

What are the advantages and disadvantages of Ebooks versus paper books?

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電子書籍と一般書籍のメリットとデメリットは？

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Abstract

The purpose of this research was to examine the pros and cons of two types of book formats: ebooks versus paper books. Students are now able to borrow both types of books from many university libraries, yet they may not be aware of the benefits or problems they may encounter with each style. The more information the students have about each choice, the better they will be able to choose the style of book that best fits their needs. This research looks at the advantages and disadvantages of reading books on smartphones, and then presents the benefits and problems with reading paper books. Ultimately, the decision about which style of book to read is a personal choice based on each reader's situation.

本研究は、電子書籍と一般書籍のメリット・デメリットを考察することを目的とする。今日、大学図書館では電子書籍と一般書籍の両形式の書籍を借りることができるが、各形式がもたらすメリットとデメリットを認識できていない場合がある。それぞれの形式についてより多くの情報を得れば、ニーズに合った形式を選択することができる。本研究では、スマートフォンと一般書籍で読むメリットとデメリットをそれぞれ紹介する。どの形式の書籍を活用するかは、最終的には個人の選択であり、各学生の状況次第である。

Keywords : graded readers, ebooks, smartphones, paper books

Introduction

As the benefits of extensive reading become more widely understood, more teachers are requiring their students to read tens of thousands of words each semester to fulfill their syllabus requirements. Generally speaking, students should be free to choose which books they read based on their ability and genre interests. In addition to choosing which title and difficulty level to read, students now have the possibility of choosing the format they want to read: tradition-style paper books or electronic books (ebooks). During the Covid-19 pandemic, when visiting actual libraries was restricted, schools encouraged students to borrow ebooks online so that they could continue their reading even when they could not physically visit the libraries. Schools and publishers seem to have realized the benefits of making more ebooks available because in recent years this type of book has become more accessible to university students. As a result, the range of students' reading options has expanded. Students are now commonly reading both types of books, so it is worth considering the pros and cons of each mode. Is it better for students to read traditional-style paper books, or ebooks that can be accessed on their smartphones? A quick list of the advantages of reading ebooks includes (but is not limited to) their easy accessibility, their privacy, their cost, the customizable reading experience, and the large variety available. The disadvantages of ebooks are the eye strain, limited battery life, distractions, and the small screen size. On the other side of the issue, the advantages of reading traditional paper books include their sensory appeal, their cost, their durability, the lack of technology required, their light weight, and a better understanding of the reading material. Meanwhile, the disadvantages of paper books are they are inconvenient to carry, they have a negative impact on the environment, and their storage requirements. There are clearly many arguments on both sides of this question, and the purpose of this research is to take a non-biased approach to analyzing the good and bad points on each side of the issue to let students and teachers know what will work best for their situations.

Advantages of Reading Books on Smartphones:

Portability

The first good point of reading books on smartphones is the issue of portability. Smartphones are small, lightweight, and easily tucked into pockets of clothes or backpacks. This means they can be carried anywhere and accessed quickly at any time. This ease-of-use leads to an increase in the amount of time students spend looking at their devices, and could therefore increase the amount of time spent reading ebooks. Smartphones are normally held in one hand so books can be read while eating or holding onto the handstrap of a train car without taking up too much space and disturbing others in a public space such as a cafe or train car. It is also possible to rest a smartphone on one's lap, prop it up on a table, or lean it against another item, which frees both hands from the sometimes tiring and cold (in winter) task of holding it.

Privacy

Some students have expressed discomfort about reading English books in public. They are self-conscious about their reading level or the title and genre of their book selection. This unwanted attention may discourage them from taking out their books in public places where they know other people will observe or judge them. This issue is mitigated when reading on a smartphone because the back of the phone faces outward and does not expose the contents of the screen. It is easy to hide the screen from unwanted attention with screen guards and by reducing the screen's brightness. These measures improve privacy and allow shy students who are worried about neighboring eyes eavesdropping on their reading selection a worry-free reading experience.

