in a survey study by Wu (2012). There are several possible reasons for these differences. One, data for the OECD and Wu (2012) investigations and this study were not collected at the same time or in the same locations in China. Two, the OECD report focused only on 15-year-olds, whereas Wu (2012) surveyed Grades 1 to 12. At least in terms of the comparison to the OECD study, the current study involved mostly younger children, and younger students in this investigation spent less time on line than older ones (as predicted). Three, the law recently enacted in China to limit online gaming by minors may have limited online time (National Press and Publication Administration, 2021). For students who played games online, they overwhelmingly indicated game playing was limited by the law.

On average, students in this study reportedly spent only 17 min a day online at school, with primary grade students spending more time online at school (20 min) than middle school students (13 min). For both the younger and older students in the present study, they spent considerably less time online at school than average OECD students in 2021 (OECD, 2023), who used digital devices at school for learning for 3.4 h a day. Additional research is needed to replicate our finding and explore possible explanations for why online activity at school was more common with younger than older students and why online activities at school were so uncommon in Chinese classrooms. One possible explanation for the obtained difference between younger and older students in this investigation was that traditional instructional practices were implemented in Chongqing middle schools for the preparation of a citywide high school entrance exam, reducing the emphasis placed on online activities for these older students. In any event, the schools these students attended made minimal use of online resources at school, and the reasons for this needs to be explored.

### Parental and school guidance

According to students in our study, a majority of parents provided online guidance, with 62% of parents controlling which websites were accessed, 58% of parents monitoring and discussing time spent online at home, and 30% of parents limiting online time. Almost all students (89%) reported that online rights and responsibilities were taught at school. As predicted, middle school students more strongly agreed that their teachers taught online rights and responsibilities than did primary grade students. Our findings on parental involvement were slightly higher than parental involvement in U.S. studies (Lyons, 2012; Martin et al., 2020), and considerably higher for the teaching of digital citizenship at school, where only 37% of middle schoolers in the U.S. indicated such instruction occurred (Martin et al., 2020). Research is needed to replicate our findings as well as to draw a fuller portrait of parental and school involvement in shaping children's online behaviors. It is possible that greater parental guidance observed in this study was a consequence of the importance placed in Chinese culture on children's educational and societal success (Yijie, 2023).

## Digital capabilities

Chinese students in this study were positive about their digital media capabilities, as just 5% of them indicated these capabilities were poor or very poor. We further found that middle school boys were more positive about their digital media capabilities than girls. We had predicted that older students would view themselves as being more capable than younger students, but made no prediction concerning gender differences. Assuming our findings are replicated, future research is needed to determine why the gender and grade interaction observed with older students was not obtained with younger ones. It is possible that gender differences between boys and girls were less evident with younger than older students because stereotypes about digital capabilities need more time to form. It is also possible that younger students overestimate their digital capabilities when compared to older ones. In any event, parents and schools may need to pay particular attention to ensuring that older girls are as well prepared to use digital devices as boys.

## Adherence to digital citizenship social norms

An essential part of becoming a good digital citizen is to learn and apply established social norms for online behavior. These normative rules help students act in responsible, safe, ethical, and healthy ways when online (e.g., Gleason & Gillern, 2018; ISTE, 2018). As a group, the Grade 4 to 9 Chinese students in this study generally appeared to be good digital citizens based on their mean response to questions about digital netiquette, digital privacy, digital footprint, balanced media use, and digital literacy. Students moderately agreed they followed norms of digital netiquette when communicating or posting online, practiced safe online privacy behaviors, managed their digital footprint appropriately, balanced digital media use in healthy ways, and approached digital media in a literate manner. Additional research is needed to replicate these findings, determine if teachers and parents agree with such assessments, and to observe if students demonstrate these same behaviors online. Assuming future research replicates that Chinese students generally act in responsible, safe, ethical, and healthy ways when online, investigations need to be undertaken to determine why this is the case. We suspect that two important ingredients in their online behaviors are determined by the emphasis placed in Chinese culture on communicating respectively with each other and the prominence of collectivism in Chinese society (Yijie, 2023).

While the mean outcomes for the five digital citizenship scales were positive, students' responses to a number of individual items were concerning when all agreements (strong, moderate, and slight) were combined. About one-fourth of students agreed they had been cyberbullied, whereas 70% of respondents agreed they knew someone who had. Only about one-half of students agreed they knew how to limit online data collection by companies, and just 40% of respondents agreed they always used real personal information to register online. Between 30 and 40% of students agreed they allowed strangers to follow them online, added strangers as friends, reshared posts from someone else, and had their own post shared by another

person. Close to a quarter of students agreed they did not know online actions were tracked or that companies collected information about them. A similar proportion of students agreed they shared passwords with friends and copied text directly from online sources when doing homework. While the overall findings concerning students' perceptions of their adherence to the social norms for digital citizenship were generally reassuring, it is clear that these students view cyberbullying as a problem, and a sizable minority of them engage in risky online behavior. Similar concerns about password sharing, and resharing of posts were reported in studies conducted in the U.S. (Lyons, 2012; Martin et al., 2018, 2020). Thus, an important practical implication is that parents and schools in China and elsewhere need to do a better job of making sure students are aware of these issues and can address them effectively.

