
Title	The impact of technology use on adolescents' leisure reading preferences
Author(s)	Chin Ee, Loh and Baoqi, Sun

This is the peer reviewed version of the following article published in *Literacy*, 56(4), which has been published in final form at <https://doi.org/10.1111/lit.12282>. This article may be used for non-commercial purposes in accordance with [Wiley Terms and Conditions for Self-Archiving](#).

The Impact of Technology Use on Adolescents' Leisure Reading Preferences

Abstract

There is worldwide concern about the decline in children and adolescent enjoyment of reading as documented by international and national surveys, with smartphones and other technologies often blamed for the decline. Yet, with recent rapid improvements in technologies for reading, the accelerated adoption of devices for learning during the pandemic, and increased access to e-books through the public library system in Singapore, the relationship between adolescent technology use and reading may be more complex than is typically painted in popular press. This mixed-methods study seeks to make current our understanding of adolescent reading in relation to technology by exploring their preferred reading devices, their use of technology for reading as well as their use of public e-resources for reading. We found that adolescents preferred using their smartphones to print for reading and preferred to read social media most online. E-books accessed freely through the public library are under-utilised, and adolescents reported lack of knowledge or experience about how to look for reading resources online. Findings suggest an intentional and nuanced approach is needed to create an ecosystem of opportunities for adolescents to have meaningful reading experiences in print and digitally.

Keywords: leisure or independent reading, adolescent reading, print and e-reading, technology

Introduction

Leisure reading is associated with reading proficiency, academic achievement, student well-being and life-long learning (Cunningham & Stanovich, 1998; Krashen, 2004; Schleicher, 2018; Sullivan & Brown, 2015). However, the recent 2018 PISA survey report highlights that even as literacy demands have risen, 15-year-olds across the world are reading less for leisure, and reading fewer books of fiction, magazines, or newspapers because they want to, with more students considering reading “a waste of time” compared to their counterparts in the 2009 survey (Schleicher, 2018, p. 14). Much of the decline in reading and reading enjoyment have been blamed on competing media in the form of easy access to social media, games, and online sites. Yet, studies suggest that this displacement theory, that new media supplants traditional media forms, is not to be blamed totally (Johnsson-Smaragdi & Jönsson, 2006). While some segments of the adolescent population are reading less because of other media engagement, other segments are reading more both in print and digitally (Loh & Sun, 2019; Merga, 2014). At the same time, with increasing online content and improvements in reading technology, adolescents may be accessing more reading material online. Rapid technological and sociocultural changes require constant updates about how adolescents are reading in print and digitally to ensure that researchers, educators, and librarians have the latest evidence.

This paper presents findings from a mixed-methods study of the leisure reading habits of 5,732 adolescents from six Singapore secondary schools, specifically in relation to their use of technology for reading. By technology, we refer to computers or laptops, iPads or tablets, smartphones, and e-readers. We include print as traditional technology for reading. For the purposes of this study, we distinguish between reading digitally and digital reading. Reading digitally is the reading of traditional texts delivered via hypermedia with few enhancements whereas digital reading refers to the ability to navigate, find and evaluate multimodal texts within the Internet, thus requiring new cognitive processes and processing skills compared to

Technology's Impact on Adolescent Leisure Reading

the reading of traditional texts (Singer & Alexander, 2017). We seek to understand if adolescent readers prefer to read using traditional print technologies or newer devices, what they read on those devices, when they use devices and whether these new technologies support or constraint adolescent leisure reading in their daily lives. Furthermore, since Singapore students have free access to a wide variety of e-reading materials via the National Library Board (NLB) app, we wanted to understand how adolescents were utilising these public resources to support their leisure reading, if at all.

The following research question guided this study:

1. What are the preferences of Singapore adolescents in relation to using print and other forms of technology for reading?
2. What are their preferred reading devices for different types of reading materials?
3. How often do they use public resources (in the form of the NLB app) for reading?
4. What reasons do adolescents give for their print or digital reading preferences?

Theoretical Perspectives

Benefits of Adolescent Leisure Reading

The terms leisure reading, independent reading and extensive reading, often used interchangeably, have at its heart an emphasis on reading practice and reading enjoyment (Gambrell et al., 2011). Children and adolescents who enjoy reading are more likely to be engaged readers who are motivated to read and read to learn (Afflerbach & Harrison, 2017; Cremin & Moss, 2018), resulting in increased self-driven reading practice that has a positive impact on reading proficiency, well-being, and lifelong learning (Cunningham & Stanovich, 1998; Schleicher, 2018). Furthermore, children's early engaged reading practices have an impact on their later digital literacies (Notten & Becker, 2017) as well as their adult literacy, including educational benefits, occupational literacies, and adult digital literacy proficiencies

Technology's Impact on Adolescent Leisure Reading

(Sikora et al., 2019). Beyond childhood, adolescence is an important stage for continued reading especially as students must constantly learn how to adapt to new ways of reading in a multimodal, information-saturated world (Schwab, 2017). Although previously understudied, researchers are recognising the need to better understand the leisure reading habits and practices of adolescent readers to support their reading development (Fletcher, 2014; McGeown et al., 2015; Merga, 2016). Researchers and educators may feel a greater sense of urgency, with the OECD 2018 findings showing that 15-year-olds read less than they used to, enjoy reading less and read only when they have to (Schleider, 2018).

While adolescents may engage in various forms of out-of-school reading, and these distinctive practices can serve as cultural resources within peer, family, and other social groups (Moje et al., 2008; Sellers, 2019), research suggests that only reading longform texts, both fiction and non-fiction, is associated with improved reading proficiency and academic achievement (Moje et al., 2008; Zebroff & Kaufman, 2017). Jerrim & Moss (2019) analysed more than 250,000 adolescents' reading using the Programme for International Student Assessment (PISA) 2009 database and found that the 15-year-olds who read fiction frequently had significantly stronger reading skills than their peers who do not. In a longitudinal study that following 2525 students from age 7 to 16 in Finland, Torppa et al. (2020) found that fiction reading predicted better reading comprehension skills than other short form of reading (e.g., magazines, comics) did. At the same time, Kirsch et al. (2002), analysing PISA 2000 data, found that adolescents who read more kinds of texts tended to be more proficient readers than those who read fewer texts. Adolescents who read widely may have greater opportunity to develop their reading proficiencies and interests.

A National Literacy Trust study of reading before and during the COVID-19 lockdown in the U.K. showed that young people aged 9 to 18 enjoy reading more during lockdown, but a lack of access to reading resources and suitable reading environments negatively affected

Technology's Impact on Adolescent Leisure Reading

some young people's ability and motivation to read for enjoyment (Clark & Picton, 2020). Given the move to blended and online learning resulting from pandemic school closures, students who do not enjoy reading with fewer access to reading resources at home may fall further behind, akin to summer learning loss (Allington & McGill-Franzen, 2017; Sun, Loh & Nie, 2021). Understanding how adolescents make use of devices for reading and other leisure activities can help educators better understand how to support students' access to reading resources and motivation when school is out.