Cost

The monetary cost of reading ebooks that are borrowed from school libraries is negligible because the books are free to borrow. The price of the smartphone is certainly expensive, as is school tuition fees. However, it is

safe to assume that no student is buying a smartphone or paying university tuition for the sole purpose of reading library books. Therefore these costs can be considered “sunk costs” because they have already been paid. If students were required to buy the books they read, ebooks would hold a clear advantage because book-for-book, they are much cheaper on average than paperback versions (and even more so when considering hardback covers). For the purpose of this comparative analysis, however, it is assumed that students are not buying the books they read. University libraries allow students to borrow both ebooks and paper books for free, so the only cost students incur is the effect that continuously keeping their phones on has on their battery life. Ebooks do not require more battery power than other popular smartphone usage such as social media or internet browsing. However, compared to reading paper versions of books, reading ebooks will drain power from smartphone batteries. It is reasonable to argue that a “cost” of reading ebooks is a reduced battery life, if the phone is not plugged into a charger while it is being used.

Customization

A clear advantage that ebooks have over their paper counterparts is their customizability. While paper books are unchangeable, important aspects of ebooks can be altered to make the reading experience easier, more enjoyable, and more understandable. The brightness of the screen, the font size, and the background color can all be easily adjusted depending on the user’s preferences. Reading in a dark environment, such as outside at night or in a room with low light is impossible with a paper book. However, brightening the screen on a smartphone allows students to continue to engage with the text regardless of the low-light environment. In order to become immersed in a book’s story, students should sustain their reading for a reasonably long time. Reading small fonts for a long time, however, can be tiring and this discourages extended reading sessions. This issue can be addressed by increasing the font size on smartphones, which alleviates eye strain and encourages students to continue reading the text for a longer time. Similarly, adjusting the background color and brightness in accordance with the

environment can also lead to more time engaged with the book. In a dark environment, reading black text on a white screen can contribute to eye strain and headaches. These two problems might be reduced by changing to a dark screen with white text, as there is less glare emanating from the phone (Kakehi, 2019). Using the dark screen also reduces the strain on the battery, which can increase the amount of time students spend continuously reading.

Durability

Another advantage of ebooks over paper books is that ebooks never get bent, creased, torn, or physically damaged, no matter how often they are read. Conversely, there is a finite number of people that can handle a paper book during its lifespan, and each student who borrows it inflicts a degree of wear-and-tear on the pages. Careless students might even render a book unreadable if food, drinks, or rain comes into contact with its pages. This can leave a book looking and feeling worse-for-wear and might contribute to how readers feel about the reading experience. If a paper book gets very wet, it will most likely be damaged beyond repair. Ebooks, however, never show signs of age. Even though they are borrowed by students from the library, they do not get creased, stained, torn, or weathered. Of course, if one reader's smartphone gets wet, the device will be damaged, but the book on the device will remain unaffected and subsequent readers will not notice.

Availability

A final important advantage of ebooks over paper books is their large availability in virtual libraries compared to paper versions. This is due to the finite amount of shelf space in university libraries. Universities cannot realistically provide multiple copies of (most of) their books, or display an extensive collection of all the books available. Furthermore, when a book is borrowed by one student, no other student can read that book until it is returned to the library. However, there is a near-unlimited amount of space for ebooks on the universities' databases. Libraries can stock multiple copies of books without sacrificing space for other titles. This allows many students

to borrow the same book simultaneously and is therefore a more equitable system for universities to employ, and a boon to students who want to read books that have already been loaned to other people. Add to this the convenience of being able to borrow books from anywhere the internet is available, rather than needing to visit the actual library buildings and locate the physical books on the libraries' shelves. This advantage was especially clear during the Covid-19 "lockdown" when students were not allowed to visit the campuses. The benefits continue today for students who live far from school, during inclement weather, or for those who don't have the time to go to the library due to their busy schedules. It is much easier to get students reading when books are available with a few search words on their smartphones, versus requiring students to visit the schools' libraries.

