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The Effect of Reading Medium on EFL Students' Reading Comprehension

Reading on Paper versus Reading on Screen:

A Case of Master Two Students at Mascara University

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Requirements for the Degree of Doctorate in TEFL**

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Dedication

To the soul and memory of my beloved father, May Allah have mercy on him, whose love, care, and encouragement during his life were the source of power and inspiration to succeed in my studies.

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Abstract

Due the increased prevalence of screen reading over paper reading, it is of primary importance to examine the effect of the medium on reading comprehension. Therefore, the current study aims to examine the effect of the reading medium on Algerian EFL graduate students' reading comprehension at Mascara University when reading academic texts. It also aims to explore students' preferences for reading mediums. To meet this endeavour, the quantitative approach is adopted. A true experiment is conducted, where thirty Master Two students are randomly assigned to two groups. The control group reads two informational texts and one narrative text on paper, and the experimental group reads the same texts on a computer screen. Then, they are required to answer reading comprehension tests in both mediums. In addition, a questionnaire is administered to the same participants to examine their preferences for paper or screen medium. Furthermore, a semi-structured interview is conducted with four EFL teachers at Mascara University to solicit insightful data about their perspectives on students' reading patterns in the digital age. Results have revealed that students who read informational texts on paper scored better than those who read on the computer screen. However, no significant difference has been noticed when reading the narrative text in both formats. Data from the questionnaire have shown that EFL graduate students' preference for the paper medium is superior to achieve better learning outcomes. Findings from the interview indicated that the reading purpose is the major factor that influences the choice of the reading medium. This study suggests that, despite the dominance of screen reading, paper reading is still advantageous to achieve concentrated and effective reading. Implications of these findings for subsequent research, teachers, and policymakers are considered.

Keywords: *screen reading, paper reading, Algerian EFL graduate students, reading comprehension, preferences*

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List of abbreviations

EAP: English for Academic Purpose-----40

EFL: English as a Foreign Language ----- iii

EHEA: European Higher Education Area-----59

ELT: English Language Teaching-----61

ESL: English as a Second Language ----- 1

ESP: English for Specific Purposes -----74

ICTs: Information Communication Technologies -----62

L1: First Language ----- 4

L2: Second Language----- 3

LIH: Linguistic Interdependence Hypothesis-----12

LMD: License Master Doctorate -----50

LTH: Linguistic Threshold Hypothesis -----13

PDF: Portable Document Format-----46

RCT: Randomized Control Trials -----79

SPSS: Statistical Package for the Social Sciences----- 106

SRS: Simple Random Sample-----69

General Introduction

General introduction

Background of the Study

Reading is the cornerstone of literacy that contributes to achieve academic success and intellectual development. It opens avenues for knowledge and learning. The ability to read allows readers to dive into the ocean of words and uncover the conveyed ideas that reside in the written language. These ideas are of paramount importance to achieve the feat of reading either for enjoyment or learning. Further, reading as a language skill is the primary input for language learners to acquire more vocabulary, improve grammar and enhance writing skills (Krashen, 2004). According to Anderson (2003), mastering reading skills is an essential requirement for learning English in EFL and ESL (English as a Second Language) contexts.

With the invention of the printing press by Gutenberg in 1460, the paper medium became the prevailing mode of dissemination of information in the form of books, magazines, and newspapers. Bikerts (2004) noted that reading printed text is mainly private and offers the reader a very linear and static experience. In other words, the contents pass from the privacy of the author to the privacy of the reader. By flipping the pages, the reader is easily taking control of the reading by following the order of ideas when he transits from one paragraph to paragraph and from page to another: he begins at the top of the page and vertically descends. Bikerts opined that the layered composition of printed text encourages rereading information and sustaining focus that is crucial to comprehension.

However, with the proliferation of the Internet and technological advancement, students are confronted with the exponential growth of electronic information. This influx of information alters students' reading behaviours from paper-based reading to reading on screen. For instance, the ubiquity of electronic libraries and their heavy use force students to move beyond the realm

of paper-based-text. As a result, the increase consumption of electronic information creates a new trend of reading known as digital reading or screen reading that becomes a means of university students' empowerment in this abundant world of information.

This tangible shift in students' reading behaviours from paper reading to reading electronically sparks the interest of numerous researchers from disparate disciplines. Liu (2005) investigated readers' screen reading behaviours from different ages and disciplines, his investigation showed that screen reading is characterised by skimming, fragmented and superficial reading. In other words, students read on the screen quickly and selectively to get the gist of the content since they are bombarded with a sheer volume of information. Carr (2010) claims that readers who read electronically either online or offline cannot read deeply. Carr concludes that readers who adapt their brains to the huge amount of electronic information in an environment that values speed over depth, miss the virtues of effective and deep reading such as concentration and comprehension. In a similar vein, Mangen et al. (2013) studied children's reading comprehension on paper and computer screen. They found that children who read on paper scored better than those who read on screen. This study comes to an assertion that screen reading encourages scrolling that inhibits the reader to get access to the entire text. Therefore, scrolling disrupts the continuity of reading and hinders reading comprehension.

Previous studies have undertaken research with students who read in their first language. In addition, these studies dealt with children or undergraduate students whose reading is underdevelopment. While there have been many studies that examine students' reading comprehension while approaching shorter texts, there have been relatively few studies of EFL students' on screen reading when reading longer and more complex texts.

The Problem Statement

The acquisition of the English language has become a necessity in the 21st century. All educational systems across the globe endeavour to increase their students' English proficiency, and the Algerian system is no exception. In the EFL context, Algerian teachers are constantly looking for strategies to develop their students' language proficiency. One of the essential language skills that needs to be given much attention is reading. There is ample evidence in the literature to demonstrate the importance of reading as a profuse input for EFL students (Anderson, 2003; Hassan, 2021; Mason & Krashen, 1997; Noor, 2011). Thus, practitioners, policymakers, and researchers should examine the factors that may maximize students' effective reading skills and circumvent the possible obstacles that inhibit students' reading performance.

Unquestionably, technology permeates Algerian EFL students in almost every aspect of their lives, and reading is among these aspects. These students are increasingly reading on their digital devices such as mobile phones, tablets, and computers either for pleasure or for learning. As a result, screen reading becomes a +common behaviour among university students. Although technology and screen reading have brought about significant changes to students' reading habits, their reading performance is still inferior.

Given this in mind, the ongoing transition of reading behaviours from print to screen compels researchers to understand whether and how this shift affects reading comprehension (Mangen, Walgermo, & Brønnick, 2013; Sage, Augustine, Shand, & Bakner, 2019). In fact, comprehension is the essence of reading that leads to impactful learning. Reading comprehension as a cognitive faculty refers to the reader's ability to construct meaning from written text. In the past, research in the second language (L2) reading focused on the characteristics of the reader, text, and context in explaining reading comprehension (Group, 2002). In recent years, however, research suggests

that reading comprehension is also affected by reading mediums, and the prominent question in the digital age becomes: Does the medium matter when it comes to reading comprehension? It is therefore critical to examine whether the medium used to display the text (paper or screen) has an impact on reading comprehension.

The Objectives of the Study

Most of the studies that have examined the effect of the medium on reading comprehension were conducted on students who read in their first language (L1) (Delgado, Vargas, Ackerman, & Salmeron, 2018; Mangen et al., 2013a; Trakhman et al., 2017). Research on EFL students, especially graduate students, has been much scarcer. In addition, the paucity of research on students' preference for reading medium in EFL context is another impetus to conduct the current study.

The objectives that underpin the present study are as follows:

1. To investigate the effect of the reading medium on Algerian EFL graduate students' reading comprehension in the academic context at Mascara university.
2. To explore students' preference for reading mediums when approaching academic texts.

Research Questions and Hypotheses

To achieve the overarching objectives of the current study, two main questions were addressed:

1. What is the effect of reading mediums (paper and computer screen) on Algerian EFL graduate students' reading comprehension at Mascara university when reading informational and narrative texts?
2. Which reading medium (paper or screen) do students prefer to use when reading academic texts?

Based on the literature, two research hypotheses are derived from the aforementioned research questions. For this study, it was assumed that:

H1. There is a positive effect of paper medium on Algerian EFL graduate students' reading comprehension when reading informational and narrative texts.

H2. Algerian EFL graduate students prefer paper medium when approaching academic texts for better learning outcomes.

Significance of the Study

Reading is a vital focus for educators, policymakers, and researchers because it correlates with students' success in life in general and academia in particular. Undoubtedly, reading digitally is ubiquitous in Algerian EFL students' lives in this digital environment. Graduate students, for instance, are required to read extensively to write theses. Digital texts, thus become the main resources to meet this requirement. It goes without saying, that reading on digital devices, such as computer screens, becomes pervasive among Algerian EFL graduate students in the academic context. However, the potential effect of this norm of reading on students' comprehension remains an uncharted area of research in EFL context.

