

# Reading Patterns, Scanning, and the “Control F”/Search Icon: How Students Really (Don’t) Read

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Received: March 29, 2023      Accepted: April 25, 2023      Published: April 27, 2023

doi: 10.5296/ire.v11i1.20943      URL: <https://doi.org/10.5296/ire.v11i1.20943>

## Abstract

The purpose of this research was to investigate whether digital reading had an impact on reading skills, as well as students’ tendencies to read online or offline in the L2 English speaking classroom. This quantitative-qualitative mixed methods case study involved was comprised of a convenient, purposive sample of 15 participants for semi structured focus group interviews in an English-speaking private university. The findings seem to suggest that reading digitally prods students not only to adopt skimming patterns, but to use the “Control F” command to bypass reading altogether. Furthermore, students’ reading preferences for online/offline material was also revealed, showing a significant tendency of students to revert to online material “just to understand” or “get an idea” while deep understanding was substantially associated with preference for offline reading.

**Keywords:** digital media, online reading, reading patterns, offline reading, performance, “Control F”

## **I. Introduction**

### *1.1 The Problem*

On March 6, 2009, Google's CEO, Eric Schmidt publicly announced his concern for the plethora of information disseminated by the internet which inherently affects not only cognition, but the way students read (as cited by Carr, 2010, pg. 89). The concerns of Mr. Schmidt regarding the internet, digital reading and the mannerism by which information has become revolutionized, morphing itself into an influx of never ending, surface level micro-bits of entertainment (Wolf, 2018), has indeed become a major concern for many a parent, instructor and researcher in the field of technology in education. According to a report by the World Economic Forum (2016) mankind is indeed stepping well into the threshold of the Fourth Revolution, the Digital Revolution, which was initially preceded by the First Industrial Revolution of 1784 which revolved around production using water/steam engine, the 1870's Second Electrical Revolution spurred by Taylor's electric power to spur assembly line mass production, and subsequently, the Third Revolution which used electronics to automate production circa 1969 leading well into the Digital Revolution, one marked by the ubiquity of digital interfaces pervading human lives in the personal, social, and professional.

Moreover, the ubiquitous use of digital screens did not occur overnight; rather, it happened in incremental stages, starting as early as the 1990's when personal computers became affordable, internet services became reliable (Baron, Calixte & Havewala, 2017) and communication channels such as text messaging and emails were commonplace. Later, the advent of the smartphone took communication to another new level with the ability to access emails and messages instantly. However, it wasn't until the creation of Amazon Kindle in 2007 and the iPad in 2010 that an explosion in digital reading was sparked (Baron et al., 2017). By then, higher educational institutions had started to adopt E-books in their course curricula as they were predominantly driven by economic considerations (Baron, 2015). In addition, with the development of learning management systems, educational institutions were increasingly posting digital material online allowing for easier accessibility of material for students (Baron et al., 2017). Moreover, with the creation of more variegated social networking sites allowing youth continued connection such as Instagram, Twitter, Whatsapp, Facebook, Snapchat among others, adolescents and young adults spent more time on their laptops and mobile phones, thus preferring to access their academic material digitally (Lim, Whitehead & Choi, 2021). The reasons for their growing popularity lie inherently in the myriad advantages entailed in their usage.

Digital technology's positive impacts on reading and learning abound, specifically as concerns economic costs. Youth are often thought to be prodded to choose digital screens

over printed forms to tap into their assignments. Furthermore, ease of access to academic material from any digital device anywhere (Baron et al., 2017) is yet another reason that the current corpus of literature has revealed favorable use of digital technology in student learning. In addition, Mangen, Olivier & Velay (2019) equally argue that digital devices allow for the storage of copious amounts of texts on simple, lightweight devices, thus minimizing storage space, which may equally be another probable reason students gravitate towards them. In addition, Martin-Beltran, Tigert, Peercy & Silverman (2017) also contend that adolescents and youth alike are more inclined to use digital devices for their lighter portability (one laptop as opposed to many text books). Still, other reasons advocating the likely tendency for adolescents and youth to prefer screen reading over print is for environmental considerations as less paper is consumed (Mangen, Olivier & Velay, 2019). Moreover, students and youth alike are equally likely to favor digital texts as they claim more engagement through collaborative group work, videos, hyperlinks and other interactive media which they claim makes the lesson more stimulating and engaging (Riddler, 2000). Furthermore, Walsh (2016) argues that students are more likely to gravitate towards digital reading as they claim different reading experiences through the navigation of hyperlinks where students find “easy, quick information”, (Alcott, 2019, pg. 3); thus, digital reading invites students to read in a non-chronological, almost loop-like fashion instead of reading from beginning to end as they would a printed text (Walsh, 2016).