Adolescent Reading and Technology

Historically, technological advancements and societal changes have contributed to structural changes in reading behaviours and school expectations of reading. The printing press made reading resources available to the greater public as did the invention of the modern newspapers, leading to the democratization of reading (Darnton, 2009). Other significant technological milestones in the history of books from the late 20th century include the setting up of Amazon in the US as an online bookseller in 1994, the launch of the Kindle, a dedicated e-reader in 2007, the launch of *iBooks* by Apple in 2010, the development of commercial online book services such as *Overdrive* in 2000 and *Libby* in 2016, and more recently, commercial subscription apps such as *Epic* and *Storytel*. In Singapore, the National Library Board launched NLB Mobile, a consolidated library services app, as part of its *Reading on the Move* initiative, in 2016, making it easy for library patrons to obtain e-books and audiobooks through *Overdrive* and *Libby*. During the COVID-19 pandemic lockdowns, e-book loan rates increased exponentially in Singapore (Lam, 2020), the U.K. (Sweeney, 2020), and the U.S. (Pressman, 2020). Across the world, e-book app readership increased by 30%, with readers consuming over a million digital books on the *Libby* app alone (Rowe, 2020).

The myth of adolescents as “digital natives” (Prensky, 2001) is often invoked in policymaking and practice, directing policymakers and educators who base their policies and

Technology's Impact on Adolescent Leisure Reading

teaching on their misguided beliefs of uniformly digitally-skilled youth (Kirschner & De Bruyckere, 2017). However, research has shown that youths from different home backgrounds and with differing resources may not possess equally sophisticated digital skills or utilize technology in equally meaningful ways (Roswell et al., 2017; Selwyn, 2009; Warshauer, 2007).

Johnsson-Smaragdi and Jönsson (2006), in their longitudinal study of leisure book reading in Sweden between the 1976 to 2002, debunk a broad application of displacement theory, which suggests that new digital media replaces traditional book media. Rather, they point out that children and adolescents read more in 2002 than before, despite access to other competing technologies, though students from low-SES homes saw the least increment in reading volume and were more likely to state that they did not read at all. Research on children and adolescent reading in Australia (Merga, 2014; Merga & Roni, 2017; Rutherford et al., 2018), the U.K. (Chapman, 2020) and the U.S. (Twenge et al., 2019) suggest that access to technology may be negatively associated with leisure reading. In an earlier study of Singapore adolescents' digital and print reading habits, Loh & Sun (2019) found that adolescents preferred to read in print, but students read more online as they grew older. Furthermore, the study uncovered differentiated uses of digital resources for reading, with adolescents who stated that they enjoyed reading reporting they read more both in print and on other devices. Adolescents who did not enjoy reading preferred to use their smartphones for other leisure activities such as playing games and interacting on social media. Given changes in technology since the earlier studies were implemented, it would be helpful to understand if there have been changes in adolescent reading preferences and usage since.

Reading and reading enjoyment are bound up with texts as well as technologies for reading (Burnett et al., 2017; Kucirkova & Cremin, 2020; Mangen & van der Weel, 2016), and adolescents' reading identities are tied to the devices and books they have access to. In earlier studies, avid readers share about their preference for print (Loh & Sun, 2019; Merga & Roni,

Technology's Impact on Adolescent Leisure Reading

2017; Olave, 2020) whereas reluctant readers in a case study by Tveit and Mangen (2014) preferred reading on the e-readers provided for the study. The convenience of e-books, offering quick access and taking up less physical space are also functionalities that are appreciated by readers (Ketron & Naletelich, 2016). Adolescents may complain that reading on mobile phones strain the eyes but appreciate the access to otherwise unavailable content such as online fanfiction and comics (Kuzmicova et al., 2018). Different technologies (print included) with their different affordances support different kinds of reading and functionalities, and technology is continually improving to support the ease of online reading (Walsh, 2016). Given the ubiquity of teen smartphone usage in developed countries and increasing access to digital devices, understanding the kinds of reading that take place on devices can illuminate opportunities afforded and challenges provided by technology. A more nuanced approach to understanding young people's leisure reading habits in relation to their use of technology will help educators to better design curriculum, learning environments and practices to support adolescents' engaged reading.

Methods

An explanatory sequential mixed methods design (Creswell & Clark, 2017) was used for the study. A reading survey (quantitative data) allowed us to understand broad reading trends and patterns, and a follow-up focus group discussion (FGD) with one case study school allowed us to obtain qualitative data to probe further to examine the reasons for the observed trends and patterns.

The Context of the Study

Singapore ranks highly on international tests of reading literacy, but there are national concerns with the dip in reading quantity and enjoyment over the last decade (Schleicher, 2018). It is one of the most digitally connected countries in the world (IMDA, 2021). As of 2021, every secondary school student has been issued with a personal learning device, in the

Technology's Impact on Adolescent Leisure Reading

form of a laptop or tablet device, to support their blended learning (MOE, 2020). Notably, all Singapore students have access to a wide range of e-books through the National Library Board. Although e-book loans are increasing year on year, little is known publicly at present about adolescents' actual usage of the public library's e-book collection.

Sampling and Participants

This study is part of a larger study of focusing on adolescent reading habits and practices. In Singapore, most secondary schools are fully government funded (i.e., government schools) though a few rely on a mix of government funds and funds from other sources (i.e., autonomous schools) (Singapore MOE, 2021). For this study, participants in the quantitative component (i.e., the survey) were 5732 adolescent students (aged 12 to 17) from 6 government schools. School selection was based on willingness to participate and on their prior aggregate school achievement. The population of 136 secondary schools in Singapore were first divided into three strata based on their prior aggregate school achievement, i.e., top third (45 schools), middle third (46 schools), and bottom third (45 schools). Two schools from each stratum agreed to participate in the study. The total enrolment of the six schools was 6690 and the response rate was 85.7%. Of the students, 52.0% were girls.

Due to pandemic movement restrictions and school constraints, online focus group discussions (FGD) sessions were conducted with 18 Secondary 2 students and 19 Secondary 3 students ($n = 37$), 14 and 15-years-old respectively, from one secondary school. The interviewees, who were chosen by their teachers, represented spread of varied reading proficiencies, motivations, and interests.

Data Collection and Analysis

The survey was adapted from an earlier study (Loh & Sun, 2019), with key questions retained and more questions related to reading and technology included, based on a review of research on print and e-reading (Loh, 2020). Ethics approval from the university was obtained

Technology's Impact on Adolescent Leisure Reading

for the study. A pilot survey was conducted with one class of Secondary 3 (15-year-olds) students in another school, to clarify the ease of conducting the survey and surface any issues. Final minor amendments were made before the survey was administered online between March to April 2021. Overall, there were approximately 50 questions, which took each student between 25-30 minutes to complete.

For the present article, 16 closed-ended questions were retrieved from the survey and grouped into three categories: (1) adolescents' device ownership and preferred reading devices; (2) adolescents' preferred reading devices for different types of reading materials; and (3) adolescents' use of public resources for e-book reading. The completion rate for these questions is very high, with only 0.03% of data missing. Survey data were submitted to descriptive, inferential, and correlational analyses using SPSS 26.