The current study contributes to this need by exploring the potential effects of the reading medium on students' reading comprehension. In fact, it is imperative to learn much more about the merits and address challenges associated with reading mediums when reading academic texts that require more concentration and comprehension. Furthermore, exploring students' preference for one medium over another is an important area of research for EFL students to have a clear judgment about the medium that is well-suited to their reading performance.

Another area of significance for this study is the better understanding it can bring to the dearth of research in digital reading in EFL context. As mentioned earlier, prior research has focused on

the effect of the reading medium on students' reading comprehension who read in their first language (L1). The question that needs an answer is: what is the effect of the reading medium on students who read in a foreign language, namely English? Furthermore, previous studies were conducted on shorter texts aiming to assess the literal levels of reading, including multiple choice questions and reading to get the general idea of the text. However, this study adds to knowledge gained from previous studies by focusing on gauging students' reading comprehension at an inferential level such as deducing meaning from the context and giving points of view towards the author's claims. The study used longer and more complex texts on both paper and screen to see if the length of text matters in both conditions. Although the study is related to EFL students, some of its findings can be applied to the experience of L1 students as well.

Organisation of Thesis

The introduction provides an overview of the background of the study, in addition to the problem statement, research objectives and questions that have been identified. Finally, the value and significance of this study have been argued.

In chapter one, the researcher reviews the existing literature to establish the theoretical framework for this study, and the major studies that are pertinent to the current study have been synthesised.

Chapter two describes the policy of the education system in Algeria focusing on the state of the English language in the Algerian context. In addition, the researcher examines the fate of reading among EFL students to identify the influential factors that may affect their reading practices.

Chapter three focuses on the research methodology that orients the current research. It provides justifications for the adoption of the quantitative approach. It also describes the data

gathered tools that consisted of the experimental design, the questionnaire, and the semi-structured interview.

Chapter four presents the obtained results that aimed to address the research questions.

Chapter five discusses the gathered data. It answers the research questions through the arguments generated by the data.

Finally, the general conclusion discusses the implications of the study, it also presents the limitations encountered in this study and suggests recommendations for further research.

CHAPTER ONE:
LITERATURE REVIEW

Chapter1 Literature Review**1.1 Introduction**

Reading is regarded as a fundamental skill in the field of education. There has been recognised in extensive literature that reading is the gateway to academic success and learning languages. With the rapid changes in the technological world, there is a pressing need to understand the effect of the digital age on this cognitive skill.

Therefore, the purpose of this study is twofold: first, to investigate the effect of the reading medium on Algerian EFL students' reading comprehension, and second, to explore students' reading preferences for reading mediums when reading academic materials.

To gain a general understanding of the reading process, the first section of this chapter examines the literature on the nature of reading and the theories behind reading in a foreign language; the second delves into what has been written about reading comprehension and focuses on Construction-Integration Model as a theoretical lens for this study; the third provides a discussion on the effect of the digital age and highlights the major studies that focus on the tangible shift of reading from paper to screen.

1.2 The Reading Nature

Reading is an important language skill that improves students' learning. It is considered a receptive skill since the reader receives the writer's ideas and information to be adequately perceived and understood. Krashen (2004) confirmed that reading has a crucial role in helping readers to acquire more vocabulary and develop their writing and speaking skills. This occurs when the reader interacts with a text aiming at extracting its appropriate meaning. The complexity of the reading process and its multifaceted nature, like the capacity to make inferences and analogies, make any attempt to give an exact definition to this skill arduous. Thus,

scholars with their different theoretical backgrounds endeavour to understand the nature of this complex process and provide a clear definition of reading.

Many reading researchers agree that reading is an active and complex cognitive process of constructing meaning: it starts with decoding words and ends with comprehending the author's ideas. According to Smith (2004), reading is a natural process that takes place when the child makes sense of everything he encounters in his everyday life. He further stresses that reading a written language requires interpreting and understanding every word in its context by relating the prior knowledge with the existing one. Fischer (2004) states "... in its most general modern definition, reading is, of course, the ability to make sense of written or printed symbols" (p.11). In addition, Nuttall (1996) pointed out that reading is a process of getting meaning from a written language. According to him, the prime concern of the reader is to clearly understand the writer's message. Therefore, reading becomes an interactive and communicative process that takes place when the writer attempts to put his message across for the reader to decode it successfully.

Reading encompasses various cognitive skills that activate the reader's mode of thinking to decipher written words and symbols. In this respect, the neuroscientists, Wolf and Stoodley (2008) focused on the pivotal role of the human brain and its exceptional abilities to achieve the feat of reading. Wolf and Stoodley (2008) believed that reading is an unnatural process and "[human beings] were never born to read" (p.3). According to them, reading is acquired only when the brain's structure (mainly neuroplasticity) employs the neuronal circuits to develop the human capacity for thinking and understanding the encountered visual aspects.

Although scholars advocate the mental act of reading, Mc Laughlin (2016) goes beyond the cognitive skills to demonstrate the physical practice of reading, the body. In his book '*Reading and the Body*', Mc Laughlin (2016) maintains that "reading is undeniably a bodily act, eyes scan

the page, hands hold the book, body postures align the entire musculoskeletal frame around the visual and manual requirements of reading...” (p.1). In other words, McLaughlin believes that the body plays a central role in immersing the reader in the reading content. According to him, the physical act of reading is critical to meaning construction.

Kress (2003) provides a comprehensive picture of reading and how this process involves both mental and physical acts not only to understand the word but also to comprehend the world. He states:

Some things are common to ‘Reading’ across time, across culture, across space, namely those which derive from the way in which our bodies place us in the world, ranging from the physiology of vision to the structure of organs which we use for speech and hearing, to the organization of brain and its inherent capacities for memory”(p.139).

In sum, understanding the essence of reading and explaining its complex nature needs much attention, especially when dealing with human cognitive and physical abilities. Nevertheless, reading with its extraordinary features and enormous tasks paves the way for the human species to understand the world and transcend its boundaries. Indeed, reading is the gateway toward knowledge and enjoyment, it opens up more avenues for readers to expand the scope of understanding others’ thoughts and learning their languages.

1.3 Reading in a Foreign Language

Reading researchers acknowledge that reading in a language that is not the reader’s first language (L1) becomes a source of considerable difficulty. Despite a multitude of studies devoted to studying reading in a foreign language, understanding its nature remains complex and ambiguous, as Clarke (1980,p. 203) puts it “ reading is perhaps the most thoroughly studied and least understood process in education today”. The difficulty of understanding this process comes

from the complex relationship between the reader's L1 and Second Language (L2). It is important to note that this relationship cannot be easily explained from one particular theory. Therefore, reading theorists suggest various theories to elucidate this issue. The two hypotheses most commonly associated with L2 reading, the Linguistic Interdependence Hypothesis, and Linguistic Threshold Hypothesis, are used in this study as theoretical lenses to examine L2 reading.

1.3.1 The Linguistic Interdependence Hypothesis (LIH)

The basic intention of Linguistic Interdependence Hypothesis, sometimes referred to as the Developmental Interdependence Hypothesis (Cummins, 1979), is that a language learner's L1 reading ability is critical to the development of L2 reading. This theory proposes that readers should possess certain linguistic knowledge and reading skills in their L1 to be proficient in L2 reading. LIH implies that there is a transfer of reading ability from L1 to L2. "This theory argues that when L1 reading abilities reach a certain level of proficiency, involving some degree of automaticity and fluency, these underlying skills will transfer to L2 reading" (Grabe, 2009, p. 141). Cummins's (1979) argument holds that students who are proficient readers in their L1 are more likely to become proficient readers in L2.

There is a large volume of research that supports LIH premise (e.g. Bernhardt & Kamil, 1995; Carson et al., 1990; Gelderen, Schoonen, Stoel, & Hulstijn, 2007). Verhoeven (1991,p.72) noted that " literacy skills being developed in one language strongly predict corresponding skills in another language acquired later in time" (as cited in Grabe, 2009, p. 142).

These studies have been criticised for being conducted with children (ESL) learners whose literacy skills in L1 and L2 are still in development (Bernhardt & Kamil, 1995). Furthermore, Grabe (2009) claims that "transfer of skills from the L1 to the L2 does not seem to occur for

vocabulary knowledge, morphosyntactic knowledge, listening comprehension, and orthographic script-processing differences” (p.144). In other words, there are basic language skills in L2 such as vocabulary knowledge and grammatical structures which form L2 language proficiency that language learners should acquire to attain good reading in the target language regardless of their level in L1 reading. This claim is supported by an alternative hypothesis for LIH known as Linguistic Threshold Hypothesis.

1.3.2 Linguistic Threshold Hypothesis (LTH)

Linguistic Threshold Hypothesis is based on the idea that L2 proficiency has great importance in facilitating L2 reading. This hypothesis proposes that students should acquire a sufficient amount of language knowledge (e.g. vocabulary and grammar) in the target language before transferring their L1 reading abilities to L2 reading (Bernhardt & Kamil, 1995; Grabe & Stoller, 2002). Bernhardt and Kamil (1995) write, “in order to read a language, one has to ‘know’ the language” (p.17). Yamashita (2002) supports this claim when she writes, “a certain threshold level of L2 language proficiency is necessary before L1 reading ability transfer to L2 reading... even skilled L1 readers cannot read in L2 until their L2 language proficiency has reached the threshold level” (p.81).