Disadvantages of Reading Books on Smartphones:

Health Consequences: Eyes

The most serious issues related to reading books on smartphones are the negative health consequences that result from looking at the screen of an electronic device for an extended period of time. The following conditions have been reported by doctors at the Centre for Sight eye clinic that treats issues resulting from extended use of electronic devices. Some people experience a syndrome known as eye fatigue, which causes headaches, difficulty concentrating, and double vision. Looking at screens for a long time also leads to a reduction in blink rate, which causes dry and itchy eyes. Other problems related to eye fatigue include a sore neck and shoulders, photophobia (a sensitivity to light), and pain around the eyes. According to eye doctors, the blue light emitted from the screens of smartphones can cause damage to the sensitive cells in the retina and weaken the eye muscles, which leads to the need to wear prescription eyeglasses. Almost half of the students surveyed by Baron (2016) complained of eye strain when reading on digital screens. While reading from a paper page also strains and weakens the eye muscles, it seems that reading on digital screens is more stressful and taxing.

Health Consequences: Mind and Body

The health problems resulting from excessive time looking at a smartphone are not restricted to just the eyes. Staring at the blue light of screens in the evening can also negatively affect sleeping patterns. According to WebMD, a lack of sleep is associated with a causal chain reaction of a host of physical and mental health issues including difficulty concentrating, mood disorders, a weakened immune system, diabetes, heart disease, and weight gain. Too much time staring down at a smartphone causes problems in neck muscles, which brings about tightness and spasms. It is also possible to experience nerve pain that extends down the shoulder, back, and arm. To reduce the risk of experiencing these adverse health effects, doctors recommend taking a break from looking at smartphone screens every 20 minutes. Neck strains and shoulder pains are not solely caused by looking at smartphones, and people who read books with bad posture will also feel similar discomfort. Readers should adopt neutral and non stressful body postures when reading ebooks of paper books for extended periods of time. Taking short periodic breaks to stretch and flex the neck and shoulder muscles will go a long way towards promoting healthy minds and bodies.

Battery Life

The next problem students will experience after using their smartphones continuously is a weakened battery. The best new smartphone batteries can last around 15.5 hours of continuous use on a full charge, according to tomsguide.com, a website comparing the battery life of several different smartphones. The website charbycharge.com reports that recent smartphones' batteries will last between two to three years before they must be replaced. The older the battery, the shorter span of time it will hold a charge because as months and years elapse, smartphone batteries inevitably lose their ability to hold a charge. As a result, if a student has a smartphone that is more than three years old, it is unlikely to hold a charge for as long as it did when it was new. If reading on phones quickly drains their

batteries, students will be unable to do all the other things they expect from their phones, such as searching the internet, watching videos, texting their friends, and listening to music. This tradeoff is unacceptable for most students.

Distractions

Distractions are another problem associated with reading books on smartphones. Concentration is required, especially when reading in a foreign language. However, this concentration can be easily lost when reading books on smartphones. Notifications from students' calendar apps, alerts from social media platforms, and texts from family and friends constantly pop up on the screen and divert students' attention. While it is possible to deactivate notifications from the smartphones' settings, this is a step that students must proactively perform every time they want to read on their phones, and it can be more troublesome than leaving the notifications turned on. A study by Florida State University (Elish, 2015) asserts that even short notification alerts "can prompt task-irrelevant thoughts, or mind-wandering, which has been shown to damage task performance." As a result, students' attention gets diverted from the text, and their time spent reading is not as effective as it would be if they were reading offline books.

Size

Another disadvantage of reading books on smartphones is the small screen size. There is a physical limit to how large smartphone screens can be and still fit comfortably in hands and pockets. Depending on the size of students' hands, a large phone can feel like a small tablet computer. Average smartphone screen sizes are between 5.8 and 6.2 inches according to the website coolblue.be. While a 6-inch screen is large enough to handle many of the functions students want from their smartphones, it might be too small for some to comfortably read for an extended length of time. The website elearningindustry.com notes that "Smaller screens reduce comprehension because the need to call on (far less than perfect) memory for information previously read/seen to make sense of what is currently being read/seen.

Scrolling and clicking introduce more problems, including time lags and interrupted attention.” While website creators design websites specifically for the small screens of smartphones, books are not written to be read on a smartphone. Solid paragraphs of text require constant scrolling and fixed attention. This is why reading books may be more difficult on small smartphone screens.