Each FGD lasted for about 45 minutes, and students were asked about their reading habits and preferences, home, school, and library practices as well as their use of technology for reading. The FGD data was transcribed and analysed using Nvivo 12. Constant comparison analysis (Charmaz, 2006) was used to discern emerging themes around reading and technology. We coded around the following categories: students' device preferences, students use of devices for reading, students' online reading habits. Themes that emerged included: purpose and function of reading, book recommendations, affordances and constraints of the technology, and the experience of reading.

Findings

Adolescents' Device Ownership

We present an overview of adolescents' internet access before the key findings. Consistent with the high internet and smartphone penetration rate in Singapore, 99.1% of the students reported they had internet access at home and 95.5% of them subscribed to phone

Technology's Impact on Adolescent Leisure Reading

plans that allow internet access, suggesting that digital access is not a limiting factor for most participating adolescents.

Students were asked to indicate if they owned, shared, or did not own various types of devices (smartphone, e-reader, tablet, and computer/laptop). Results are presented in Table 1.

Insert Table 1. Device ownership

	Smartphone (N=5732)	Computer/laptop (N=5732)	Tablet (N=5732)	E-reader (N=5732)
No	3.2%	9.5%	40.5%	81.1%
Yes	95.2%	62.7%	42.8%	14.9%
Yes, but it is shared	1.6%	27.9%	16.7%	4.0%

The smartphone is the least shared device among the four types of devices, as 95.2% of them have their own phones. Adolescents reported significant higher ownership of computer/laptop than tablets ($Z = 33.35, p < .001$). Although e-readers may support adolescent reading enjoyment, fewer adolescents reported ownership, likely because of the cost of a single-function device.

Across the FGD, all students talked about their personal smartphones. Computers/laptops, tablets, and e-reader, if owned, were just as likely to be shared as personal. The students conveyed that they had more freedom to use their phones in secondary school. Joanne (14) told us that she prefers to use her personal phone to the iPad she shares with her younger sister. Hisham (15) shared that he has been using hand-me-down phones from his family members since he was in Primary 3 (9-years-old). Manga, news, online articles, fanfiction, manga, comics, and social media were some of their online reading materials.

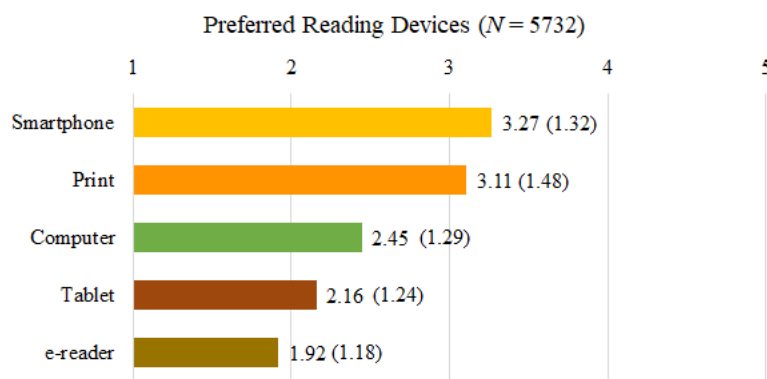
Preferred Reading Devices

The students were asked to indicate how much they preferred using various types of reading devices to read (print, e-reader, tablet, smartphone, and computer/laptop) on 1-5 scale, with 1 being never and 5 being all the time. Figure 1 shows the results.

[Insert Figure 1]

Technology's Impact on Adolescent Leisure Reading

Figure 1. Adolescents' preferred reading devices



A repeated measures ANOVA showed that smartphone and print remain to be the two most preferred reading devices over computer, tablet, and e-reader ($F(3.37, 19334.52) = 1406.46, p < .001$). Post hoc analysis revealed an important pattern that differs from an earlier study with a similar sample (Loh & Sun, 2019), in which print was more preferred than smartphone. Students in the present study reported significant higher preference to smartphone over print. When considered together with the high smartphone ownership reported earlier, our results imply that smartphones are becoming an increasingly important resource for adolescents' leisure reading.

In the FGDs, the interviewees shared their reasons for their print or digital reading preferences. As the quotes below show, adolescents' reasons for preferring print include the tactile feel of turning pages, the smell of books and paper's readability compared to the smaller screens of smartphones.

I prefer reading on paper. This might sound weird but I actually like how the pages when we turn them and I like the smell of books, fresh books, I don't know why. (Hesara, 14-years-old)

I tried the library app...when I went to the library, I saw the promoting online books then I tried it once, it was actually ok but it wasn't really that comfortable... I must strain my eyes. I felt that physical books are better. (Chakresh, 14-years-old)

Technology's Impact on Adolescent Leisure Reading

Fatin, a 15-year-old who did not enjoy reading, explained that she still preferred print because the multifunctionality of her devices was more distracting than the single function of the book.

Cause like it's- you don't get distracted. Like if you use your phone or your laptop and then you like get notification from like other apps right, and then after that like you would stop reading and then go to that app. And then after that it would distract you but if you have a hardcopy book, you can at least like take your time to like read it and then leave you phone at the side, yeah. To me. (Fatin, 15-years-old)

On the other hand, digital devices, specifically the smartphone, was preferred because “it’s more convenient to carry around”, providing instant access to alternative reading materials such as fanfiction, comics, and manga. 15-year-old Alif shared that he discovered fanfiction from a *Reddit* link. Thereafter, he downloaded these fanfiction apps and began reading online. He explained that he preferred to read online so his family members would not see him “reading something beyond his age level”.

Some adolescents appreciated that digital apps and online algorithms could help with book or topic selection whereas others preferred to visit bookstores and libraries to search for new reading material by browsing physical shelves. Ultimately, adolescents’ preference and actual usage were driven by the purpose and experience of reading. Thus, Zac would use print for reading novels but go online to read manga, typically on “a very long” bus ride to school.

I (chuckle) don't really like reading full books online. I rather read hard-copy books... certain things like those like very long stories and different books but if it's like anime, manga then I would use like the online apps to read instead. (Zac, 15-years-old)

Educators need to have a working knowledge of the affordance of each device and how it supports specific reading aims. For example, print may be preferred for focused, undistracted

Technology's Impact on Adolescent Leisure Reading

reading of fiction (Evans, 2017) but the smartphone may be preferred for exploration of the fanfiction universes (Kuzmicova, et al., 2018).

Reflecting the survey data, very few interviewees had e-readers, typically Kindles. Within the Singapore context, purchased e-books or a Kindle subscription would be required to get reading materials for use on the Kindle, which means that there needs to be continual expenditure to keep up with one's reading on the device. Swathi (14) received a Kindle for her birthday when she was 13 but had only read the Harry Potter series on it as her parents had been too busy to purchase new books. Cassie shared that she stopped using the Kindle because "it's dead and [I] can't find the charger". It is a reminder that the ecosystem in which reading takes place is crucial for a successful reading experience. A working device and access to content (whether through purchase, subscription, or loans) are crucial for adolescents to utilise devices for reading.