Much attention has been devoted to studying the role of L2 language proficiency in L2 reading. Alderson's (1984) research was one of the important studies in the L2 reading field that further highlighted the importance of language knowledge in L2 reading comprehension. His famous question “Reading a foreign language: a reading problem or a language problem?” has captured the attention of the foreign language reading research community for more than a decade. Alderson (1984) asserts that a “student’s knowledge of the foreign language is more important to the comprehension of foreign language texts than is reading ability in the first

language” (p.13). His research provides strong evidence for the Linguistic Threshold Hypothesis which posits that learners whose L2 language proficiency was under linguistic threshold failed to transfer their L1 reading abilities. Within this hypothesis is the belief that a learner’s linguistic threshold is the key factor in reading and literacy activities (Bernhardt & Kamil, 1995).

In summary, both Linguistic Interdependence Hypothesis and Linguistic Threshold Hypothesis succeeded to some extent in providing a clear picture of the needed mechanisms that language learners need to acquire to attain reading competence in the target language. They highlight the contribution of both L1 reading abilities and L2 language proficiency to L2 reading comprehension.

1.4 Reading comprehension

Reading comprehension is an essential process that contributes enormously to language development and literacy abilities. Reading researchers view reading comprehension as a prerequisite to a student’s success. According to Alkhaiyali (2014), “ reading comprehension is critically important for the development of first and second language learners’ reading proficiency and their ability to improve other language skills including writing, speaking, listening, and critical thinking” (p.1). Therefore, reading comprehension has become the primary focus of reading experts and theorists who call for understanding the nature of this process to help readers become strong and devoted comprehenders of any type of text.

It is important to note that the complexity of reading comprehension makes understanding its nature an arduous task for many reading researchers (Grabe, 2009). This complicated cognitive skill involves a variety of components. Kintsch and Kintsch (2005) claim:

comprehension is not a single unitary process. Instead, it requires the delicate integration of several components processes that integrate information from the page that the student is

reading with his or her background knowledge and experience, subject to a multitude of contextual constraints. (p.71)

In addition, Alkhaiyali (2014) views “reading comprehension as a complicated process that depends mainly on different indicators including behavioural, linguistic, cognitive, and metacognitive elements” (p.1). In his turn, Afflerback (2013) asserts that most theories share four common aspects that contribute to comprehension:

- a) a combination of information from the text and from the reader’s prior knowledge,
- b) the complexity of the texts and the activity or task to be completed with the text,
- c) the use of strategies and skills,
- and d) the reader’s cognitive and affective variables”. (as cited in Bartlett, 2014, p. 17)

Kirmizi (2014) defined reading comprehension as “the act of thinking and constructing meaning before, during, and after reading by integrating the information presented by the author with the reader’s background knowledge” (p.290). Group (2002) crystallises the definition of reading comprehension as “the process of simultaneously extracting and constructing meaning through interaction and involvement with written language” (p.11). They acknowledge that reading comprehension cannot occur without the interaction of these three essential elements: the reader, the text, and the activity. As shown in their developmental heuristic of reading comprehension:



Figure 1.1 A heuristic for thinking about reading comprehension Group (2002,p.12)

According to the group, the reader brings his cognitive abilities, linguistic capacities, motivation, experiences, and background knowledge to interpret the encountered information and build his knowledge. They add that the text features are indispensable for comprehension. For instance, if the text content is familiar and consistent with the reader's prior knowledge, the comprehension process would be effective. Furthermore, the type of text, printed or electronic, requires specific skills and abilities to extract the layer meanings of the text. Moreover, the act of reading cannot be done in a vacuum: the activity in this process refers to the purpose of reading and the processes that the reader goes through such as skimming and scanning to attain the desired outcomes. Group opines that the three elements of reading comprehension: the reader, the text, and the activity, "occur within a sociocultural context of the reader's classroom, home, and neighbourhood, and they help a reader to interpret information and create personal meaning" (as cited in Coiro, 2003, p.17).

Mc Laughlin (2012) claims that reading comprehension is a multifaceted process which involves various factors that contribute to the construction of meaning. First, he acknowledges that the reader's prior knowledge is integral for solid comprehension: the more background knowledge and experiences the reader brings to the text, the easier and better comprehension becomes. As Hattan and Alexander (2020, p. 4) put it "a strong base of relevant background knowledge, which includes the sum of what an individual knows supports students' reading fluency, accuracy, memory, and comprehension". Second, reading comprehension is a social constructive process in nature. According to Mc Laughlin, engaging students in a discussion through negotiating meaning and communicating ideas with others during the act of reading helps students to instil information and therefore promoting the process of constructing meaning from the text. Furthermore, he stresses the pivotal role of teacher in enabling students to

comprehend any type of text through explicit instructions on comprehension strategies. These strategies entail:

- Previewing—Activating prior knowledge, predicting, and setting purposes for reading
- Self-questioning—Generating questions to guide reading
- Making connections—Relating reading to self, text, and others
- Visualizing—Creating mental pictures of text while reading
- Knowing how words work—Understanding words through strategic vocabulary development, including the use of graphophonic, syntactic, and semantic cueing systems
- Monitoring—Asking “Does this make sense?” and adapting strategic processes to accommodate the response
- Summarizing—Synthesizing important ideas
- Evaluating—Making judgments about text content and the author’s craft (Mc Laughlin 2012.P.434-435)

Mc Laughin (2012) adds that teachers should train students to have a critical stance on what they are reading to deepen their understanding. Students should evaluate and analyse the conveyed information critically and read beyond the author’s ideas to build their knowledge and form their perspectives. As Pearson (2001) puts it “comprehension is not enough. It must have a critical edge” (as cited in Mc Laughlin 2012, p.493).

Tierney and Pearson (1981) believe that understanding the nature of reading comprehension helps the teacher to create a solid foundation for evaluating and improving the learning environment. By doing so, the teacher will have opportunities to design effective and efficient approaches that enable students to learn how to learn from the text. For instance, the teacher should recognise that reading comprehension is not about absorbing the author’s ideas passively,

it is rather an interactive process where the reader plays a central role in interpreting, analysing, and evaluating the information presented to him. To foster reading comprehension, Tierney and Pearson (1981, p. 3) counsel that:

Readers should be encouraged to actively engage their background knowledge prior to, during, and after reading. They should be given opportunities to appreciate and evaluate the adequacy of their own perspective and other interpretations, to monitor their own progress through a text, and to discriminate new learnings from old knowledge

According to Kamil, Pearson, and Moje (2011), reading comprehension is a constructive process that occurs when the readers generate a mental representation of the meaning of the text. This process starts when the reader elicits meaning from the words and scrutinises the composition and relations of clauses and sentences that form the overall meaning reaching the end to build a situation model or the mental representation of the meaning. They state that the reader, the text, and the context when the act of constructing meaning occurs are the important components of reading comprehension.

Furthermore, Kamil et al (2011) point to consider reading comprehension as a “quintessential growth construct”. In other words, reading is a developmental process that cannot stop at a specific age and a certain level. This process develops as the reader faces challenges and confronts more demanding materials for a variety of reading purposes that yield in the development of the reader’s abilities. This view is supported by Patricia (2005) who proposed to view reading from a lifespan developmental perspective. In Patricia’s view, the pursuit of competence in reading is a lifelong journey that encompasses changes across the lifespan. This perspective looks at reading as a long-term developmental process at the end of which “the

proficient adult reader can read a variety of materials with ease and interest, can read for varying purposes, and can read with comprehension even when the material is neither easy to understand nor intrinsically interesting” (Group,2002, p. xiii). Patricia summarises the major features of lifespan reading development as follows:

- Readers’ knowledge of language and knowledge of content domains are critical forces in developing competence.
- Readers’ personal interest in reading becomes a driving force in their development as competence is achieved.
- Lifespan development involves systematic changes in readers’ strategic processing.
- Reading development is a lifelong journey that unfolds in multiple stages.
- Profiles of successful and struggling readers are reflective of developmental forces.
- Readers in acclimation are especially vulnerable and in need of appropriate scaffolding.

(Patricia , 2005, P. 413)

Patricia (2005) opines that understanding the developmental nature of reading helps educators to identify the problems that impede their students’ reading progress and provides a panacea to circumvent these problems. Furthermore, researchers demonstrated that good instructions contribute to promoting reading development (Group, 2002; Kamil et al., 2011; Patricia, 2005). These instructions include teaching strategies that enhance reading performance and exposing students to different types (narrative and expository) of texts in different mediums (print and on websites) that spark their interest and increase their motivation. By doing so, teachers will help reluctant, unmotivated, and unskilled readers to delineate the difficulties that encounter in their endeavour to attain better reading outcomes.

1.5 Cognitive and Metacognitive Reading Strategies

Ahmadi et al. (2013) claimed that EFL and ESL students still have difficulty understanding the author's message while reading a text despite that they have learnt English for many years. They refer this to a lack of interest in enhancing reading comprehension through formal instruction of reading strategies.