Reading Paper Books Advantages:

Physical Appeal

The first appealing point about reading paper books is their physical appeal. The feel of an actual book, its weight, smell, and appearance, is more attractive than the rectangular metal, plastic, and glass block of a smartphone. A study by Baron (2016) found that students considered paper-based reading to be “real reading” because the printed page gave them the sense they could “feel” and “smell” the paper, and could “see” where they were in the book. While it might not always be in the front of your mind while reading, when you are holding the actual book it is possible to recognize how many more pages are remaining in the chapter or book. Smartphone versions of books will indicate what percentage of the book has been read, or how many pages are remaining in the chapter, but these are provided with only percentages or numbers. The percentage of remaining pages includes the pages of acknowledgements and (sometimes) a references section, so the number is not an accurate representation of how many more pages of actual text remain. When asked why they prefer reading paper books to smartphones, many readers struggle to express the reason they feel a connection with the paper versions. It has been explained by the website domtar.com that the smell of the book, and the feel of the paper creates a visceral connection with the reader, and feels more personal than reading on an electronic device.

Weight

The next advantage that readers notice is the weight of paper books

is lighter than that of smartphones. As smartphone technology improves, devices continue to get bigger and heavier. For example, in the year 2008 the iPhone 3 weighed just 135 grams and had a screen size of 3.1 inches. Compare that to the iPhone 13 pro Max in 2023, which weighs 240 grams and has a screen size of 6.7 inches, and it is easy to see the growth of smartphones over the past 15 years. Meaningful weight comparisons between smartphones and paper books are variable depending on the book and the smartphone. For example, the starter level graded reading book Robin Hood is listed on amazon.com at just 59 grams and 7.8 inches tall, while the level 2 graded reader Apollo 13 from amazon.com weighs 68 grams and is 7.48 inches tall. Although they are nearly an inch taller than the iPhone 13 pro Max, the paper books are roughly 75% lighter. This weight difference can affect how comfortable or tired a reader feels when holding a book versus a phone for a long period of time.

Ability to Disconnect from Devices

Reading paper books rather than books on smartphones allows students to disconnect from their electronic devices and might improve concentration. Students spend a lot of time using their smartphones and computers, and staring at their screens all day is mentally exhausting. Most students are also multi-tasking when using their phones, switching between sites and texts without spending a lot of time concentrating on any of it. Looking at paper, on the other hand, is less taxing on the eyes than reading off of a glowing screen, and there are far fewer distractions than on smartphones, and therefore reading comprehension of a paper book might be better. Many students appreciate the opportunity to disengage from technology because it clears their brains and gives them a reason to put away their phones. It is calming and refreshing to read and not need to worry about how much power remains in their phone's batteries, whether they have a strong wi-fi signal or none at all, or how many minutes are being depleted from their data plans as they read. Therapists have noticed a correlation between the amount of time a student spends on a device, their hours of sleep, and levels of anxiety and stress. For students who find

themselves too stressed and unable to concentrate on their school work, therapists recommend taking a break from their devices to reduce the constant pressure associated with following news and text updates from friends, family, and even strangers on Instagram and Twitter. By turning off the phones and opening a paper book, students can rest, refresh, reduce their stress, and improve their ability to focus. They will get more enjoyment from the books they read as their comprehension simultaneously improves.

Learn Better from Paper

The last benefit of reading from paper books versus electronic books is discussed in a study published by Virginia Clinton (2019) in the *Journal of Research in Reading*. This study explains that people learn better when they read from paper than when reading from screens. Reading from paper led to faster reading speed, with better accuracy, comprehension, and improved performance on tests connected with the reading material. In terms of how well readers felt they understood the texts, they generally had better metacognition when reading paper books than electronic screens. Clinton suggests that readers feel paper-based texts are more important than those on screens, perhaps because of the association people make with screens and surfing the internet, browsing social media, or watching movies. Conversely, when something is printed on paper, there is a subtle differentiation made by the reader to assume it is more serious and requires a higher degree of concentration. The most significant differences Clinton found were when comparing expository texts, however there were marginally better reading outcomes when comparing narrative texts as well. A study by Mangen, et al. (2019) however, found that students were much better able to reconstruct the plot (by placing 14 events from a story in the proper order) when they read a story on paper versus on a Kindle (which is not a smartphone, but is still an ebook).