However, what truly took the world by a storm and revolutionized the use of digital technology within the educational landscape sending it into upheaval was the Corona Virus Pandemic of 2019. With the onset of Covid 19 which had exacerbated and disturbed the educational sector’s traditional status quo of books and print, neither instructors nor students had had sufficient experience in navigating and utilizing information computer technology (ICT) for online courses in a sudden and almost immediate manner (Hussein, Daoud, Alrabaith & Badawi, 2020). Many governments around the globe went into lockdown in the hopes of containing the pandemic (Bele et al., 2020). Consequently, with the global decisions of schools to close their doors to students as of March 2020, 1.6 billion learners (94% of the student populations) in over 190 countries were impacted (Hussein et al., 2020). It was then that governments, schools, colleges, universities, and variegated learning centers alike took the unanimous decision to shift learning to digital spaces and platforms in order to salvage the situation under crisis management conditions. With the passage of time, however, rising concerns over a growing corpus of research seem to indicate that this increased exposure to technological devices may be compromising students’ reading skills in the technology immersed L2 language classroom. Moreover, and in line with the afore-mentioned, the current corpus of literature seems to equally present another side to the story, namely, that as the dramatic shifting of reading media occurred via digital devices, so has there been an

equally disheveling shift in the reading experience itself (Durant & Horova, 2015) that may have indeed propelled possible negative repercussions, not only on the student's attention, focus and concentration, but on their ability to think deeply and critically (Carr, 2010; Greenfield, 2015; Wolf, 2018; Baron, 2021).

Thus, Carr (2010) argues that intelligence markers whether on IQ scores or other tests that measure intellectual skills also seem to be witnessing a steady decline. On IQ tests, for example, Carr (2010) reports a steady drop in overall test scores involving memorization, general knowledge, reading skills and vocabulary as well as basic arithmetic, while also supporting his findings with standardized tests used as entrance exams such as the PSAT (Preliminary Standardized Aptitude Test) scores between the years of 1999 to 2008. According to Carr (2010), although the internet was expanding at an unprecedented rate in both homes and schools at the said time, he argues that math scores dropped from 49.2 to 48.8, where the starker declines were in verbal sections of critical reading scores falling a good 3.3 percent from 48.3 to 46.7 percent. Furthermore, he also posits that writing skills scores also plummeted from 49.2 to 45.8. Similarly, a 2007 report from the United States Department of Education showed that literary reading aptitude dropped 12 percent between the years of 1992 and 2005. Even more alarming was the 2018 PISA report (Program of Student International Assessment) between the years of 2006 to 2018, marking Canada among the countries with continued declining overall scores, with a 35-point drop in reading, an overall 34 decline in science an equally alarming 46 decline in math scores in different provinces.

Hence, one can only seemingly entertain concerns that are indeed justified: how is it possible that with the ubiquity of technology permeating people's personal lives, homes, workspaces and places granting the world at the mere touch of fingertips, people seem to have poorer vocabularies, compromised attention spans and almost incapacitated memories? Can the lower scores across various IQ tests, PISA and PSAT tests indeed be attributed to reading using digital devices? With such serious concerns, the current literature at hand strongly suggests that there is indeed a problem.

### *1.2 Significance of the Problem*

The research at hand is significant in that it attempts to shed light on the possible consequences of reading using digital devices. A noteworthy corpus of literature has been undertaken to explore the possible impact of reading digitally on students' critical reading skills. However, with variegated research come equally variegated conclusions: while certain research seems to suggest that there is no impact of digital devices on reading skills such as that of Margolin et al., (2013), other research seems to suggest that indeed, digital texts enhance reading skills such as the works of Moehring et al., (2016) as well as Verdi, Crooks

& White (2014) whose research claims superior comprehension of digital texts compared to print. However, still other research alarmingly claims the opposite; namely, that digital devices may indeed be negatively impacting students' reading skills. Studies by Mangen et al., (2013), as well as Noyes, Garland, & Robbins (2004) seem to suggest that in fact, reading using digital devices compromises reading comprehension. Moreover, Singer & Alexander (2017a) suggest that as texts become longer, student comprehension is compromised, while still other studies such as Wastlund, Norlander & Archer (2008) suggest that reading off digital devices may induce interruptions in reading thus increases cognitive overload, lowering comprehension and overall understanding of the text. In response to such sharp declines in such scores, CIVIX, a Canadian Education Charity issued a report written by Pavlounis, Johnston, Brodsky & Brooks (2021), boasting of refined tech skills that would enable students to use "Control F" as a reading tool to help distinguish false claims when students read online texts in minimal time and with heightened accuracy. The report claimed that while Canadian students were struggling with evaluating online information, the above-mentioned tool was thought to remedy the growing digital literacy gap exposed through lowered reading comprehension scores on Canadian PISA scores.

### *1.3 Literature Review*

#### *1.3.1. Distractions, Visual Fatigue and Deep Reading*

One common misgiving concerning reading on digital screens is that it exposes students to many distractions. Spence, Beasley, Gravenkemper, Hoefler, Ngo, Ortiz & Campisi (2020) contend that digital reading is likely to induce distractions in the form of the pop-up messages as well as the lighting of the text. Williams (2011) further claims that notifications through beeps and buzzes for emails, instant messaging as well as actual phone use (Spence et al., 2020) not only serves to distract the student him/herself, but also acts as a distractor for other students in the classroom as well. Loh & Kanai (2016) equally argue that while students have been working on digital devices, they have also been noted to do other tasks during a lecture, which later compromised their performance. Furthermore, Singer & Alexander (2017) suggest that digital devices may likely cause eye strain (Mangen, Olivier & Velay, 2019) and visual fatigue, thus interrupting students' deep reading. These interruptions are likely due to the distractions inherent in the nature of liquid crystal display (LCD) screens such as the flickering light, constant refreshing of the webpage as well as contrast levels. Hence, the following sections will further elaborate in more detail the various features inherent in the use of digital screens that are likely to cause distractions such as hypertexts.