Reading strategies help the learner break down any barriers that hinder his reading comprehension. These strategies include cognitive and metacognitive strategies. O'Malley et al. (1985) provide a comprehensive definition of these two types of strategies:

Metacognitive strategies involve thinking about the learning process, planning for learning, monitoring of comprehension or production while it is taking place, and self-evaluation of learning after the language activity is completed. Cognitive strategies are more directly related to individual learning tasks and entail direct manipulation or transformation of the learning materials.

(Brown and Palin-Sar 1982 as cited in O'Malley et al., 1985, p. 560,561)

In the same vein, McNamara (2007) notes that cognitive strategies are of paramount importance that serve as a feasible tool for effective reading comprehension. According to Ahmed et al. (2013, p.236):

Cognitive strategies can be divided into the following elements: recognizing, using topics, guessing from the context, using a dictionary, writing down, imagery, activating background information, summarizing, using linguistic clues, using text markers, skipping the difficult parts and repeating words and phrases.

On the other hand, a great deal of evidence supports the importance of metacognitive strategies in promoting reading comprehension (Ahmadi et al., 2013; Salataci, 2002; Wang,

Spencer, & Xing, 2009; Zhang, 2018). O'Malley et al. (1985) demonstrate that “ students without metacognitive approach are essentially learners without direction or opportunity to review their progress” (p. 561).

Ahmadi et al. (2013) argue the central role of metacognitive strategies in facilitating students reading comprehension when they say “metacognitive strategies indicate one’s thinking and can facilitate more learning and developed performance, especially among students who try extremely hard to understand the written context” (p.236). Furthermore, they claim that reading comprehension should receive a high priority in English language teaching through proper instruction of metacognitive reading strategies. Thus, learners will be able to overcome any constraints that hamper their reading comprehension.

Previous studies have shown that cognitive and metacognitive strategies are the foundation of solid reading comprehension. However, Anderson (2003) points out that “ strategic reading is not only a matter of knowing what strategy to use but also the reader must know how to use a strategy successfully and orchestrate its use with other strategies” (p.469). In other words, knowing about the use of strategy is not sufficient, a reader may know which strategy to use but he may fail to apply it strategically. Therefore, the good reader is the one who can use the reading strategy effectively and appropriately to reach proficiency in reading comprehension and attain his reading purpose.

1.6 The Metaphorical Reading Models

In their task to characterise the basic processes of reading comprehension, (L2) reading researchers proposed three main reading models: top-down, bottom-up, and interactive models. “The term *model* refers specifically to a representation of the psychological processes that comprise a component or set of components involved in human text comprehension” (Goldman,

Golden, & Paul Van Den, 2012, p. 2). Top-down, bottom-up, and interactive models are known as metaphorical models whose assumptions do not match empirical findings (Grabe, 2009). However, these reading models have a significant role in explaining the nature of reading abilities and understanding the main processes involved in comprehension (Pearson & Kamil, 1978).

1.6.1 Top-down model

This model puts much emphasis on the reader in controlling the comprehension process. It is termed the reader-driven model in which the reader uses his expectations and background knowledge to guess the content of the text (Barnett, 1989). The reader moves from the *top*, the high level of the mental stage, such as inference and prediction to make intelligent guesses, *down* to the text to confirm or reject these guesses (Barnett, 1989; Nuttall, 1996).

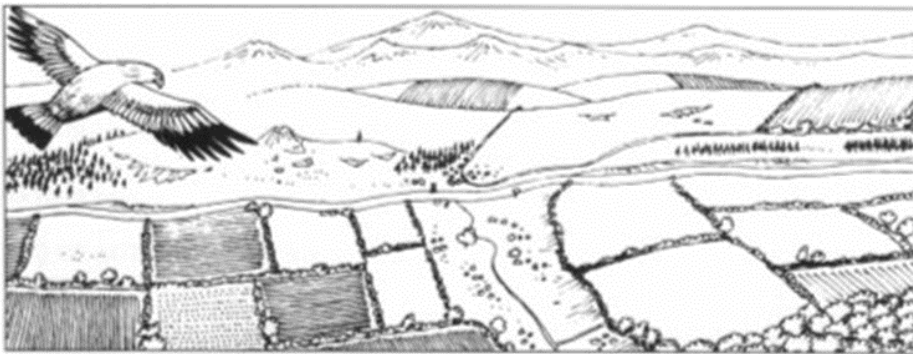


Figure 1.2 Top- down processing (Nuttall,1996, P.16)

On the other hand, the top-down model does not identify the mechanism used by the readers to make accurate inferences (Grabe, 2009), in addition to overreliance on the reader's prior knowledge that would be inadequate for second or foreign language learners in particular, especially when encountering with difficult text (Wang, 2009).

1.6.2 Bottom-Up Model

Unlike the top-down, the bottom-up model focuses on the text as a point of departure for the comprehension process to occur. It is a text-driven model where the reader starts from the bottom (the written text) by scrutinising the linguistic units; decoding the text's components letter by letter, word by word, and sentence by sentence to arrive at a full understanding of the text (Barnett, 1989; Grabe, 2009; Nuttall, 1996). “ Bottom-up models analyze reading as a process in which small chunks of text are absorbed, analysed, and gradually added to the next chunks until they become meaningful”(Barnett, 1989, p. 13).

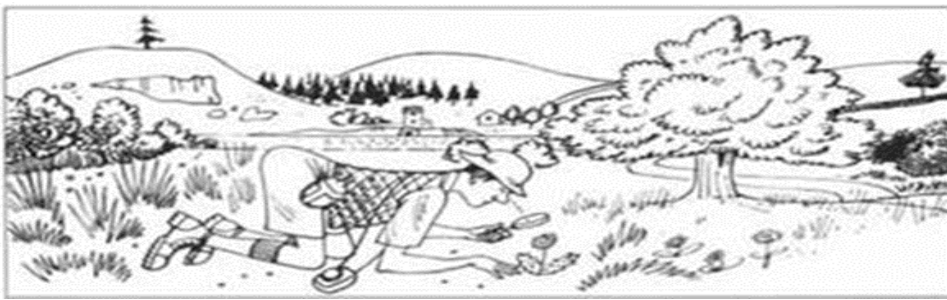


Figure 1.3 Bottom-up Processing (Nuttall,1996, p.17)

However, the bottom-up has been criticised for its total dependence on decoding the ongoing text and neglecting the reader's prior knowledge, “and no current model of reading depicts reading as a pure bottom-up process” (Grabe, 2009, p. 89).

In short, the course of the reading process does not rely only on one approach over the other. And to achieve comprehension, useful elements from top-down and bottom-up approaches should be combined in an interactive set of processes.

1.6.3 Interactive Reading Model

As its name indicates, the interactive model encompasses the interaction between a reader and the text as well as the combination of the major features of top-down and bottom-up models.

Alderson (2000, p.18) states that:

Neither the bottom-up nor the top-down approach is an adequate characterization of the reading process, and more adequate models are known as interactive models, in which every component in the reading process can interact with any other component, be it “higher up” or “lower down”.

Reader’s background knowledge and the effective recognition of words serve as a support to text understanding. L2 reading researchers describe the interactive model as a compromise solution that “takes into account the critical contribution of both lower-level processing skill (word identification) and higher level comprehension and reasoning skills (text interpretation) (Grabe, 1991, p. 386).

1.6.4 Construction-Integration Model: Theoretical Framework

Interactive models of reading posit that reading comprehension is based on a combination of both top-down and bottom-up processing. Kintsch (1988) presents a theory of text comprehension that combines both analysing of words and sentence structure and the mental representation of these words’ meaning in the reader’s mind. This theory can be explained through **Construction-Integration Model**.

The first level of text comprehension is the decoding process. This process starts with the identification and recognition of a single word presented in the text in terms of orthography, phonology, morphology, and meaning (Kintsch & Kintsch, 2005; Perfetti, Landi, & Oakhill, 2005; Verhoeven & Perfetti, 2009). While identifying the relevant meaning of individual words and putting them together, they form a single meaning of a sentence in the reader’s mind that is known as a proposition.

The propositions have an important role in text construction at both local and global levels. According to Kintsch and Van Dijk (1978), the propositions are structured and ordered under

semantic relations. Some of these relations are either presented directly in the surface structure of the discourse or expressed implicitly needed to be interpreted using inferences with the help of a given context or general knowledge. The semantic structure of the discourse is known as the text base. “The text base is a mental representation of the propositions of the text, as extracted from the reading of successive sentences, supplemented only by inferences necessary to make the text coherent” (Perfetti, Van Dyke, & Hart, 2001, p. 133). The text base has microstructure and macrostructure levels. The microstructure is the local level where single propositions are built in a structured and organised way. Once these propositions of the text base are combined and aggregated with other propositions in a sequence way at a global level, they form the macrostructure of the text base or what is called the “topic discourse” (Kintsch & van Dijk, 1978). Both microstructure and macrostructure levels of text base are of paramount importance in forming a coherent text that contributes to reading comprehension.