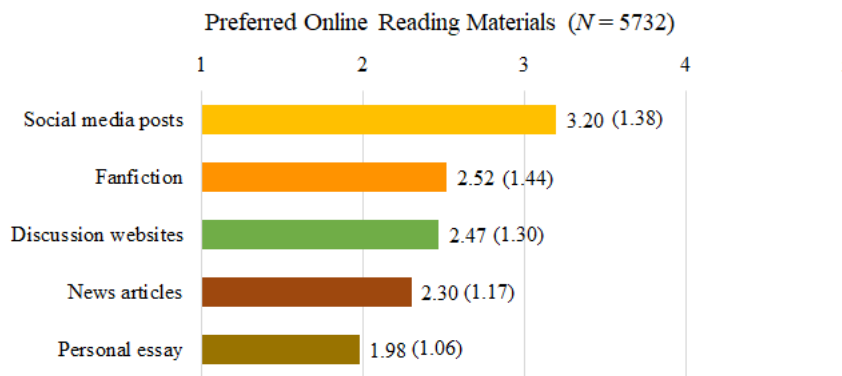
What Adolescents Read Online

To find out more about adolescent online reading preferences, we provided a list of online reading materials (social media posts, fanfiction, discussion websites, new articles, and personal essay), and asked the adolescents to indicate how much they preferred each type of material on a scale of 1-5, with 1 being never and 5 being all the time (Figure 2). Overall, students prefer to read social media posts the most, followed by fanfiction, discussion websites (e.g., Reddit), news articles, and personal essay ($F(3.61, 20685.08) = 907.36, p < .001$). This suggests that students were less likely to engage in longform book reading online but preferred shorter reads for online reading, especially social media posts.

[Insert Figure 2]

Figure 2. Preferred online reading materials

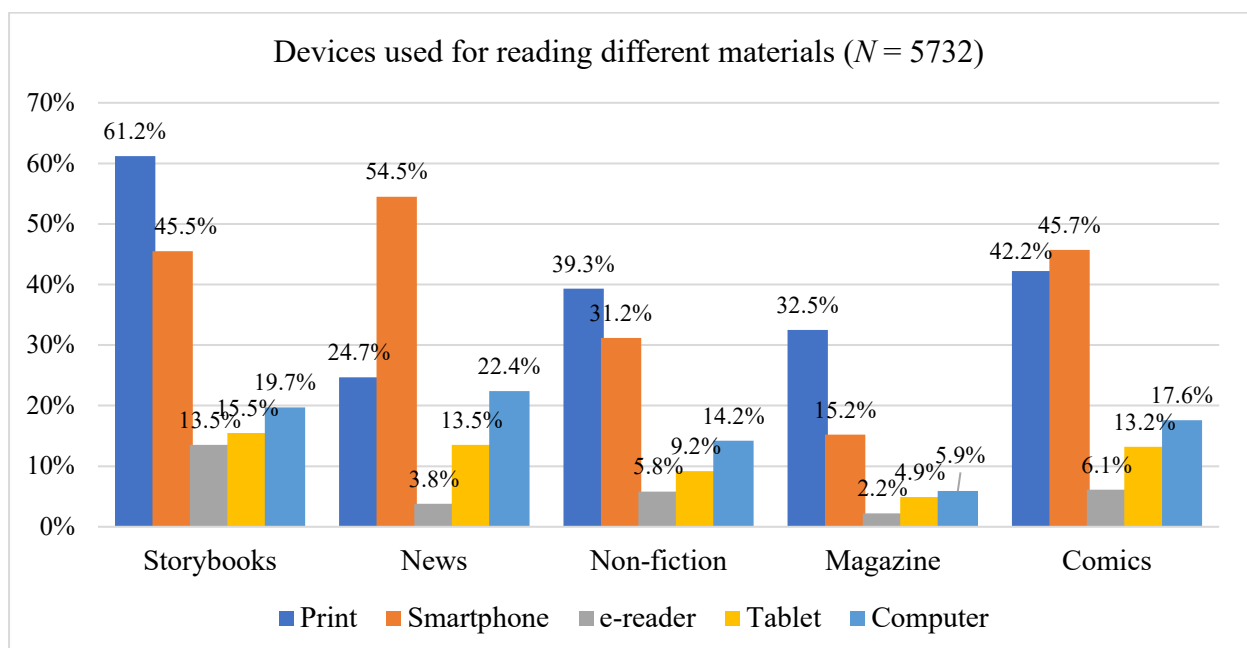
Technology's Impact on Adolescent Leisure Reading



We also asked the adolescents about the devices used for reading the various materials (Figure 3). Across the formats, adolescents used print and smartphones the most. Print was most used for reading storybooks, non-fiction, and magazines whereas smartphones was most used for reading news and comics. Adolescents thus use smartphones and print for different kinds of reading and understanding the different reasons for their choice of device(s) for different formats may help educators to discover ways to support their leisure reading across different formats by ensuring relevant resources are provided for different kinds of reading.

[Insert Figure 3]

Figure 3. Devices used for reading different materials



Technology's Impact on Adolescent Leisure Reading

Consistent with the survey results, adolescents reported using their smartphones to access various reading materials: social media posts from *Instagram* and *TikTok*, news articles, fanfiction on platforms such as *Wattpad* or *Archive of Our Own*, and other online sites such as *Reddit* and *Pinterest*.

I don't read books online, I read soccer news online. I read soccer news straight from Google. (Aatish, 15-years-old)

And uh, I start reading more, but not really NLB anymore. It's just more of Archive of Our Own... Usually I would go online and search for book,s and sometimes I would look at TikTok... TikTok has a recommended section for books. (Cassie, 15-years-old)

As Aatish's quote shows, adolescents may be selective about what they read in print and online. On the other hand, Cassie's quote shows a shift in her reading, as she turns from public to online resources to look for more reading materials and recommendations.

While not all adolescents read fanfiction regularly, many had experienced reading fanfiction, and some were regular readers who kept up with specific authors or series. The language of discovery and recommendations were often used when interviewees talked about how they found out about fanfiction:

Then I started to discover more because there was a link to a reading site which I downloaded... I was able to discover more. (Alif, 15, enjoys reading)

Last December, my sister kept pestering me, so I downloaded Wattpad... Now, I have like 33 stories in my reading list. (Humira, 14, enjoys reading)

The discovery of fanfiction site was often very social in nature, with interviewees sharing that they discovered fanfiction through their friends or through social media platforms such as *Pinterest* and *Reddit*. This highlights the importance of recommendations, whether personal or through online sites, in encouraging the discovery of new reading material. Where adolescents are less likely to encounter such recommendations, it may be that school-initiated

Technology's Impact on Adolescent Leisure Reading

recommendations are crucial to help students find new reading materials (Francois, 2013), whether in print or online.