Reading Paper Books Disadvantages:

Inconvenience

The first disadvantage of reading paper books over smartphones is the inconvenience to carry them when commuting. While one paper book may be lighter and thinner than a smartphone, carrying multiple physical books becomes heavier and more cumbersome because they consume more space in backpacks. To save time, students often borrow several books from the library every time they visit, so trips to and from the library require much more effort compared to borrowing ebooks on a smartphone, which can be done from anywhere with an internet connection.

Storage

The next disadvantage of physical books is the need to store them when they are not being read. Space is an issue in students' bedrooms and finding a place to put books where they will not be stepped on or forgotten is not always possible. There is a non-zero chance that the books will be misplaced under a bed, in a cabinet, or in an otherwise difficult to find place, which will cause students to forget about them. This is problematic because the student who borrowed the books is not reading them or completing the assignment, and other students are unable to read those books while they are kept out of the library. In the worst-case scenario that a book is permanently lost, the student responsible for that book is prohibited from borrowing more books in the future, which causes more difficulty completing the assignment. All of these problems can be avoided if the books are borrowed online in ebook format. There is no chance of losing the books, even if the device on which they were borrowed is lost. There is no inconvenience imposed on other students by the negligence of just one irresponsible student. There is no need for the school or library to spend money replacing the lost book.

Environmental Impacts

Another disadvantage of physical books is that their production,

distribution, and disposal degrade the environment. Paper books are created from trees and logging trees leads to a host of negative effects including air and water pollution, landslides, floods, species extinctions. First of all, live trees filter out CO₂ from the air while simultaneously producing oxygen. If the trees disappear, there will be more CO₂ and less oxygen. Once a tree is cut down, it must be transported to a paper mill causing more pollution. The production of paper requires the use of dangerous chemicals which further degrade the air and water. Once a book is created, it must be shipped to stores around the world, causing even more air pollution as it is transported. Forests are also the habitat of thousands of species from birds to bears, squirrels to insects, and countless other microorganisms that the entire ecosystem depends on. When the trees in the forest disappear, the animals' and organisms' habitats are lost and the ecosystem collapses. Another benefit of live trees is that they keep the soil rooted in place. When the trees are removed, the earth has nothing to keep it in place and this leads to landslides during heavy rains. Landslides collect in river valleys and dam the flow of rivers, polluting rivers with silt. This causes fish in the rivers to die, and the birds and bears that live off the fish to starve. There is also an environmental impact when a paper book is no longer readable. It must be disposed of, either in a landfill, or by incineration. Both of these methods are destructive to the environment. This is not to suggest that the creation of smartphones does not harm the environment, nor that the electricity required to power smartphones has no negative impact either. Both formats of books are guilty of harming the environment.

Cost

The next disadvantage of physical books over ebooks is their cost. Although this research is assuming that students will not bear the cost because they typically borrow the books from their schools' libraries. However, schools need to spend money on the books they put in their libraries. There is a finite amount of money available to any school's library, and the money that is spent in one place means there is less money to spend elsewhere. Paper books are more expensive to purchase than ebooks.

Additionally, in contrast to paper books, ebooks never need to be replaced due to loss or damage.

Libraries' Externalities

In addition to buying, maintaining, and replacing paper books, physical libraries also have operating costs resulting from electricity usage and librarians' salaries. A librarian must check out paper books to students and reshelve those books when they are returned. These electricity and salary costs are reduced to zero if libraries' collections shift to electronic books. Shelf space in libraries is limited, so the best use of that precious space is to only shelve paper books that do not have ebook equivalents.