Another integral part of the text base’s construction is inferences. Not all texts are fully explicit: when processing a text, the reader confronts with implicit relations among propositions that require “ a certain amount of inferential activities [like] the referents of pronouns must be identified, synonymous terms must be matched...” (McNamara, Kintsch, Songer, & Kintsch, 1996, p. 4) to arrive at a text comprehension. As Kintsch and Kintsch (2005) put it “references are necessary to bridge gaps in cohesion between propositions and to identify pronouns to arrive at a coherent microstructure” (p.73). This seems to imply that inferences are at the heart of reading comprehension.

Although inferences play an important role in understanding the text, however, this understanding remains superficial and restricted only to the information provided in the text (Kintsch & Kintsch, 2005). According to many scholars, to fully understand the text, the reader

should integrate the text with his relevant prior knowledge and experience to ensure comprehension at a deeper level (Perfetti et al., 2005; Singhal, 1999). By doing so, the reader constructs a situational model (Kintsch, 1988; Kintsch & Kintsch, 2005). As Graesser (2007,p12) writes:

The situational model (sometimes called the mental model) is the referential content or microworld that the text is describing. This would include the people, objects, spatial setting, actions, events, plans, thoughts, and emotions of people and other referential content in a new story, as well as the world knowledge recruited to interpret this contextually specific content.

Kintsch and Kintsch (2005) emphasise that the main pedagogical goal in comprehension instruction should not be restricted to gaining a superficial understanding that results only from the information provided in the text, it should focus on the reader's one situational model that integrates a text's information with the reader's background knowledge, experience and goal for a deeper understanding of the text.

Undoubtedly, inferences and knowledge are the essences of the comprehension process. As Kintsch and Kintsch (2005) state “ comprehension requires inferences and inferences require knowledge” (p.81). They insist that the reader should be exposed to a wide range of literacy experiences to acquire more vocabulary and enrich his knowledge to pave the way to a successful comprehension.

Achieving the successful comprehension relies considerably on the readability of the text (Kintsch & Kintsch, 2005). For instance, if the text is simple and familiar to the reader, there will be no more cognitive load on the part of the reader to achieve a better comprehension of it. The fully explicit text does not promote deeper comprehension: the reader does not require to make

inferences and activate his background knowledge to read between the lines and strive to extract the implicit meanings of the text (Kintsch & Kintsch, 2005).

On the other hand, the absence of these major factors of reading comprehension, like inference and background knowledge, disrupts the reader's path to arrive at a deeper understanding of the text. In this regard, Kintsch and Kintsch (2005, p.86) write:

For the more difficult text, active inferencing and interpretation in terms of what the reader already knows is necessary, however, for the text cannot be understood without it. Hence, comprehension is more effortful, but the results are better: the reader has learned something from his or her work.

Similarly, Auer (2016) argues that among the factors that play a key role in constructing a reliable and informative comprehension assessment is the complexity of the text. According to him, a complex text helps in generating more challenging questions that require the reader to employ various cognitive processes to answer them.

To sum up Construction-Integration Model seems to be the most comprehensive model that provides a rich and detailed explanation of the processes and strategies used in understanding a text at a deeper level (Graesser, 2007). The outcomes of comprehending a text can be apparent in the reader's ability to answer the questions of the text, recall it, summarize it, or paraphrase it (Kintsch, 1988). Furthermore, Kintsch's model has been used as the theoretical framework in this study to investigate how foreign language learners understand the text with the assistance of multimodal learning materials in the digital age.

1.7 Digital Literacy

The term digital literacy first emerged in the 1990s with the evolution of technology. A plethora of conceptions has been presented to describe ‘digital literacy’ in literature such as computer literacy, information literacy, technology literacy, media literacy, communication literacy, and e-literacy (Lankshear & Knobel, 2008) due to the influx of digital media that requires the use of a myriad of skills and strategies. It was this fact that led researchers to pluralize the term ‘ literacies’ to cover all literacies that may be merged under the umbrella of digital literacy (Gilbert, 2014; Lankshear & Knobel, 2008). The concept of digital literacy was widely used when introduced and explained by Paul Gilster, in his book of the same name in 1997, “as the ability to understand and use information from a variety of digital sources” (Lankshear & Knobel, 2008, p. 18).

Darmanin (2017) believes that digital literacy refers to the changing nature of reading and writing as new technologies are evolved. On other hand, Coiro (2003) claims that digital literacy challenges the traditional notion of literacy as the ability to read and write to the competence of understanding and evaluating the conveyed information in the digital environment.

Jones and Hafner (2012) go further to regard digital literacy as a social phenomenon that aims at facilitating communication and enhancing social practices among individuals in the electronic era. Undoubtedly, digital media offers people limitless opportunities and various platforms through chat rooms and discussion groups to share opinions and experiences to maintain interaction and strengthen identities regardless of local and cultural contexts as Jones and Hafner (2012, p.12) write:

literacies in the digital age are not just as the ability to operate a machine or decipher a particular language or code, but as the ability to creatively engage in particular social

practices to assume appropriate social identities, and to form or maintain various social relationships.

In a similar vein, Snyder (2002) considers digital literacy as ‘silicon literacy’ that embodies a new mode of communication in the digital environment that contributes significantly to the enhancement of individuals’ social and cultural practices. According to her, silicon literacy enables individuals not only to share experiences and attitudes but also to embrace others’ diverse views in a meaningful way from a critical eye. To practise silicon literacy, the classroom seems the best place to develop students’ communicative abilities by creating spaces for sharing and exchanging creative ideas that would be beneficial for both local and global sake. To give birth to students’ thoughtful ideas, technology serves as an optimal means to achieve educational goals and helps students reach their fullest potential. Moreover, Snyder (2002) assumes that literacy educators play an important role, through pedagogical and curriculum frameworks, in boosting students’ communicative capacities to be effectively engaged in the practice of critique and be open to different opinions. By developing critical capacities, students will be well prepared for an unknown future in a world known for its uncertainties and instability (Snyder, 2002).

Although previous authors tackled significant aspects of digital literacy, other areas in digital literacy should be examined to avoid any ambiguity that may stand in teachers' and researchers’ way to understand the nature of digital literacy. For instance, Eshet-alkalai (2004) presents a conceptual model for digital literacy when he describes it as a ‘survival skill’ in digital environments that is based on five essential literacies: photo-visual literacy(interpreting visual representations); reproduction literacy (the ability to generate a creative and original product by

using existing works: it is important to note that this type of literacy would best be applied in the academic context when scholars and students write good research papers); branching literacy (the ability to multitask and navigate in hypermedia- a based environment without losing the focus of the main task); information literacy (evaluating the trustworthiness and reliability of information); socio-emotional literacy (the most complex literacy that requires the master of other literacies vigilantly to share data and knowledge with others).

Overall, the term digital literacy should not be restricted to some aspects at the expense of others in an environment that constitutes exponential growth of information. As a result, both learners and users should acquire the appropriate skills and strategies to meet the requirements of the digital environment.

The next section will discuss the changing nature of the essential pillar of literacy in the digital era, reading.

1.8 Impact of Digital Technology on Reading

The advent of digital devices and the Internet have had a profound impact on the way people read. This digital age contributes to the increase of digital libraries across the globe and provides a tremendous number of websites that put information at readers' fingertips at any time in any place.

Bilkerts (1996) states:

In our culture, access is not a problem, but proliferation is. And the reading act is necessarily different than it was in its earliest days. Awed and intimidated by the availability of texts, faced with the all but impossible task of discriminating among them, the reader tends to move across surfaces, skimming, hastening from one site to

the next without allowing the words to resonate inwardly. As a result, we know countless more ‘bits’ of information, both important and trivial, than our ancestors.

(as cited in Liu , 2012, p. 86)

The digital environment undeniably provides readers of the twenty-first century with long-life opportunities to develop the reading aspects and acquire digital literacies that give a new meaning to reading in the digital culture.

1.8.1 Digital Reading

The terms “digital reading”, “e-reading”, “reading on screen”, and “online reading” are used interchangeably in the literature. Digital reading is the act of processing text on any kind of electronic device. Pardede (2019, p. 81) writes:

Digital texts can be the one accessed from the internet in the form of a web page, text message, or online postings such as blogs, or those kept in screen reading tools, computers, or hand-handled devices. They are electronically generated and multimodal (blending texts with audio, video, image, and hypertext).

Digital media with its outstanding features like the immediacy of information and interactivity grabs the reader’s interest to consume as much as he can of information. According to Wolf (2018), a study conducted by the Global Information Industry Center at the University of California; revealed that the average person consumes about 34 gigabytes of information from multiple devices every day. This sheer of information undoubtedly alters the real nature of reading and creates a new trend in reading behaviour, particularly among university students. Students are likely to spend much time reading on the screen to do their assignments or writing research papers. The increased amount of time spent on reading digitally results in a shift from

paper-based reading behaviour to screen-based reading. This new paradigm in reading impresses different researchers from disparate disciplines to investigate this screen reading behaviour.