For news reading, adolescents reported varied reading habits. Some read the news by subscribing to Singapore news sites such as the Straits Times, Channel News Asia, and even international news sites such as South China Morning Post. Others relied on their friends and social media feed for news. Chakresh (14) reported using Google News, a news aggregator to “pick up the best news” whereas Sabitha (14) relied on a downloaded Straits Times app for “keeping up news” though she doesn’t utilize it so much now. Joanne’s (14) friends would “send [me] links to the news and if [I’m] interested, [I’ll] read.” While a few students displayed great sophistication in the way they read news or online information, others were less circumspect about their online reading stating that they did not typically read the news or check their sources. The smartphone is a convenient device to get the latest news and information. Given the ubiquity of smartphone usage, schools should attend to adolescents’ smartphone habits, and see the smartphone as a possible device to support adolescents’ varied and wide leisure reading habits.

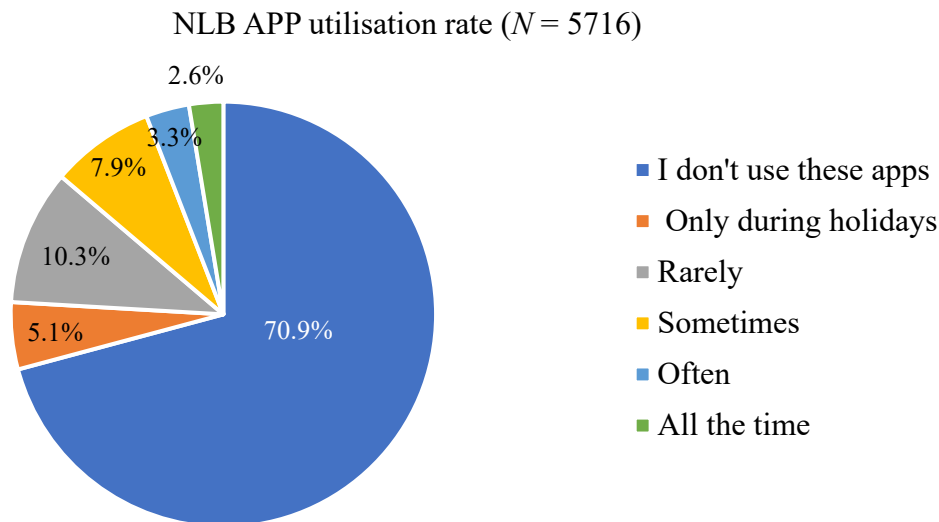
Use of Public Resources for E-book Reading

As mentioned, reading resources in the form of free e-books are made available to all Singapore students enrolled in government schools. We asked the students whether they borrow e-books or browse the NLB app to better understand how these public resources were being utilised. Figure 4 shows the results. Surprisingly, the app was under-utilised, as 70.9% of the students reported they did not use the app. Even then, only 5.9% reported using the app “all the time” or “often” and 15.4% used it “rarely” or “only during holidays”.

[Insert Figure 4]

Figure 4. NLB App usage

Technology's Impact on Adolescent Leisure Reading



The survey showed low uptake of the NLB app despite it being a free resource for e-books. There were four categories of users based on the FGD data: (1) Students who had not heard of the app, (2) students who had heard about it but not tried it; (3) students who had tried it but given up; and (4) regular users. Avid NLB app users were more likely to report that they enjoyed reading and read frequently. Dan (14), who stated that he enjoyed reading and read four to five books every month, explained that he discovered the NLB app when visiting a mall where there was a vending machine book dispenser provided by the library with a promotion of the app. Since then, he preferred to read electronic books to print because “it’s more convenient” and he can “read more different books”, typically on his smartphone. He still visits the public library to study and occasionally picks up hardcopy books from the library. He also sources for titles on his visits to bookstores but use the app to borrow these titles in their e-version and read them using his smartphone. Other than books, he might use social media apps to access the news on his smartphone. Cassie (15), an avid NLB app user who enjoys reading, whipped out her smartphone during the FGD to check her recent loans and reported: “I’ve recently read *The Bride Test*, *The Case Couture*, *The Supernatural Era*, *The Picture of Dorian Grey* and *The Hating Game*”, demonstrating dexterity with using the app. Although Cassie

Technology's Impact on Adolescent Leisure Reading

loves reading, she cannot afford to buy many books. She either visits the public library or uses the NLB app to obtain books to read. She actively uses the recommendation function on the NLB app to “find” new books through “the feed” and would also use social media platforms such as TikTok for book recommendations, demonstrating a general familiarity with using various platforms to help her find new reads.

Some students report that they had downloaded the NLB app but decided that they did not like reading online or were unable to find materials that they wanted online. Marcus (14), a self-declared non-reader who preferred to watch videos to reading, shared that although he had heard about the NLB app, he did not use it because he wanted to utilize his limited screen time for his other interests. The occasional reading done on the smartphone was for manga reading and occasional news browsing. Humira (14) who enjoys reading and did go online to read manga asked during the FGD, “There’s a library app?”, reflecting the students’ lack of knowledge.

Even adolescents who used the app may not be familiar with all its functions. Hisham (15), who visits the public library and knows how to use the OPAC system to look for books related to his interests, did not realize that he could use the NLB app to borrow e-books. He had only utilized it for recommendations and processing physical book loans. Earlier research on children’s use of e-books have suggested that children need to be socialised to reading by being taught how to use technology for online reading (Ciampa, 2016; McVicker, 2019; Sun, Loh & Nie, 2021). Although adolescents are older and may seem more familiar with digital devices than children, the study suggests that they too need to be socialised to use technology such as the NLB app for reading by being given time and opportunity to explore these reading apps and to find reading material they are interested in.

Device Conflict with Reading

Technology's Impact on Adolescent Leisure Reading

To understand how device-related activities are related to students' independent reading, students were asked to indicate their reading enjoyment, reading frequency, reading duration and the frequency of four device-related leisure activities (playing e-games, browsing social media apps, watching videos online, and watching TV). All variables were measured on 1-5 scale, with 1 being never and 5 being all the time. Table 3 presents the correlation results.

Insert Table 2. Correlations between reading habits and leisure activities (N = 5732)

	Reading enjoyment	Reading frequency	Reading duration
Playing e-games	-.09***	-.07***	-.05**
Browsing social media apps	- 0.12***	- .15***	-.06***
Watching videos online	- 0.08***	- 0.12***	- 0.04**
Watching TV	- 0.05***	- 0.03*	- 0.09*

* $p < .05$. ** $p < .01$. * $p < .001$.

Results showed that the frequencies of all four device-related leisure activities were negatively related to reading enjoyment, frequency and duration, affirming earlier studies' observations that devices usage may be in conflict with leisure reading (e.g., Merga, 2014; Twenge et. al., 2019).

FGD data support the survey results, as a common theme in the interviews was that the adolescents had less time to read as they got older because of the competing demands of schoolwork and other activities resulting in less leisure time. Moreover, some adolescents reported that having greater access to their own smartphone was a hinderance to reading. For Khairul (15), who did not enjoy reading, getting a smartphone in secondary school reduced reading time as he would use his smartphone rather than read during his leisure time.

“Umm, honestly I think last time in Primary School I didn't have a phone, so uh, I read because I want to kill time and stuff. Now, I mostly use my phone to do that.” (Khairul, 15)

Technology's Impact on Adolescent Leisure Reading

While the interviews focused on reading generally, adolescents mentioned using spending time with friends, watching videos, anime, and television series, using Youtube and social media platforms as some online distractors from reading. The displacement theory may apply to certain profiles of adolescents, who have replaced potential reading time with non-reading leisure activities afforded by their smartphones.