Conclusion

In conclusion, both reading books on a smartphone and traditional paper books have their own advantages and disadvantages, and the choice between the two ultimately depends on individual preferences and needs. Some people may prefer the convenience and accessibility of reading books on a smartphone, while others may find the physical appeal of paper books and disconnecting from digital devices more appealing. The potential adverse health risks associated with reading on a smartphone should not be ignored, but that issue might not be a strong enough reason to discount smartphones' convenience and utility. After all, there are remedies to mitigate these bad health effects, such as taking a break every 30 minutes, or adjusting the brightness of the screen. Additionally, many students already look at their smartphones during their free time. One could reasonably suggest that any bad health effects that result from excessive use of their smartphones would happen whether or not the students are reading books on their phones. More research is necessary to determine which method of reading leads to greater comprehension. Future research will assess students' preferences and their success rate on post-reading quizzes to determine if there is any correlation with the mode in which they read. Regardless of which option students choose, both offer the opportunity to enjoy reading, learn new information, and expand their base of knowledge.

References

- Baron, N. S. (2016). *Words Onscreen: The Fate of Reading in a Digital World*. Oxford University Press.
- CFS Editorial Team. (2020). Ways To Prevent Eye Fatigue During Work From Home. <https://www.centreforsight.net/blog/ways-to-prevent-eye-fatigue-during-work-from-home>
- Charby Admin. (2022). How Often Should I Charge My Phone To Prolong The Battery Life? <https://charbycharge.com/how-often-should-i-charge-my-phone-to-prolong-the-battery-life/>
- Clinton, V. (2019) Reading from paper compared to screens: A systematic review and meta-analysis. *Journal of Research in Reading*, 42: 288–325. <https://doi.org/10.1111/1467-9817.12269>.
- Domtar Newsroom. (2019). 5 Reasons Paper Books Are Still More Popular Than ebooks. <https://newsroom.domtar.com/paper-books-still-popular/#:~:text=Better%20Sensory%20Experience%20E%28%94%20The%20feel,and%20flipping%20through%20the%20pages.>
- Elish, J. (2015). Cell Phone Alerts May Be Driving You To Distraction. <https://www.fsu.edu/indexTOFStory.html?lead.distraction>
- <https://www.amazon.com/Penguin-Readers-Starter-Level-Graded/dp/0241463394>
- https://www.amazon.com/Apollo-Pearson-English-Readers-Penguin/dp/1405881569/ref=sr_l_1?crid=1FX5RY99WBOX0&keywords=level+2+graded+reader+Apollo+13&qid=1675738562&s=books&prefix=level+2+graded+reader+apollo+13%2Cstripbooks-intl-ship%2C226&sr=1-1
- Kakehi, T. (2019). White on black or black on white? The pros and cons of Dark Mode. <https://uxdesign.cc/white-on-black-or-black-on-white-the-pros-and-cons-of-dark-mode-3439e37d6c6c>
- Mangen, A. (2019). Comparing Comprehension of a Long Text Read in Print Book and on Kindle: Where in the Text and When in the Story? *Frontiers in Psychology*. 10.10.3389/fpsyg.2019.00038.
- Michaels, P. (2023). Best phone battery life in 2023: The longest lasting smartphones. <https://www.tomsguide.com/us/smartphones-best-battery-life,review-2857.html>
- Ratini, M. (2021). Ways Your Smartphone Can Wreck Your Health. <https://www.webmd.com/balance/ss/slideshow-smart-phone-health-problems#:~:text=Too%20much%20time%20looking%20down,Try%20not%20to%20hunch%20forward.>
- Shank, P. (2020). Minimizing Challenges Of Learning From Smaller Screens. <https://elearningindustry.com/minimizing-challenges-of-learning-from-smaller-screens#:~:text=Smaller%20screens%20reduce%20comprehension%20because,time%20lags%20and%20interrupted%20attention.>
- Thomas. (2022). What Size Smartphone Do You Need? <https://www.coolblue.be/en/advice/smartphone-screens.html>
- Thompson, A. (2019). Study: Paper Reading More Effective Than Screen Reading. <https://learningenglish.voanews.com/a/study-paper-reading-more-effective-than-screen-reading/4876473.html>