1.8.2 On Screen Reading Behaviour

Digital media offer more opportunities for students to interact with digital texts. This fact prompts college students to spend much more time reading on screen. The fact that alters students' reading behaviour in this digital age.

In his study, Liu (2005) investigated 113 students from different disciplines to explore the impact of digital media on reading behaviours. The results showed that the reading behaviours have been changed. Liu found that most of the participants (83%) spent more time reading electronic texts. He argues that screen reading has totally alters the nature of reading. According to him, skimming and browsing are the major characteristics of screen reading. Consequently, these new norms in digital reading encourage reading selectively, spotting the key words, and skipping from one material to another to look for the needed information as quickly as possible. Liu claims that these new trends of reading create a kind of shallower and superficial reading that take precedence over deep reading.

However, the question that arises is whether the length of the texts and the readers' language proficiency might affect the reading behaviours when reading digitally.

Through his interview and observation of the onscreen reading behaviours of five ESL graduate students while reading academic texts, Chou (2012) found that hardcopy materials are the most favorable medium for careful reading in an academic context than reading materials on a screen computer. According to Chou (2012), students increasingly read on the computer screen only to search for pertinent information to write their papers, once they found the relevant online journal articles, they printed them out for full understanding and deep reading. Chou's findings

(2012) revealed that the reading purpose and level of proficiency in L2 affected onscreen reading behaviours.

1.9 Reading on Paper versus Reading on Screen

“Every medium has its strengths and weaknesses: every medium develops some cognitive skills at the expense of others”

(Patricia Greenfield as cited in Wolf 2018, p.105)

Numerous recent studies have found that reading on-screen and reading on paper differ significantly in different aspects. In his article “ Why the Brain Prefers Paper”, Jabr (2013) points out that the physicality of paper tempts readers of different ages to enjoy the reading process. He states, “The feel of paper and ink; the option to smooth or fold a page with one’s fingers; the distinctive sound a page makes when turned. So far digital texts have not satisfyingly replicated such sensations (Jabr, 2013, p. 53).

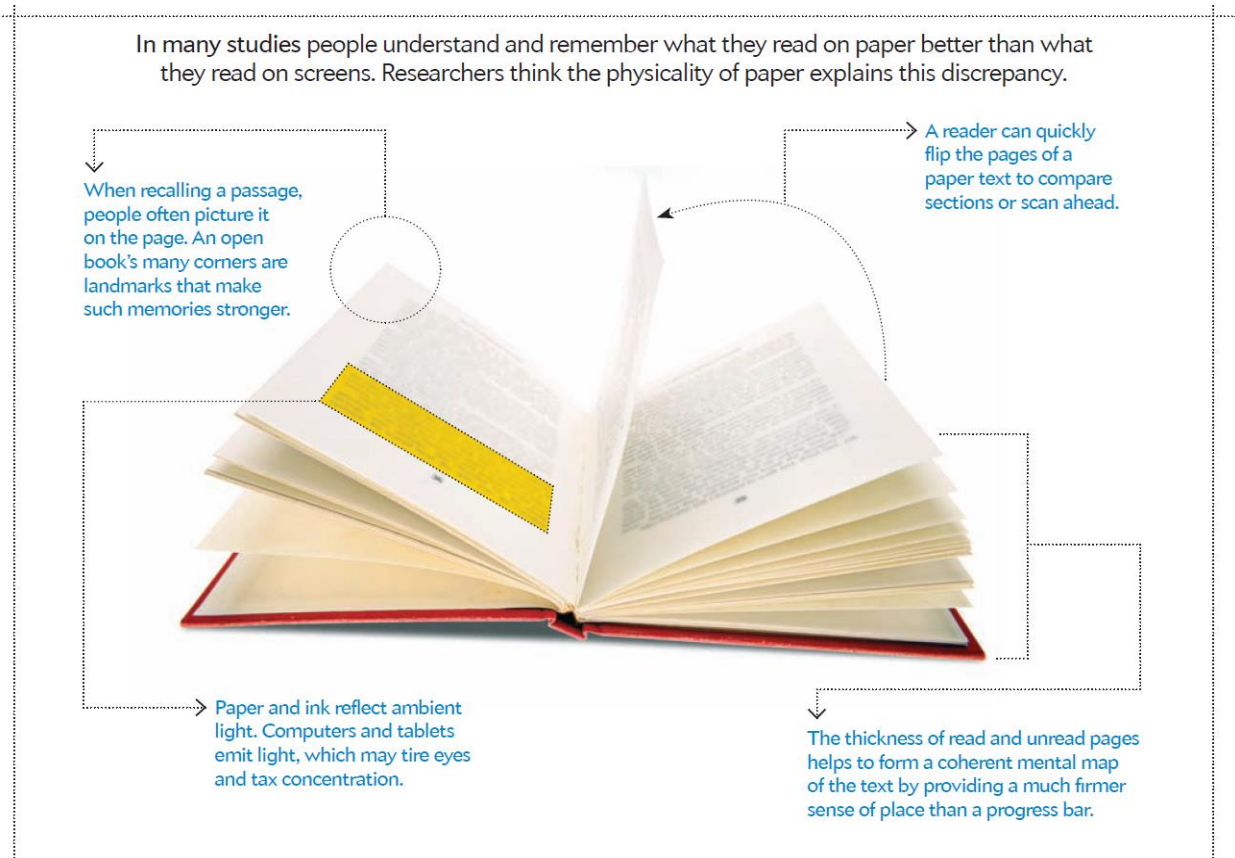


Figure 1.4 Weighing Paper against Pixel (Jabr,2013,p.52)

According to Jabr (2013), the paper medium enhances cognitive abilities like memory and attention and facilitates reading comprehension. The author argues that the paper medium creates a relaxed atmosphere for the brain to read, learn, and remember information effectively.

In her study of the child's reading brain, Wolf (2018) argues that children's interaction with physical books at an early age is the solid foundation for cognitive and linguistic abilities. According to her, children who receive linguistic input from humans and grow up in an environment empty of digital devices, that are known for their distracting characteristics, “do better on language indices” (Wolf, 2018, p. 134). Wolf (2018) explains that parents who frequently read to their children under the age of two from physical books will unconsciously develop their kids' language capacities and create a sort of “*dialogue reading*” (see Wolf 2018)

that maintains communication and engagement. However, exposing children to digital devices to learn to read impedes consolidation of children's background knowledge and affects negatively on their deep reading skills.

Another aspect that is hardly unattainable in screen mode is "*recurrence*" (Wolf, 2018). Recurrence refers to the immediate access to previous pages and backtracking to reread earlier parts to connect events while reading novels or stories; these are the most outstanding mechanisms paper can afford (Mangen, Olivier, & Velay, 2019; Wolf, 2018). Wolf (2018) concludes "Before two years of age, ...physical interaction with books and print are the best entry into the world of oral and written language and internalized knowledge, the building blocks of the later reading circuit" (p.136).

1.9.1 Multitasking

Numerous studies have agreed that one of the omnipresent activities in reading on screens is multitasking (Baron, 2015; Liu, 2005; Wolf, 2018; Wolf & Barzillai, 2009). "[This activity] entails rapid shifting or switching between different tasks or media" (Clemmons et al., 2013, p. 05). This behaviour is common among college students who report that when they read on screen, they are 90 percent likely to multitask and only 01 percent are likely to multitask when reading in print (Baron, Calixte, & Havewala, 2017).

Clemmons and his team (2013) investigated the effect of the reading medium (print or screen) on university students' reading comprehension while reading for pleasure and in school in a multitasking environment. The results showed that the reading medium had no effect on reading comprehension, and multitasking was prevalent in on-screen reading. More importantly, the results indicated that multitasking was rampant and increased the time reading. Despite this result, the researchers concluded that multitasking did not impact negatively reading

comprehension. This view is opposed to that of Baron (2015) who points out that multitasking leads to distracted reading which in turn yields unsatisfying results especially if the reading material is difficult and requires more focus and careful attention.

In the same vein, Wolf and Barzillai (2009) opine that multitasking and quick attentional shift among multiple sources lure the reader's focus from the target task and cause deficits in the comprehension process. They argue that these activities alter cognitive aspects like memory and attention and prevent deep reading. From a neuroscientific and psychophysical perspective, “multitasking creates a dopamine addiction feedback loop effectively rewarding the brain for losing focus and for constantly searching for external stimulation” (Levitin, 2014, p. 97).

Applied research has provided some evidence of the impact of multitasking on academic performance, particularly in reading academic texts. In an experimental study, Bowman, Levine, Waite, and Gendron (2010) found that students who used instant messaging while reading texts online took much more time to accomplish the reading task. It is plausible that when students are interrupted by instant messages need more time to reread the passage. However, the striking result of this study revealed that switching from reading the passage to responding to instant messages did not affect reading comprehension.