Discussion

This paper provides a snapshot of the impact of technology on adolescents' leisure reading habits at a point in time where adolescents in developed countries have unprecedented smartphone access, have grown up immersed in online technologies and relied totally on online learning during the pandemic school closure of 2020. Online learning is here to stay, and it is vital that educators consider the possibilities as well as challenges of technology for supporting adolescents' leisure reading.

The rise in smartphone ownership and reading technologies is likely to have contributed to shifts in adolescents' reading preferences and use of devices for reading. Although an earlier study in 2017 had found that adolescents in Singapore preferred print to other digital devices for reading (Loh & Sun, 2019), this study points to a change in their preferences, with adolescents now ranking the smartphone as their preferred reading device, followed by print. Adolescents noted that the smartphone could be distracting and caused eye strain, but that it was also portable and extremely convenient, factors to be weighed when considering what device to use for reading. Similar to earlier research (Merga, 2014; Rutherford et al., 2018), the study found negative correlation between reading enjoyment and frequency with increased device usage, suggesting that for some students, technology was distracting from rather than supporting reading. As such, educators need to consider how to mitigate the effects of technology on reading for this profile of students.

Technology's Impact on Adolescent Leisure Reading

The study found that adolescents were focused on the experience of reading, and would use different devices depending on their needs, preferences, and purposes. Thus, adolescents prefer to read novels in print form but prefer smartphone on-the-go reading than print reading and get their news through social media, similar to findings about Israeli adolescents' news reading habits (Lowenstein-Barkai, & Lev-on, 2021). They also make use of their smartphones to get other forms of reading resources (e.g., fanfiction and comics) otherwise not available in print through online channels. As such, our findings suggest that the different functionalities of each device could either encourage or constrain reading. For example, a single-function print book, without the distraction of notifications and other possible entertainment, allowed for focus, concentration, and immersion in the book. On the other hand, the smartphone allowed instantaneous access to just-in-time news and social media for adolescents to keep up with the world. Tablets such as iPads are more friendly to the eyes and more portable than computers/laptops and could allow the student to mimic a print book reading experience as s/he holds the device, seated in a comfortable posture (Ketrón & Naletelich, 2016). As Mackey (2016) points out, everyday materialities mediates the experience of reading, and understanding the potential and challenges of each affordance could allow educators to guide their students through different reading pathways and materials.

Whether using print or other technologies, being able to find content they were interested in was a consideration for adolescents' continued engagement in reading (Jones & Brown, 2011; McGeown et. al., 2021). Some students familiar with the NLB app were able to use it expertly to find reading resources whereas other students were not able to do so or were unfamiliar with it. Adolescents' access to reading materials are embedded within publishing and sociocultural contexts, and some adolescents may find it less restrictive to get reading materials online (e.g., free online comics and Gutenberg classics). Educators' knowledge of online resources from the NLB reading app to news media, webtoons and fanfiction sites can

Technology's Impact on Adolescent Leisure Reading

allow them to support adolescent wide reading by directing them to a wider variety of reading resources through different channels. Deliberately showing adolescents how to use their smartphones to discover reading materials may be one way to encourage more smartphone reading, since almost all secondary school students have access to a smartphone.

Earlier studies have shown that recommendations are crucial to helping adolescents find interesting materials to read (Francois, 2013; Ivey, 2014; Merga, 2016). This study affirms the findings of those studies and also show that beyond peers and teachers, students also discovered reading material through online sources or social media platforms. Creating a culture of recommendation where teachers and students exchange book titles, share online web platforms for reading and recommend news apps to each other can support adolescents' leisure reading and expand their reading diets. Librarians and teachers can also ask students what they are interested in reading as a starting point for engagement (Chapman, 2020; McGeown et. al., 2020) and consider recommending book sites such as Goodreads, Commonsense Media, audiobook platforms such as Storytel and Audible, news apps such as BBC and the Straits Times and even use social media such as BookToks (Merga, 2021) to help adolescents find more reading material and to expand their reading tastes. Creating a community of practice where teachers and students are constantly talking about books can encourage greater engagement in reading (Francois, 2013).

Within the Singapore context, e-books are easily available to students through the NLB app. However, the study showed that the app was not widely used by students for a variety of reasons. While some students, typically avid readers who enjoyed reading and read frequently, were familiar with the app and used it regularly to get reading materials, others were unfamiliar with the app. Yet others who did use the app for other functions did not realise that they could borrow e-books using the app, highlighting that they still need to be explicitly introduced to the app and its functions during school hours (for example, during library periods or sustained

Technology's Impact on Adolescent Leisure Reading

silent reading periods). The NLB app and other online resources are portals to increased reading resources, and educators need to ensure adolescents know how to use these resources meaningfully to extend their reading possibilities. Although all secondary school students have access to a personal learning device, time needs to be put aside in school for students to help them optimise the reading app. Teachers or librarians can teach the students to use the app functions, learn how to search for books on the app and allow them time to read in class, under the tutelage of teachers and peers. Adolescents will read if they can find purpose and pleasure in reading (Ivey, 2014; McGeown et. al., 2020; Moje et. al., 2008; Smith & Wilhelm, 2002) and helping them to find books that they enjoy reading, whether in print or online is vital to encourage them to read independently for leisure.

Conclusion

Reading is an embodied, multifaceted, and complex activity, and adolescents are motivated to read for leisure when they can find relevant reading material, derive pleasure from and see purpose in reading, and have the right device (print included) to enable an enjoyable reading experience. Their ability to do so may be tied to their reading proficiencies, attitudes, and preferences. Understanding adolescents' preferences for reading allows educators to evaluate how better to integrate both print and digital reading into adolescents' everyday school practices to encourage students to find books and reading materials they would like to read as habitual practice.

In an age of personalised learning (Alexander & Fox, 2019), educators' holistic understanding of the total learning environment within which the reading experience takes place can help them customize students' reading and learning experiences. The ecosystem to facilitate a successful reading experience involves a set of interrelated factors, including the device affordances, the content enabled (in the form of purchased books or subscriptions), the physical environment and being immersed in a culture of book exchange and recommendation.

Technology's Impact on Adolescent Leisure Reading

Designing reading ecosystems that integrate both print and digital reading to cater to the different needs and interests of students can do much to encourage teens to read more, enjoy reading more and see reading as a meaningful activity for their growth, wellbeing, and development.

Acknowledgements

This work was supported by the DEV02-20 LCE Designing School Libraries of the Future Study. Ethics approval was obtained (IRB2019-03-026-04). The views expressed in this paper are the authors and do not necessarily represent the views of the National Institute of Education nor the Singapore Ministry of Education. The authors wish to express their gratitude to the participating schools, teachers, and students.