### **Predicting digital citizenship**

When examining variables that predicted scores for each of the five digital citizenship scales, predictive measures examining perceived importance of online engagement, purposes for being online (literacy and social), as well as attitudes toward digital reading (social and at school) and digital writing. They slightly agreed that being online was important because it helps learning, makes it possible to write more, and makes reading more enjoyable. For purposes of being on-line for learning, they read online almost weekly and wrote online monthly. The most common social purposes for being online involved accessing music and videos (almost weekly) as well as making social contacts and playing online games (monthly). As a group, students' attitudes toward digital reading for social reasons, digital reading at school, and digital writing were slightly positive. As predicted students' beliefs about importance of online engagement, online purposes, and attitudes towards digital reading and writing were related to student gender and grade. Consistent with our expectations, girls had higher scores for purposes of being on-line for learning as well as higher scores for digital reading and writing attitudes than boys. Also, as anticipated, middle school students perceived online engagement as well as being online for social purposes as more important than primary grade students. Contrary to our predictions and prior research (Graham et al., 2018), middle school students expressed more positive attitudes toward digital reading and writing. Additional research is needed to replicate these findings and to explore why older students' digital reading and writing attitudes did not decline as expected.

For all five measures of digital citizenship, the 13 predictors collectively accounted for statistically significant variability in scores: digital privacy (15.4%), balanced media use (13%), digital footprint (7.7%), media literacy (8.3%), and digital netiquette (6%). All 13 of the predictors accounted for unique variance for at least one of the digital citizenship measures. Grade-level as well as social purposes for being online uniquely predicted all five citizenship outcomes; online time at home, perceived digital capabilities, and attitude towards digital writing uniquely predicted four digital citizenship outcomes; internet access at home and attitude towards reading at school uniquely predicted three digital citizenship measures;

internet time at school, importance of being online, and being online for learning purpose uniquely predicted two digital citizenship outcomes; and internet access to mobile devices at home and attitude towards reading for social purposes uniquely predicted one of digital citizenship measure. These outcomes were generally in line with our predictions, but they need to be replicated. Additionally, the contribution of other variables to predicting students' digital citizenship needs to be investigated.

It is important to note that multiple predictors were negatively correlated with one or more digital citizenship measures. This was repeatedly the case for grade, internet access via home mobile devices, internet time at home, social purposes for being online, and attitude towards reading at school. If these associations are replicated in future investigations, researchers need to examine why this is the case.

### **Limitations, practical, and research implications**

While we randomly selected a large sample of Grade 4 to 9 students from 3,386 schools in Chongqing, China and we obtained an 84.6% survey completion rate, we were not able to randomly select students from across China. Selecting students randomly from a country the size of China is likely an impossible task at this time. Thus, we cannot be sure if our results fully reflect the perceptions of all Grades 4 to 9 students in China.

A second limitation of this study was our reliance on students' self-reports instead of behavioral data such as directly analyzing students' internet behaviors and products. This must be considered when interpreting the findings from this investigation. Further, we focused on perceptions of digital citizenship in a single country. We believe this is justifiable given the impact of cultural, social, institutional, historical, economic, and historical factors on a broad array of behaviors (Goncu & Gauvain, 2012; Graham, 2018), and caution must be exercised in generalizing our findings to other countries.

While we were able to collect some information about the students in this study (e.g., gender, grade), other information such as socio-economic status, parents' occupations, students' achievement level were not available to us. We encourage researchers to collect as much information as possible about students in the future because this will help clarify better clarify the characteristics of the participants and generalizability of findings.

One issue not addressed in the current study is the advent of artificial intelligence (AI) as part of the digital landscape. The concept of digital citizenship needs to be expanded to include AI and its use in and outside of school as well as how AI is used in both settings by students for reading, writing, learning, and social purposes. Practically, both parents and teachers will need to help youngsters learn how to use A.I. in an ethical, responsible, and safe manner when learning and engaging in literacy activities like reading and writing at home and at school.

Additionally, the current study did not address when students should be introduced to digital citizenship concepts. Should this occur before they begin to engage in any online activity, as they start to do so, or sometime later? We think that this should occur as they start to engage in online activity, with parents leading such efforts at home and



teachers at school. Research is needed, however, to determine if this recommendation is the most effective course of action.

## Summary

This investigation yielded a number of important and positive findings about Chinese students and digital citizenship. Access to the internet at home was close to universal, nine out of 10 students were positive about their digital capabilities; 93% of students indicated their parents provided guidance concerning digital access at home (ranging from monitoring digital access to forbidding it). Further, students spent relatively little time on the internet each day after school (an average of 28 min), and students mostly agreed they followed digital netiquette when communicating or posting online, practiced safe online privacy behaviors, managed their digital footprint appropriately, balanced digital media use in healthy ways, and approached digital media in a literate manner.

These findings are important because the ability to access, use the internet capably, and act online in responsible, safe, ethical, and healthy ways is essential to success in the informational societies of today. Collectively, the students in this study recognized the importance of online access, agreeing that access was important for social and academic purposes, including learning, reading, and writing. They were also positive about reading and writing online, and they further noted they read online weekly and wrote online monthly. Even though the internet was used sparingly at school for academic purposes, these youngsters had developed positive attitudes about the use of the internet for learning and literacy.

Nevertheless, the study revealed multiple concerns that policy makers, parents, and teachers should carefully consider. This included limited use of internet resources at school as well as a sizeable proportion of parents (42%) who did not monitor and influence youngster's online behavior. Student responses to survey questions also revealed unacceptable rates of cyberbullying, sharing of passwords with friends, friending strangers, resharing of posts, using false personal information to register online, and copying text directly from online sources when doing homework. These concerns need to be better addressed by parents, teachers, and students if the norms of digital citizenship are to become habitual in China (and other countries as well).

## Declarations

**Conflict of interest** The authors do not have any financial or non-financial interests that are directly or indirectly related to the study presented here. The authors agree to share data from this study with interested researchers.

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