1.10 Effects of Reading Medium on Reading Comprehension

During the past couple of decades, reading has increasingly become digitised. This new trend in the reading practice sparks scholars' interest in the potential effect of technological devices on aspects of learning in general and reading comprehension in particular. A large body of empirical studies has been carried out comparing reading on screens with reading on paper. However, The issue of the reading medium's effect on reading comprehension remains unsettled: some empirical studies have found reading comprehension to be superior on paper (Delgado et al.,

2018; Mangen et al., 2019, 2013b; Singer & Alexander, 2016) while others indicate no difference between paper and screen (Hermena et al., 2017; Hou, Rashid, & Lee, 2017; Kol & Scholnik, 2017).

In one of the few studies assessing children reading comprehension on paper and screen (Mangen et al., 2013b), the researchers examined whether children's reading comprehension was affected by the reading medium. 72 tenth-grade students in Norway read two types of texts (expository and narrative) of 1400 to 1600 words in print and on computer screens. Subjects were tested on their reading comprehension by answering the questions on screen for both texts under time constraints. The results indicated that students who read texts on paper scored better in reading comprehension tests compared to those who read texts on computer screens. Mangen et al. (2013b) acknowledge that issues of navigation on screen like scrolling, among other things, might be the cause of the lower scores in reading comprehension. This view is supported by Hou et al., (2017) who state "Scrolling is known to impede readers' capacity to create an effective mental map of the text" (p.87).

In a similar study, Kerr and Symons (2006) examined whether children's reading rate, comprehension, and recall are affected by computer presentation, 60 children read two expository texts (320 words) on a computer screen and paper. Results showed that children read the text more slowly on a computer monitor than on paper. However, they performed well in recalling information from the computer. Moreover, the findings revealed that children were more efficient at comprehending informational text in the print medium than on the computer. "Difficulties in reading from computers may be due to disrupted mental maps of text which may be reflected in poorer understanding and ultimately poor recall of presented material" (Kerr & Symons, 2006, p. 5).

The essence of Kerr and Symons' arguments is that the lack of spatial representation of the text on the computer impedes reading comprehension. For this reason, readers of long texts on a computer screen often prefer to print the documents for detailed reading (Baron, 2017; Hou et al., 2017; Mangen et al., 2019; Marzban, 2011).

Whereas earlier empirical studies provided ample evidence that reading on paper is superior to on-screen, Hermena et al. (2017) believe that reading medium has no significant impact on reading comprehension. In their study, 24 undergraduate students read two passages in Arabic (the students L1) on tablet and paper under the same display conditions for both media. Hermena et al. (2017) reported that neither the order of the reading medium (reading on tablet first versus paper) nor familiarity with tablet options influences reading performance. Furthermore, the findings revealed that using the Arabic language with its distinctive features from other languages reported no noticeable effect on reading rate and comprehension on tablets and paper. The researchers conclude that reading from a tablet does not result in a slow rate of reading or disrupt reading comprehension if the conditions of text display are well manipulated and matched with those of paper. By focusing on the visual display of the text, Hermena et al. (2017) overlooked the kinesthetic and tactile features of the medium in addition to the length of the text that may impact reading comprehension.

A significant study (Mangen et al., 2019) shed new light on the effect of kinesthetic and tactile cues on reading comprehension, which previous studies had not addressed. In this study, 50 young adults read a long mystery story on kindle and in a print pocket book under the same display conditions to compare their reading comprehension. Researchers tested whether the absence of kinesthetic and tactile feedback hampers the localisation of events and reconstruction of the plot of the story. It was found that readers were efficient to locate events and reconstruct

the plot of the story in print. Mangen et al. (2019) refer this result to the advantage of paper as the kinesthetic and tactile cues that affect significantly the aspects of readers' cognitive reconstruction of a narrative reading, in particular to its temporal and chronological dimensions. It was concluded that sensorimotor cues have a crucial role in print reading whereas they are lacking when reading on the Kindle. In her book, "*Words Onscreen*", Baron (2015) maintains that "smell and sight are relevant senses when it comes to reading. But touch may well be the most important" (p.142)

Another potential explanation for the learning performance on paper and screen platforms might be related to the metacognitive factor. "Metacognition, or the ability to monitor one's cognitive performance, has been shown to correlate with good reading comprehension" (Mangen et al., 2013b, p. 66). In a significant study (Ackerman & Lauterman, 2012) observing the differences between On-Screen Learning (OSL) and On-Paper Learning (OPL), the authors found that under a short and fixed study time, OSL and OPL performance was equivalent (Experiment 1). However, under a self-regulated study, test performance was lower for OSL than for OPL. Ackerman and Lauterman (2012) claim that participants' greater overconfidence for OSL about predicted performance (shorter study time + lower-level learning) results in low performance contrary to subjects in the OPL group who monitored their performance accurately. Ackerman and Lauterman's (2012, p.29) point is that

People appear to perceive the printed paper medium as best suited for effortful learning, whereas the electronic medium is better suited for fast and shallow reading of short texts such as news, e-mails, and forum notes... the common perception of screen presentation as an information source intended for shallow messages may reduce the mobilization of cognitive resources that are needed for effective self-regulation.

Other authors assume that students reading comprehension on screen might be enhanced if students are taught the necessary strategies (Kol & Scholnik, 2017). In Kol and Scholnik's study (2017), 47 students studying English for Academic Purpose (EAP) were randomised into two groups: the control group read a text of 4 pages on paper whereas the experimental one read the same text on screen using the find feature, the highlighter, and a hyperlinked of the text. Students' reading comprehension was assessed under three different types: scanning for specific information by using the find feature of the word processor, skimming (looking for specific sections quickly and highlighting them to get the main idea), and close reading that includes multiple choice questions and short answers. Results revealed that students reading from screen and students reading from paper performed equally in all types of questions on the reading comprehension text. Nevertheless, the study's findings can not be generalised to participants who perform the reading task under a time constraint on both media.

A recent meta-analysis (Delgado et al., 2018) of 54 studies published between 2000 and 2017 comparing the reading of comparable texts on papers and screens found an advantage for papers over the screen. This meta-analysis revealed three significant moderators for this finding (1) Time frame: Time constraint resulted in better reading outcomes on paper than in self-paced reading (2) Text genre: the paper-based reading advantage was consistent across studies using informational texts or a mix of informational and narrative texts, but there was no effect of medium when it comes to the narrative text only. (3) Publication year: this meta-analysis debunked the idea that "digital natives" becoming effective at screen-based reading with greater screen exposure and experience, it found the advantage of paper-based reading increased from 2000 to 2017 (Delgado et al., 2018) as it is shown in the following Figure:

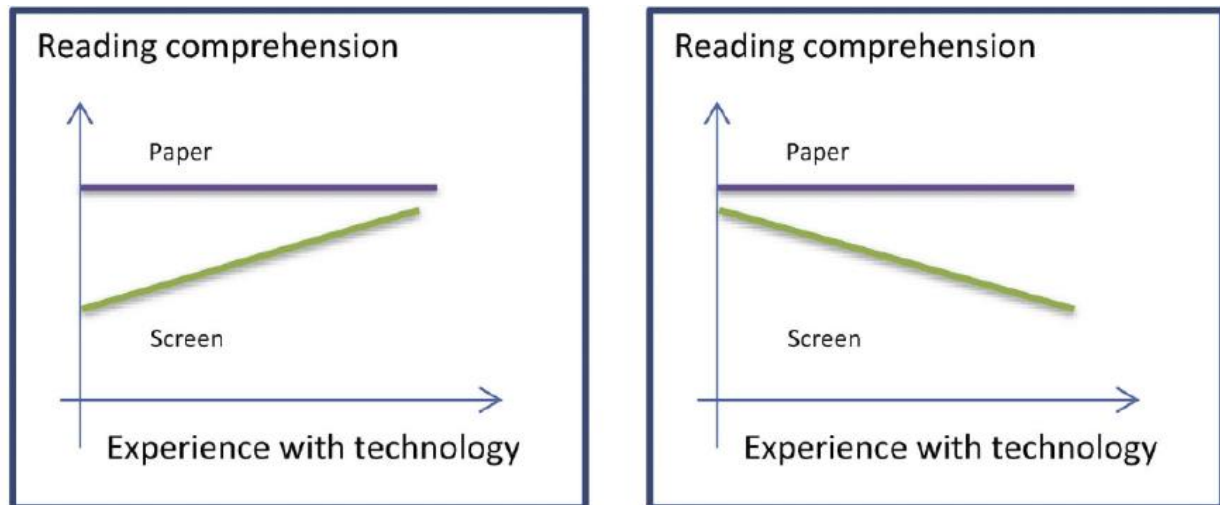


Figure 1.5 The effect of experience with technology on reading comprehension differences between print and digital devices (Delgado et al.,2018, p.25)

These findings go in line with Singer and Alexander's study (2017) which concedes that paper medium plays a significant role in enhancing deep comprehension and learning despite the prevalence of screen reading. Although previous studies (Delgado et al., 2018; Mangen et al., 2013b; Singer & Alexander, 2016) yielded a clear picture of paper superiority, authors invite investigators to study the effect of the medium from motivational and sociocultural perspectives (Singer & Alexander, 2016).