### 1.3.2 Hyperlinks and Cognitive Demands

Furthermore, Loh & Kanai (2015) contend that hypertexts, nonlinear nodes of information (Naumann, 2015) can bear a heavy burden on cognitive load and so impact memory negatively in several ways. According to Loh & Kanai (2015) hypertexts can impose additional visual demands as the reader tries to visualize the constantly changing pattern of the texts online; thus, the more the changing format of the reading texts, the more likely the student will revert to skimming as opposed to in depth reading and thinking critically. Carr (2010) further posits that hypertexts prod the reader to collect myriad snippets of information in fragmented form, inciting students to jump between one snippet of information to the next, likely disallowing very little, if any, cognitive processing demands which involve the linking the newly found information with prior knowledge and deriving meaning out of it. In addition, hyperlinks may likely impose other cognitive demands; namely, evaluating hyperlinks and deciding which ones are worthy of follow up. That is, in navigating online texts and the inclusive hyperlinks embedded therein, and in order for the reader not to get “derailed” off the original research question which s/he started with when reading online, the reader needs to evaluate and decide which hyperlinks are worthy of pursuing and which are meant to be ignored (Baron, 2021). Thus, such additional processing demands impose extra cognitive effort in assessing which hyperlink to follow and which to forgo over and above the processing the information from the text-altogether- take their toll on the working memory, defined by Carr (2010) as the amount of attention utilized for keeping information in the mind. Consequently, he argues that hypertext environments may reduce the cognitive resources available for deeper information processing and memory consolidation specifically due to this continued imposed cognitive demands of sifting through and evaluating hyperlinks. Still, there are other features that are likely to demand distractibility on the part of the student, namely through the interactive features inherent through online reading texts.

### 1.3.3 Interactive Media, Reading and Digital Text Layout: scrolling and memory recall

Yet another form of distraction is also inherent in the very nature of digital screens and their interactivity lies in the form of texts and their respective layout. When reading online, the actual presentation of the text is set in a dynamic medium where the boundaries of information accessible are constantly changing (alternating the size of the document, column length, and fonts) (Carr, 2011), which in the long run may hamper the brain’s ability to retrieve data through visualization, thus weakening memory recall. Greenfield (2015) argues that the better the spatial-mental representation of the reading text’s physical layout-meaning the more the reader is able to remember the physical layout of the text along with its distinctive characteristics, the more likely it is for a student to have better reading comprehension. Singer & Alexander (2017) also contend that due to the ever-changing nature

of digital readings, students are unable to feel and experience the actual dimensions of the text (length and breadth) which are otherwise present in printed material, thus compromising memory recall. Baron (2021) equally contends that while reading via digital screens, students are required to scroll down to continue their reading which is also likely to compromise comprehension. Cull (2011) posits that this is likely due to the fact that scrolling requires more mental effort than reading offline (which does not require scrolling). Cull (2011) claims that this is so as students are likely to try and pinpoint their spatial location throughout different sections of the text while recalling and maintaining reading continuity, thus taxing the student mentally. Meanwhile Proaps & Bliss (2014) suggest through their research that students are likely to face challenges in remembering information on a digital document as they scroll through it; their preferences would likely gravitate towards a stable screen-set text which would offer the reader a temporary frame of physical reference likely to enhance memory.

Singer and Alexander (2017) argue that yet another default of digital screens is that they promote discontinuous reading as students scroll the pages back and forth whilst they read, thus interrupting students' processing of information, adding further cognitive load which in turn may negatively impact memory recall. Mangen et al., (2013) equally posit that scrolling challenged students' spatial memory of where text would be located on a page, hindering their ability to construct a coherent mental text model. Moreover, Mangen, Olivier & Velay (2019) that memory is likely to be compromised while reading digital texts due to the increased mental and sensorimotor effort that students would need to additionally exert to go back and forth through the digital text to recall any given detail. Mangen, Olivier & Velay (2019) contend that since screens lack visual anchors that enable the reader to link a piece of information to the page it is located in, the construction of information with its respective spatial location is therefore likely to be compromised, which is explained in further detail below.

#### 1.3.4 Developing a Digital Reading Mindset

Given the dynamic nature of digital texts vis a vis screen size, fonts, hypertexts, scrolling, a digital reading mindset, according to Baron (2021) develops. Baron (2021) defines the digital reading mindset as one that adopts certain behaviorisms pertaining to reading off digital screens. Such behaviorisms include speed reading, multitasking, as well as skimming and scanning for information. According to Singer Trakhman et al., (2019) there occurs a trade-off between speed and accuracy when students read online, as they can navigate through the digital texts with a great deal of ease and speed, however, at the likely expense of accuracy. Furthermore, Baron (2021) equally posits that among the variable reasons students seemingly prefer reading digital texts is that they appeared shorter.