Author Contributions

Chin Ee Loh: Conceptualisation, Literature review, Qualitative data collection and analysis;

Baoqi Sun: Conceptualisation, Literature Review, Quantitative data collection and analysis

References

- Afflerbach, P., & Harrison, C. (2017). What is engagement, how is it different from motivation, and how can I promote it? *Journal of Adolescent & Adult Literacy*, 61(2), 217-220.
<https://doi.org/https://doi.org/10.1002/jaal.679>
- Alexander, P. A., & Fox, E. (2019). Reading research and practice over the decades: a historical analysis. In D. E. Alvermann, N. J. Unrau, M. Sailors, & R. B. Ruddell (Eds.), *Theoretical models and processes of literacy (7th Ed.)*. Routledge.
- Allington, R. L., & McGill-Franzen, A. (2017). Summer reading loss is the basis of almost all the rich/poor reading gap. In R. Horowitz & S. J. Samuels (Eds.), *The achievement gap in reading: complex causes, persistent issues, possible solutions* (pp. 170-184). Singapore.
- Ang, J. (2020, March 4, 2020). Parliament: All secondary school students to have personal digital devices by 2028, \$200 Edusave top-up to support purchase. *The Straits Times*.
- Burnett, C., Merchant, G., Simpson, A., & Walsh, M. (2017). *The case of the iPad: mobile literacies in education*. Springer.
- Chapman, L. (2020, 2020/04/02). What are teenagers reading? An exploration into the reading lives of a class of year 9 pupils. *English in Education*, 54(2), 146-160.
<https://doi.org/10.1080/04250494.2019.1623667>
- Charmaz, K. (2006). *Constructing grounded theory: A practical guide to qualitative analysis*. Sage Publications.
- Ciampa, K. (2016). Motivating Grade 1 children to read: exploring the role of choice, curiosity, and challenge in mobile ebooks. *Reading Psychology*, 37, 665-705.
- Clark, C., & Picton, I. (2020). "It makes me feel like I'm in a different place, not stuck inside": children and young people's reading in 2020 before and during Covid-19 lockdown. National Literacy Trust Research Report, Issue.

Technology's Impact on Adolescent Leisure Reading

- Cremin, T. & Moss, G. (2018) Reading for pleasure: supporting reader engagement. *Literacy* 52(2), 59-61. <https://doi-org.libproxy.nie.edu.sg/10.1111/lit.12156>
- Cremin, T., Mottram, M., Collins, F. M., Powerll, S., & Safford, K. (2014). *Building communities of engaged readers: Reading for pleasure*. Routledge.
- Cunningham, A. E., & Stanovich, K. E. (1998). What reading does for the mind. *American Educator*, 1-8.
- Darnton, R. (2009). *The case for books (Kindle Edition)*. Public Affairs.
- Evans, E. (2017). Learning from high school students' experiences of reading e-books and printed books. *Journal of Adolescent and Adult Literacy*, 61(3), 311-318.
- Fletcher, J. (2014). A review of “effective” reading literacy practices for young adolescent 11 to 13 year old students. *Educational Review*, 66(3), 293-210. <https://doi.org/https://doi.org/10.1080/00131911.2013.772126>
- Francois, C. (2013). Reading in the crawl space: a study of an urban school's literacy-focused community of practice. *Teachers College Record*, 115, 1-35.
- Gambrell, L. B., Marinak, B. A., Brooker, H. R., & McCrea-Andrews, H. J. (2011). The importance of independent reading. In S. J. Samuels & A. E. Farstrup (Eds.), *What research has to say about reading instruction* (4th Edition ed., pp. 143-158). International Reading Association.
- IMDA (Infocomm Media & Development Authority). (2021). *Infocomm Usage-Households and Individuals*. <https://www.imda.gov.sg/infocomm-media-landscape/research-and-statistics/infocomm-usage-households-and-individuals>
- Ivey, G. (2014). The social side of engaged reading for young adolescents. *The Reading Teacher*, 68(3), 165-171. <https://doi.org/https://doi.org/10.1002/trtr.1268>

Technology's Impact on Adolescent Leisure Reading

- Jerrim, J., & Moss, G. (2019). The link between fiction and teenagers' reading skills: international evidence from the OECD PISA study. *British Educational Research Journal*, 45(1), 181-200. <https://doi.org/10.1002/berj.3498>
- Johnsson-Smaragdi, U., & Jönsson, A. (2006). Book Reading in Leisure Time: Long-Term changes in young peoples' book reading habits. *Scandinavian Journal of Educational Research*, 50(5), 519-540. <https://doi.org/10.1080/00313830600953600>
- Jones, T., & Brown, C. (2011). Reading engagement: a comparison between e-books and traditional print books in an elementary classroom. *International Journal of Instruction*, 4(2), 5-22.
- Ketron, S., & Naletelich. (2016). How e-readers have changed personal connections with books. *Qualitative Market Research*, 19(4), 433-452.
- Kirsch, I., de Jong, J., Lafontaine, D., McQueen, j., Mendelovits, J., & Monseur, C. (2002). *Reading for change: performance and engagement across countries*
- Kirschner, P. A., & De Bruyckere, P. (2017) The myths of the digital native and the multitasker. *Teaching and Teacher Education*, 67, 135-142.
<https://doi.org/10.1016/j.tate.2017.06.001>
- Krashen, S. D. (2004). *The power of reading: insights from research* (2nd edition ed.). Heinemann.
- Kucirkova, N., & Cremin, T. (2020). *Children reading for pleasure in the digital age: mapping reader engagement*. Sage.
- Kuzmicova, A., Schilhab, T., & Burke, M. (2018). m-reading: fiction reading from mobile phones. *Convergence: The International Journal of Research into New Media Technologies*, 1-17.
- Lam, L. (2020, May 9, 2020). Surge in e-book checkouts, with more borrowing cookbooks and juvenile fiction during circuit breaker: NLB. CNA.

Technology's Impact on Adolescent Leisure Reading

<https://www.channelnewsasia.com/news/singapore/surge-in-e-book-checkouts-with-more-borrowing-cookbooks-and-12715320>

Loh, C. E. (2020) Children and adolescents' reading in print and digitally: a review for the Curriculum Planning and Development Division, Ministry of Education (CPDD, MOE). Singapore Ministry of Education.

Loh, C. E., & Sun, B. (2019). "I'd still prefer to read the hard copy": adolescents' print and digital reading habits. *Journal of Adolescent & Adult Literacy*, 62(6), 663-672. <https://doi.org/10.1002/jaal.904>

Lowenstein-Barkai, H., & Lev-on, A. (2021). News videos consumption in an age of new media: a comparison between adolescents and adults. *Journal of Children and Media*, 1-17. <https://doi.org/10.1080/17482798.2021.1915831>

MacKey, M. (2016) Literacy as material engagement: the abstract, tangible and mundane ingredients of childhood reading. *Literacy* 50(3), 166-172. <https://doi-org.libproxy.nie.edu.sg/10.1111/lit.12086>

Mangen, A. & van der Weel, A. (2016) The evolution of reading in the age of digitalisation: an integrative framework for reading research. *Literacy* 50(3), 116-124. <https://doi-org.libproxy.nie.edu.sg/10.1111/lit.12086>

McGeown, S., Bonsall, J., Andries, V., Howarth, D., Wilkinson, K. & Sabeti, S. (2020) Growing up a reader: exploring children's and adolescents' perception of 'a reader'. *Educational Research* 62(2), 216-228. <https://doi.org/10.1080/00131881.2020.1747361>

McGeown, S. P., Duncan, L. G., Griffiths, Y. M., & Stothard, S. E. (2015). Exploring the relationship between adolescent's reading skills, reading motivation and reading habits. *Reading and Writing*, 28(4), 545-569.