In turn, this phenomenon lends itself into the second main “allure” for digital reading; namely, reading via digital texts allows for the phenomenon of multi-tasking. Multi-tasking, or the juggling or switching of cognitive attention between two or more tasks offers a great deal of allure to students as they may likely be “connected” to social media platforms which render “likes”, comments, Tweets, followers as well as other messages while students are concurrently reading on their digital devices. Not only is this set up possibly very distracting to the student, causing interruptions at the cognitive level, but this continued connectivity on social media platforms exposes students to continued, repetitive, interactive and very addictive-multi-sensory stimulation which is also dopamine induced and thus, according to Carr (2010) may very likely rewire the brain circuitry creating alterations in the neuronal circuits and functions. Daniel Levitin, a neuroscientist at Stanford University claims that multitasking is likely to create what he referred to as a dopamine-addiction feedback loop where the brain is “rewarded” for altering its focus and constantly searching for stimulation, often likely to be external. Moreover, Levitin (2015) posited that the situation is further exacerbated by the brain’s prefrontal cortex whose tendency is to gravitate towards what Levitin called a “novelty-bias”; that is, the tendency of the human brain to direct its attention to any new phenomenon. Thus, what this means in layman’s terms is that it would therefore take more effort to keep one’s focus on task while reading via digital devices. Furthermore, Durant & Horova (2015) argue that this continued fragmentation of attention is likely to yield impatience and a constant need for stimulation. It comes as no surprise then, that students tend to find reading in print “long” and “boring” (Baron, 2021).

Consequently, and still another likely “allure” to reading using digital devices is the tendency of students to skim and/scan texts. Carr (2010) posits that due to the dynamic nature of digital screens as well as the pervasiveness of hypertexts, digital texts promote keyword searching, power browsing, one-time, nonlinear reading at a very superficial level. In fact, in 2006, Jakob Nielsen had discovered that as people read on the web, they very likely revert to using patterns. Neilson discovered the first pattern where readers would likely start off by glancing at the first two or three lines of the text and then their eyes would drop down a little in the form of an “F”. In fact, his first discovered pattern was called the “F” pattern, where “F” stands for “FAST” reading. Later studies by Neilson also discovered other patterns to reading online.

Another pattern which online readers may likely employ is the spotted pattern (Pernice, 2019). This pattern focuses on fixating specific words or phrases spread throughout the page. The reader chooses these specific words since they are likely to be directly linked to the target questions on the exercise/exam. Generally, Pernice (2019) posits that the spotted pattern is used when the reader searches for key words similar to those more often used with words that visually stand out. Yet another digital reading pattern is known as the layer cake pattern



(Moran, 2020) whereby the reader fixes attention on headings and subheadings. On an eye-tracking heat map, this pattern presents itself as a series of horizontal lines separated by spaces in between (resembling a cake, thus the name). This pattern is likely to be the most commonly used patterns students use as they skim through their readings (Moran, 2020).

Still another pattern is the Zig-zag or Z pattern where the readers start “reading” from the top left corner of the document and then swing to the top right corner, dropping down diagonally to the bottom left and finishing at the bottom right of the document, almost in an imaginary “Z” shape (Pernice, 2019). Often, readers would likely revert to this method of reading when oscillating between texts and images. Finally, there is the commitment pattern which is equivalent more or less to traditional reading and not skimming. Normalized reading happens in this pattern with regular fixations on words and ideas as they are linearly and sequentially presented. Students likely use this pattern when they are reading directions of perhaps reviewing content for their exams. The commitment pattern is most likely the best pattern of reading for comprehension on the part of the student, although it is more time consuming than the first four.

However, the commitment pattern caters to more improved comprehension when the text is broken down into headings and subheadings, allowing the reader to mentally map and outline what is being read (Pernice, 2019). Moreover, Cosgrove (2018) posits that as digital texts offer few physical/structural cues to the reader, headlines are necessary in order to allow the person reading to organize information mentally. In addition, Neilson (2016) contends that readers often are likely to revert to power browsing and skimming online texts through the afore-mentioned patterns rather than actual committed reading engagement, claiming that, “on average, readers read 20-28% of the words per given page” (pg. 5).

Hence, to recap wholistically, reading via digital devices may render certain benefits, such interactivity and collaborative opportunities for learning offered by shared digital content, saving on space in storing copious amounts of information, economic costs as well as convenience in accessing educational tools as well as ease of portability. However, according to the existing corpus of literature, the downsides of digital reading are noteworthy of concern possibly forgoing their novel benefits. Among the myriad attributes inherent in the nature of digital devices impacting their constructiveness are the distractions offered when using digital devices in the form of messaging, notifications due to continued connectivity with social media platforms and applications, as well as the visual fatigue. Furthermore, cognitive demands impacting memory recall have also been reported due to the presence of a dynamic screen promoting scrolling, hyperlinks, changing of size and screen font. Consequently, and to the effect of the afore mentioned, a digital mindset promoting superficial reading patterns, as well as skimming and scanning have likely resulted in

compromising deep, critical reading and impacting comprehension performance on variegated standardized test scores to a large extent.

#### *1.4 Purpose of the Research and Hypotheses*

Hence, this research has two basic purposes; the first is that it aims to shed light on the impact of digital devices on students' reading skills and perhaps portray how students engage with reading as they navigate online texts. Specifically, and in line with CIVIX's newly founded feature, "Control F", the research's aim is to investigate the impact of this tool on reading digitally among students. The second purpose of this research is to investigate students' tendencies towards online/offline content in the L2 classroom. The findings of this study could possibly guide English school teachers as well as university instructors of English to take actions enhancing students' proficiency levels in reading, deciding what skills to promote, which to perhaps by-pass and which to underscore and how to navigate online texts comprehensively. The significance of this research also lies in its ability to fill the national and international research gap on the requisites of implementing online reading. To sum up, this research may serve as guide for teachers and university professors possibly helping them how to implement online reading as part of their teaching practices. Thus, the research at hand will attempt to address the following research questions:

**-To what extent does reading on digital devices impact students' reading skills?**

**-What preferences do students seem to have when reading in the L2 classroom?**

Thus, the purpose of this research is to investigate the extent to which reading on digital devices may in fact impact reading skills, and to shed light on students' preferences, whether online or offline, in the L2 classroom.

## **2. Methods**

### *2.1 Participants*

In a private, English-speaking university in Beirut, Lebanon, during the Fall semester of the academic year 2022, 15 students were chosen for semi-structured, focus group interviews. The students were chosen from two, researched-based courses in the English Language Sequence Program: Academic English, or English 102 henceforth, and Advanced Academic English, or English 202 henceforth. There were two sections per course: namely, English 102 sections A and B, as well as English 202 sections A and B.

### *2.2 Sampling Procedures*

Students were given four reading achievement exams as part of the course requirements in both English 102 and 202. The exams were categorized as such: online long reading exam,

offline long reading exam, online short reading exam, and finally offline short reading exam. After administering the four reading achievement exams, sixteen students were chosen based on their average scores on the reading exams. The sample at hand was a purposive non convenient sample. It is noteworthy to mention that the students were selected from the researcher's workplace and so accessibility of data collection was made feasible. Approximately two to four students were chosen from each section based on their performance scores on the said reading achievement tests and their voluntary willingness to participate. Scores were categorized into three sections: proficient scores ranging from 100-77, average proficient scores ranging from 76-67 and non-proficient scores ranging from 66-and below. In turn, upon requesting permission to interview students in semi structured focus group interviews, those interested acquiesced as participation was completely voluntary. Furthermore, students were debriefed about the purpose of the interview once they had given their approval to the researcher. Finally, the researcher also requested permission to record the interviews by phone, to which the participants equally acquiesced.

### *2.3 Research Design*

The study at hand is a mixed-methods, quantitative-qualitative case study and involves semi-structure, focus group interviews of sixteen students. The interviews took place off campus, in a neutral space of a café, not far from the university and had a duration of approximately two and half hours. Afterwards, the interviews were transcribed verbatim and analyzed according to repeated coded themes.

## **3. Results**

### *3.1 Reading Test findings, Patterns and the Control F Chart*

The findings attached below show the student anonyms, the course and respective student scores, whether or not students actually read, what skimming reading patterns they employ and whether they also employ the "Control F" search tool. The latter, in fact, was a finding that was uncovered by coincidence during the data collection process. While taking an offline exam, one proficient student asked the instructor if they could access the text online in order to search for a word they couldn't seem to spot during the reading. The findings seem to indicate that students who read using the commitment pattern in addition to using variable reading patterns online and offline, and who equally used specific reading strategies such as note-taking, re-writing the material on their own notes and memorizing them, in addition to using the "Control F" icon scored exceptionally well with an overall proficiency score ranging from 84-90, while those who only differed in that they didn't employ "Control F" had scores lower by three to four points. Similarly, students who used the "Control F" along with other skimming patterns replacing reading altogether had lower scores than their

proficient counterparts by as much as 12 points. Moreover, students who did not employ the commitment pattern -meaning they don't read in general, who lacked a solid reading strategy of note-taking, summarizing and re-writing notes, and who instead employed variable skimming reading patterns online and/offline, in addition to using the "Control F" icon were categorized in the Non-Proficient section as they scored rather poorly, with scores ranging between 64 and below. Interestingly enough, students who did not read, meaning they did not employ the commitment pattern when they read documents online or offline, and who did employ reading strategies or note-taking, summarizing and memorizing-could not compensate for better performance when using the "Control F". As such, the findings seem to suggest that the tool "Control F" is not a compensatory tool to use for reading comprehension exams in replacement of actual reading employing the commitment pattern. Furthermore, reading patterns suggested by Neilson (2016) are neither comprehensive tools for reading nor do they contribute to a solid performance score on their own; however, that being said, the variable strategies can be conducive to proficient performance if used as pre-reading strategies in addition to the commitment pattern. Included below are the reading patterns, strategies and scores.

Table 1. Proficient Students

Name/ Patter ns	Scores Proficie nt (P)	F shape	Spot	Commitme nt	Reading Strategie s Used	ZigZa g	Layer Cake	Control F
R.e.A (102A )	80	Online/ offline	Onlin e	Offline only	Re-write Memori ze	Onlin e	No	Yes
MR (102 A)	87.5	Online	Onlin e	Online/offli ne	Re-write / Memori ze	Onlin e	Onlin e Offlin e	Yes
RY (102 A)	78	Online/offli ne	Onlin e	Offline only	Re-write Memori ze	No	Onlin e	Yes
Mo (202 A)	87.5	No	Onlin e	Online/offli ne	Re-write Memori ze	No	Onlin e	Yes
Th (202 B)	85	Online	Onlin e	Online/offli ne	Re-write / Memori	No	Onlin e	No

					ze			
JY (202 B)	84	Online	Onlin e	Online/offli ne	Re-write Memori ze	Onlin e	Onlin e	No