Technology's Impact on Adolescent Leisure Reading

- McVicker, C. J. (2019). Plugged and unplugged reading: studying the preferences of readers. *The Reading Teacher*, 72(6), 731-740. <https://doi.org/10.1002/trtr.1791>
- Merga, M. (2021) How can Booktok on TikTok inform readers' advisory services for young people. *Library and Information Science Research*, <https://doi.org/10.1016/j.lisr.2021.101091>.
- Merga, M. (2016). What would make them read more? Insights from Western Australian adolescents. *Asia Pacific Journal of Education*, 36(3), 409-424.
- Merga, M. K. (2014). Are teenagers really keen digital readers: Adolescent engagement in ebook reading and the relevance of books today. *English in Australia*, 49(1), 27-37.
- Merga, M. K., & Roni, S. M. (2017). The influence of access to eReaders, computers and mobile phones on children's book reading frequency. *Computers and Education*, 109, 187-196. <https://doi.org/10.1016/j.compedu.2017.02.016>.
- Ministry of Education [MOE] (2020) Blended learning to enhance schooling experience and further develop students into self-directed learners. Press Release. <https://www.moe.gov.sg/news/press-releases/20201229-blended-learning-to-enhance-schooling-experience-and-further-develop-students-into-self-directed-learners>.
- Singapore Ministry of Education. (2021) *Education Statistics Digest*. <https://www.moe.gov.sg/about-us/publications/education-statistics-digest>
- Moje, E. B., Overby, M., Tysvaer, N., & Morris, K. (2008). The complex world of adolescent literacy: Myths, motivations, and mysteries. *Harvard Educational Review*, 78(1), 107-157.
- Notten, N., & Becker, B. (2017, Dec). Early home literacy and adolescents' online reading behavior in comparative perspective. *Int J Comp Sociol*, 58(6), 475-493. <https://doi.org/10.1177/0020715217735362>

Technology's Impact on Adolescent Leisure Reading

- Olave, M. A. T. (2020). Book love. a cultural sociological interpretation of the attachment to books. *Poetics*. <https://doi.org/10.1016/j.poetic.2020.101440>
- Prensky, M. (2001). Digital natives, digital immigrants. *MCB University Press*, 9(5), 1-6. www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf
- Pressman, A. (2020, June 18, 2020). E-book reading is booming during the coronavirus pandemic. *Fortune*. <https://fortune.com/2020/06/18/ebooks-what-to-read-next-coronavirus-books-covid-19/>
- Roswell, J., Morrell, E., & Alvermann, D. E. (2017). Confronting the digital divide: debunking Brave New World discourses. *The Reading Teacher*, 71(2), 157-165. <https://doi.org/10.1002/trtr.1603>
- Rowe, A. (2020, March 28, 2020). Ebook app readership is up 30% amid pandemic lockdowns. *Forbes*. <https://www.forbes.com/sites/adamrowe1/2020/03/28/ebook-app-readership-is-up-30-amid-pandemic-lockdowns/#1d9f5844721d>
- Rutherford, L., Singleton, A., Derr, L. A., & Merga, M. K. (2018). Do digital devices enhance teenagers' recreational reading engagement? issues for library policy from a recent study in two Australian states. *Public Library Quarterly*, 37(3), 318-340. <https://doi.org/10.1080/01616846.2018.1511214>
- Schleicher, A. (2018). *PISA 2018: insights and interpretations*. <https://www.oecd.org/pisa/PISA%202018%20Insights%20and%20Interpretations%20FINAL%20PDF.pdf>
- Schwab, K. (2017). *The fourth industrial revolution*. Crown Business.
- Sellers, C. (2019). 'Fitting in' and 'standing out': the peer group and young people's development of reader identity. *British Journal of Sociology of Education*, 40(7), 938-952. <https://doi.org/10.1080/01425692.2019.1622407>

Technology's Impact on Adolescent Leisure Reading

- Selwyn, N. (2009). The digital native - myth and reality. *Aslib Proceedings*, 61(4), 364-379.
- Sikora, J., Evans, M. D. R., & Kelley, J. (2019). Scholarly culture: how books in adolescence enhance adult literacy, numeracy and technology skills in 31 societies. *Social Science Research*, 77, 1-15. <https://doi.org/https://doi.org/10.1016/j.ssresearch.2018.10.003>
- Singer, L., & Alexander, P. A. (2017). Reading on paper and digitally: what the past decades of empirical research reveal. *Review of Educational Research*, 87(6), 1007-1041.
- Smith, M. W., & Wilhelm, J. D. (2002). *Reading don't fix no chevys: Literacy in the lives of young men*. Heinemann.
- Sullivan, A., & Brown, M. (2015). Reading for pleasure and progress in vocabulary and mathematics. *British Educational Research Journal*, 41(6), 971-991. <https://doi.org/https://doi.org/10.1002/berj.3180>
- Sun, B., Loh, C. E., & Nie, Y. (2021). The COVID-19 School Closure Effect on Students' Print and Digital Leisure Reading. *Computers and Education Open*. <https://doi.org/10.1016/j.caeo.2021.100033>
- Sweney, M. (2020) Pandemic drives ebooks and audiobook sales by UK publishers to an all-time high. *Guardian*. <https://www.theguardian.com/books/2020/nov/14/pandemic-drives-ebook-and-audiobook-sales-by-uk-publishers-to-all-time-high-covid>
- Torppa, M., Niemi, P., Vasalampi, K., Lerkkanen, M., Tolvanen, A., & Poikkeus, A. (2020). Leisure Reading (But Not Any Kind) and Reading Comprehension Support Each Other—A Longitudinal Study Across Grades 1 and 9. *Child Development*, 91(3), 876–900. <https://doi.org/10.1111/cdev.13241>
- Tveit, K., & Mangen, A. (2014). A joker in the class: Teenage readers' attitudes and preferences to reading on different devices. *Library and Information Science Research*, 36, 179-184.

Technology's Impact on Adolescent Leisure Reading

- Twenge, J., Martin, G. N. & Spitzberg, B. (2019) Trends in U.S. adolescents' media use, 1976-2016: the rise of digital media, the decline of TV, and the (near) demise of print. *Psychology of Popular Media* 8(4), 329-345.
- Walsh, G. (2016). Screen and paper reading research. *Australian Academic & Research Libraries*, 47(3), 160-173.
- Warshauer, M. (2007). The paradoxical future of digital learning. *Learning Inquiry*, 1, 1-49.
- Zebroff, D., & Kaufman, D. (2017). Texting, reading, and other daily habits associated with adolescents' literacy levels. *Educational Information Technology*, 22, 2197-2216.