Table 2. Average Proficient Students

Name/Pattem	Scores/ Average Proficient Avg P	F-shape	Spot	Commitment	Reading Strategies Used	Layer Cake	Zigzag	Control F
LY (102 B)	73	Online / Offline	Onlin e/ Offline	No	Read only  Re-write at home	No	Onlin e	Yes
LnD (102 A)	75	Online / Offline	Onlin e	No	Read only  Memoriz e from screen	Onlin e/ offline	Onlin e	Yes
JDD (202 A)	75	Online / Offline	Onlin e	No	Listen in class/  Memoriz e from screen	Onlin e/ Offline	Onlin e/ Offline	Yes
N (102 A)	74	Online / Offline		No	Read only  Memoriz e from screen			Yes

Table 3. Non Proficient Students

Name/ Pattern	Score Non Proficient NP	F shape	Spot	Commitment	Reading Strategy Used	ZigZag	Layer Cake	Control F
TnA	60	Online / Offline	Online / Offline	No	Paraphrasing	Online	Online / Offline	Yes
Rsh	58	Online / Offline	Online	No	Notes from friends	No	Online / Offline	No
Rmm	67	Online / Offline	Online	No	Notes from friends	Online	Online / Offline	Yes
Nh	67	Online / Offline	Offline	No	Notes in class	No	Offline	No
Jnfr	64	Online / Offline	Online	No	Read to understand/ Notes in class	Online / Offline	Online	Yes

### 3.2 Interview Findings

The responses for the interviewees were as checkered as the students' proficient/ non proficient and average proficient scores. For example, when asked whether the preference is for online or offline reading, one student diagnosed with ADHD answered:

*-R.e.A.: It's harder for me to read a physical book. I can't concentrate as much. I feel like e-books are more interactive. They're more engaging.*

While another student, MR, found note-taking on computers was more attention grabbing as:

*-MR: I find it more fun typing/studying on my computer because I add colors and stuff.*

Furthermore, online reading was deemed attractive to students mainly for economic reasons primarily, then for convenience reasons:

*-TnA: I prefer reading online because I can read what I want without needing to buy the book*

*-LnD: It's also cheaper to read online; it's good for the environment.*

*-R.e.A: It's more convenient cause if you turn off the lights or if there's a power outage, you can just continue reading on your phone because of the electricity outages. You don't have to worry about forgetting the book somewhere; it's there on your phone all the time.*

Similarly, online reading was preferred to "quickly get an idea about a certain topic" as some respondents phrased it.

*-LnD: If I wanna quickly understand something, like I wanna skim, I read online. I read online when I want to know the main ideas just quickly; I don't want to go deep into it.*

*-I just have to understand it so I keep it online.*

*-N: I would read online to get a quick idea about something*

*-JDD: If the article is easy to understand, I read it online, but I if I need to analyze it, then I print it.*

*- K: Reading offline feels too disassociated, too disconnected and nothing is within reach, nothing is accessible. Reading online is much easier.*

Still, some students, when asked whether they preferred to read online or offline, their responses were:

*-Nh: I don't read.*

*-Rmm: I don't like to read, neither online nor offline.*

*-Rsh: I don't read, miss. Not even in my free time.*

When asked about the “Control F” tool, some students answered:

Table 4.

Control F-	Student anonym	Quotations
	<i>Mo</i>	<i>I agree; I recently started using the SEARCH icon and only in tests or if I am looking for certain words. It saves time.</i>
	<i>Jnfr</i>	<i>It helps when you have comprehension or when I am looking for something specific. Why should I have to go through all this useless information when I can get to the main point?</i>
	<i>LnD</i>	<i>When you have a whole pdf to read, if you just need the main points-so why I have to read the whole thing when I can put in a word and get the basic points about it?</i>
	<i>JDD</i>	<i>I read the question first and I look for the keywords in the question. I would write the keywords and it will take me to where this word is mentioned. It takes less time to find and is more accurate. -You can find directly the main idea that you need and skip all the ideas that you don't need in order not to waste time.</i>
	<i>RBG</i>	<i>I use the search icon mostly when I have something specific in mind to look for and read about. It is more time efficient if I am targeting a certain piece of information. I don't have to read the whole article, and it is very accurate. I like it.</i>
	<i>RY</i>	<i>I need to answer this question and I have ten minutes left. I am not gonna read the whole thing to find one word. I am just gonna find the word through SEARCH.</i>
	<i>K</i>	<i>I would use it when I am reading something like an online article and mostly during tests because I have limited time.</i>

Out of the 15 students, four students did not know about the “Control F” icon and so did not use it. Of the 15 students, only 5/15, or 30% engaged in deep, committed reading, while the rest simply adopted reading patterns as well as the “Control F” to answer the reading tests.



Proficient students who employed skimming patterns as pre-reading strategies, in addition to note-taking and summarizing, and who employed the commitment pattern both online and offline scored between five to ten points more than their counterparts who employed the commitment pattern offline. Moreover, average proficient students who employed note-taking/summarizing strategies while studying and who used the “Control F” in addition to skimming patterns scored at least eight points more than their non-proficient counterparts who did not employ note-taking/summarizing strategies but used similar patterns.

When asked what challenges students faced when they read online, some of the responses were:

Table 5.

<i>Distractions during Online reading</i>	<i>Student anonyne</i>	<i>Quotations</i>
	<i>JDD</i>	<i>If I stay on my computer, I zone out immediately. It is very easy to get distracted online.</i>
	<i>RY</i>	<i>I can't read online. The idea gets lost. I have to re-read the same sentence twice. I lose focus when I am reading online</i>
	<i>LY</i>	<i>I can not focus online-too distracting with text messages, Instagram and other notifications.</i>
	<i>TnA</i>	<i>I get distracted when reading online and so I have to go back and re-read all over from where I got distracted.</i>
	<i>MR</i>	<i>I get distracted when I read online. I mainly zone out.</i>
	<i>Mo</i>	<i>If I read online, I will get distracted.</i>
	<i>JY</i>	<i>And if I read online, I sometimes have to re-read to understand because I get distracted by the notifications and messages.</i>
	<i>K</i>	<i>Another thing I don't like about online reading are the ads and these can be annoying and distracting.</i>
	<i>TH</i>	<i>When I am reading online, there are many distractions, you know, like I get notifications from friends.</i>
	<i>N</i>	<i>I prefer to read offline because when I read online I tend to disassociate and disconnect more when I read online. Plus, my eyes start to hurt.</i>

And where preferences for working offline were many because:

Table 6.

<i>Offline to focus more</i>	<i>Student anonymo</i>	<i>Quotations</i>
	<i>LnD</i>	<i>Whenever I have something where I have to focus a lot on it, I immediately print it.</i>
	<i>Mo</i>	<i>I would rather have a hard copy rather than an online copy because I can't focus while I am reading something online. It is easier for me to remember what I have read with a hard copy. -I can't read a chapter online; I would lose focus.</i>
	<i>R.e.A.</i>	<i>But like when I write them down while preparing for the exam, it is there that I have secured the information. I remember immediately.</i>
	<i>RY</i>	<i>Whereas when it is a physical paper, I can keep my focus long.</i>
	<i>K</i>	<i>When I want to study for an exam, I prefer to study offline because I can focus more.</i>
	<i>LY</i>	<i>I just focus more offline. If I want to read an article, I can only focus by writing and keeping the details in a book.</i>
	<i>MR</i>	<i>Holding a book used to help me focus more like because I can just sit on my bed and hold the book and just read.</i>
	<i>TnA</i>	<i>Because I think when you read, you have the papers in your hand and you focus more. You remember more of what you read.</i>
	<i>N</i>	<i>Work for uni I usually like to print it out because I can see it in front of me and I concentrate more. - I like taking notes more than typing since I feel the information would stick in my head, so it's in my memory.</i>
	<i>TH</i>	<i>If I want to get into what I am reading, I read offline. The book is something else; you know, the smell of pages, the touch-it's a unique experience.</i>
	<i>JY</i>	<i>I prefer offline because like I know I focus on what I am reading and this isn't possible on screen. If I want to memorize, it has to be offline.</i>
	<i>JDD</i>	<i>If the book is small, I print it out because I focus more this way.</i>
	<i>Jnfr</i>	<i>When I tend to read something on my phone or my laptop; I don't focus.</i>

And finally, when asked about what strategies students used that helped them remember and own course-related content some of their responses were as follows:

Table 7.

<i>Strategies</i>	<i>Student Level: P/Avg P/NP</i>	<i>Quotations</i>
	<i>JDD: (Avg Proficient)</i>	<i>I don't annotate; I underline</i>
	<i>LY: (Avg Proficient)</i>	<i>If I have an article, I copy/paste it on Word and then I print it out and read it till I memorize it.</i>
	<i>N: Avg P (Average Proficiency)</i>	<i>So I would read the articles online, get ideas then type them to remember them as notes.</i>
	<i>LnD: (Avg Proficient)</i>	<i>Writing down notes is easier than printing them out. When you write in your own handwriting, it's easier to remember than when it's printed in front of you.</i>
	<i>TnA: NP (Non Proficient)</i>	<i>Yes, I always write my notes offline; because I can't write on my phone and laptop faster than my hand. And I don't understand things unless I write them. But I don't annotate. I paraphrase everything to remember from what I read online.</i>
	<i>MR: P (Proficient)</i>	<i>I highlight on the computer -if I need to and I use color codes because it makes it easier to go back to the idea and read it because it's highlighted.</i>
	<i>R.e.A :P (Proficient)</i>	<i>I just write what I am typing to memorize just over and over until I get it. I would highlight it in color codes.</i>
	<i>Jnfr: NP (Non Proficient)</i>	<i>I would highlight when I read important points and definitions. Then I would summarize important things</i>
	<i>RY: P (Proficient)</i>	<i>I would summarize and I would write in my own words.</i>
	<i>K: NP (Non Proficient)</i>	<i>I read online for chapters. I take notes in class and re-read them at home.</i>
	<i>TH: P (Proficient)</i>	<i>Okay-when the chapter is divided into parts-not blocks- I can memorize them from the screen. But if the notes are like paragraphs, I write the paragraphs into notes, points, many points to memorize. I can only memorize in points.</i>
	<i>JY: P (Proficient)</i>	<i>If I want to memorize, it like has to be offline because I have to write it down in my own way. My own words.</i>

#### 4. Discussion

Hence, the purpose of this research was to investigate whether digital reading had any impact on reading skills. The research findings at hand indeed seem to suggest that digital reading not only impacts reading skills but may also impede reading skills altogether if students don't have a solid know-how of strategy use. For the most part, the findings seem to go in line with the given corpus of literature. Among the myriad responses showing preference of digital reading over print, the respondents' answers were in line with Baron et al., (2017) who posit that students have a greater inclination to gravitate towards digital reading material as it is more interactive (Riddler, 2000) and that digital technology holds greater appeal, Mangen, Olivier & Velay (2019) argue that students find the ability to store copious amounts of information very practical and convenient, in addition to the fact that digital reading is environmentally friendly.

However, and equally in line with the corpus of literature, the misgivings of digital reading are many. For instance, Spence, Beasley, Gravenkemper, Hoefler, Ngo, Ortiz & Campisi (2020) posit that students are easily distracted not only by the instant messaging services and students' "communicative connectedness" with their peers, but also due to eye strain from LCD screens (Singer & Alexander, 2017; Mangen, Olivier & Velay, 2019). Not only was the general complaint about eye strain and distractibility, but for the most part, students' responses seemed to be in line with the works of Loh & Kanai (2015) who argue that digital reading through hyperlinks and hypertexts seemed to impose a great deal of cognitive demands on memory lessening in the focusing of content material or even memory recall (Carr, 2010; Baron, 2021). Moreover, Proaps & Bliss (2014) as well as Baron (2021) posit that with the scrolling across dynamic digital documents, students are unlikely to recall much, if any, of the material needed, which based on the respondents' answers, coincided with the literature.

However, and perhaps considered most alarming was the development of this digital mindset of superficial reading and navigating digital texts through surface level reading patterns (Neilson, 2016; Baron, 2021; Wolf, 2018). As students engage in digital texts, there seems to be a trade-off between speed and accuracy, as mentioned previously by Singer Trakhman et al., (2019). In line with the fears posed by Wolf (2018), Carr (2010) and Baron (2021) students are engaging in quick-fix reading where they read just enough to get a general idea, and not to know or to learn. Not only this, but the fact that there has been a decline in reading (Baron, 2021) is shown by some respondents' adoption of various skimming patterns as opposed to deep, committed reading versus other respondents who simply "don't feel like reading". But perhaps most alarming of all, and what was uncovered by chance as the research was well underway is the novel inclination of students not only to adopt skimming

reading patterns as opposed to reading, but in their adoption of the “Control F” tool to compensate for reading and to help them complete their reading comprehension exams. A report set up by CIVIX, a Canadian Education Charity issued a report written by Pavlounis, Johnston, Brodsky & Brooks (2021), boasting of “Control F”’s ability to allow Canadian students to discern false statements when reading online has come to be used as a tool to replace reading altogether among students. The tool in itself can be helpful if used in combination with reading strategies, deep committed reading and pre-reading skimming pattern strategies. However, if used as a tool on its own to replace reading, and with the current decline in reading per se among youth (Baron, 2021; Neilson, 2016), this tool is likely to render itself a threat more than a benefit to young learners.

Finally, the study findings seem to suggest that the medium of choice, be it print or digital, will vary according to the nature of the reading task; that is, if the required reading is simply “to get an idea” about the topic or simply arrive at a “quick understanding” of the subject, then students are more likely inclined to read online; on the other hand, if the required reading is test related, requires memorization or something on which they will be evaluated, then students are likely to revert to offline reading.

## **5. Conclusion and Recommendations**

Hence, the research at hand attempted to investigate whether reading via digital devices rendered any impact on reading skills as well as students’ preference for online or offline reading. The findings seem to suggest that digital devices offer various conveniences of portability, accessibility and speed, whereby the latter likely offers the primary motivation to opt for online reading devices when quick understanding is required as opposed to deeper reading. The findings also seem to indicate that for the purposes of memorization and the possibility of testing, students have a more pronounced tendency to opt for print or offline media of reading. Moreover, despite the afore-mentioned conveniences, digital distractions, visual fatigue, disrupted focus and concentration as well as difficulty of memory recall impeded through scrolling, hypermedia and cognitive load via multitasking on social media platforms have shown to impact reading performance negatively. What’s more, digital media offers an added tool that may be a double-edged sword during times of declining reading and an increasing digital mindset. Where many students no longer feel the need to read beyond surface level browsing through patterns, others continue to use tools such as “Control F” to bypass reading altogether and gain a vantage point during reading achievement tests. Although such tools as “Control F” can add further accuracy to students’ skills of deep, committed reading, pre and post reading strategies, further research is required in order to shed light on whether or not “Control F” is in fact being used as a tool to replace reading altogether. Thus, unless students have a solid background in reading strategies and the ability

to find, select and extrapolate information, if left unchecked, the likely predominant usage of “Control F” may very well lead to the demise of reading altogether among certain societies and cultures (Griswald et al, 2005). In turn, reading may become nothing more than a social practice, exclusive to a select class, almost becoming disproportionate in the face of the Internet, power browsing and the “Control F” command.

### **Conflict of Interest**

The authors declare no conflict of interest.

### **Funding**

The study was not funded by any institution or university.

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