1.11 Preference for Reading Medium

E-books resemble motel rooms- bland and efficient. Books are home real,physical things you can love and cherish and make your own, till death do you part.

Or till you turn off out-of-shelf space.

(Michael Dirda as cited Baron,2015, p.3)

Research studies have found that students' choice and preference for the reading medium are contextually based on the reader's purposes and the text's features. It has not been proved yet that a single medium would satisfy all the reader's needs in all circumstances (Liu, 2012b).

1.11.1 Preference for paper reading

1.11.1.1 Text Length

In a recent study (Mizrachi, Salaz, Kurbanoglu, & Boustany, 2018) investigated the academic reading format preferences and behaviours of 10,293 tertiary students in 21 countries, researchers found that the majority of students worldwide preferred reading their academic materials in print, especially for important and long materials. This finding is consistent with Baron's et al (2017) study when 86% of total respondents reported preferring to read longer texts in hardcopy. "Young adults would appear to judge that reading longer texts benefits from a medium that facilitates mental focus and less-hurried thought" (Farinosi, Lim, & Roll, 2016, p. 217). This claim is supported by (Mizrachi et al., 2018), who acknowledge that "when constructing a literature review for a thesis,[readers] might find it less effortful to learn and accomplish the task using the print medium text"(p. 4). In a similar vein, Liu, (2006) asserted that paper medium is a suitable medium for serious and in-depth reading where students need to highlight and take notes.

1.11.1.2 Annotation and Comprehension

A large body of literature agrees that note-taking and highlighting are very effective learning strategies for a better understanding of the text (Baron, 2017; Liu, 2006, 2012; Mizrachi, 2015; Mizrachi et al., 2018). In his study (Liu, 2005), 85 respondents reported that they annotate paper documents more frequently than digital texts. Annotation (like highlighting, underlying, and note-taking) serves as a major contributor to print text understanding that sustains focus and

boosters better retention of information. Most students across countries express their favour of using annotation as a significant learning strategy to prepare for their exams or writing papers (Baron, 2017; Mizrachi et al., 2018).

To investigate the effect of using annotation on college students' reading comprehension in print and on screen, Ben-yehudah and Eshet-Elkhalai (2014) found that annotation on paper supports comprehension when reading for inference-level questions. Interestingly, the findings revealed that annotation had no effect on comprehension neither for factual-level questions nor for the inference ones when reading digitally. John Dickenson believes that "marking up a text on an iPad is ... like eating candy through a wrapper" (as cited in Bron,2015, p.30). Despite the advancement of digital devices with annotation enhancement, students still prefer annotation on paper to electronically. As Marshall (1997) notes, " it is likely that people will continue to annotate paper materials, even they read materials in a digital library" (p140). Above all, Baron (2015) extols the virtues of annotation as a motivating force that welcomes the reader back to reread the material.

1.11.1.3 Concentration

One of the cognitive enterprises of reading is concentration. Research finds that print tends to enhance concentration. In her book "*Words onscreen*", Baron (2015) maintains that "distraction while reading on digital devices is one of the hardest nuts to crack" (p.221). A recent study revealed that 91% of respondents chose print for not being distracted and for better concentration (Baron et al., (2017). As one of the respondents states " I feel like the content sticks in the head more easily, reading in hardcopy makes me focus more on what I am reading" (Baron et al., 2017b, p. 18). In their comments on choosing print over the screen, Mizrachi's (2015)

respondents stated that “sustained concentration seems easier when reading in a linear progression than vertical scrolling” (p.8).

1.11.1.4 Paper’s Sensory Dimensions

The sensory dimensions of paper tend to be the most significant consideration for choosing the paper medium. The physical and visual features of paper yield better comprehension of the text. This is proved from a neuroscientific perspective when Liu (2005) acknowledges that

The human nervous system has a spatial control mechanism for the coordination of the hand with the focusing muscles of the eye. It is much easier to read something that is held in the hand than something that just lies on a table. (p.709)

Paper’s haptic and tactile cues in enhancing comprehension have been approved by many researchers (Baron, 2015; Liu, 2012b; Mangen et al., 2019; Mc Laughlin, 2016; Rose, 2011; Wolf, 2018). Overall, Wolf, (2018) concluded that “the sensory dimension of print reading adds an important redundancy to information- a kind of- geometry to words- which contributes to the overall understanding of what we read” (p. 79).

Furthermore, researchers agree that paper- reading based is pleasant to read and less taxing on the eye (Chou, 2012; Farinosi et al., 2016; Jabr, 2013; Liu, 2005; Mangen et al., 2019; Mangen & van der Weel, 2016; Myrberg & Wiberg, 2015). Indeed, eyestrain is the palpable concern that readers always complain about when reading on screen. Jabr (2013) explains that based-reading screens can be detrimental to comprehension due to the shining light that digital devices emit especially computer screen (Baron, 2015) which in turn causes eyestrain, headache, and blurred vision.

From a psychological view, Rose (2011) asserts that paper provides the reader a sense of ownership as she claims “ to comprehend something fully is to take ownership of it, and in order

to own a text. I must hold it in my hand” (p.519). Admittedly, the sensory aspects of paper matter a lot for a remarkably large number of readers, and the physicality of this medium shapes the real meaning of reading (Baron, 2015).

1.11.2 Preference for Screen reading

Digital reading has many advantages, such as democratizing access, convenience, cost, and environmental benefits. These appealing features increase the students’ temptation to embrace the use of online reading in the academic context.

1.11.2.1 Democratizing Access

Easy access to online materials is a major benefit of digital reading. Mizrachi (2015) believes that access to information is the main concern for students in the academic realm. Online sources are the appropriate tool to fulfil this need and provide students with pertinent information. This belief is consistent with many researchers’ findings (Abdul Karim & Hasan, 2007; Baron, 2017; Liu, 2012b; Rose, 2011; Shen, 2006) who claim that students are increasingly reading online and using websites and digital libraries to achieve their academic purposes. Rose (2011) adds that screen reading directs the reader’s quest and steers him to the target in an abundant world of information. She states that “... in screen space, my reading is very goal-directed and strategic. I know what I need. What I am looking for...” (Rose, 2011, p. 523).

1.11.2.2 Convenience

Convenience tends to be the appealing quest in digital reading. For example, Baron’s (2017) study revealed that what students liked the most about reading on screen was convenience in terms of space, storage, or organisation. Digital devices are more convenient for students to store as many as documents they need and carry them wherever they go in PDF (Portable Document Format) format on their computers (Mizrachi, 2015; Rose, 2011).In addition, the FIND function

plays a pivotal role in finding relevant information easily on the computer screen or any other device (Baron, 2015; Kol & Scholnik, 2017; Podolsky & Soiferman, 2014). Furthermore, the ability to enlarge text size is another virtue of screen reading (Baron et al., 2017b)

1.11.2.3 Cost

When it comes to cost, the choice of medium matters a lot. Cost tends to be the main reason for choosing online reading. According to Baron et al. (2017), university students preferred to read e-books due to the low price that Amazon Kindle started to offer in late 2007. “ [Online readings] make it possible for millions of people to have access to texts that would otherwise be beyond their reach, financially or physically” (Baron, 2017, p. 16). It is agreed that if the cost has been removed from the equation, students will likely choose a print medium (Baron, 2015; Baron et al., 2017b; Mizrachi, 2015).

1.11.2.4 Environmental Issues

One of the surprising findings that recent empirical studies have revealed is the preference for screen reading that comes from students’ willingness to preserve the ecological system (Baron, 2015; Baron et al., 2017b; Jeong, 2012; Mizrachi, 2015; Vandenhoek, 2013). For instance, Vandenhoek's (2013) study revealed that students printed out fewer articles to protect the environment. However, Vandenhoek’s study did not determine the type of these articles. This finding closely tracks with those of Baron et al., (2017) and Mizrachi whose respondents are likely to print out long texts because of cost and environmental concerns. Unlike hardcopy, digital reading is more beneficial and environmentally friendly. Because “...Printed books are shipped long distances from warehouses to bookstores, using gasoline and creating pollution. They also use a large number of trees” (Jeong, 2012, p. 404).

1.12 Conclusion

This chapter presented the major concepts and themes that are related to the reading process. This process has multifaceted aspects and encompasses different cognitive enterprises. It is impossible to cover all the cognitive processes involved in the reading process. However, the scope of this dissertation is limited to one of the fundamental enterprises of reading which is comprehension. To understand the mechanisms of reading comprehension, it is essential to study the main reading models that govern this process, such as the bottom-up, top-down, and interactive models. Yet, much attention was given to the Construction-Integration model that serves as the theoretical lens for this dissertation. The underlying assumption of this theory is that the comprehension of a text starts with the construction of text; scrutinising its basic units with the integration of the reader's prior knowledge that has a pivotal role in building the comprehension process.

Nevertheless, the reading medium is another factor that contributes to a wide extent to comprehend the reading material. This chapter has presented an overview of relevant literature on the effect of reading medium on students' reading comprehension. It has also discussed students' preferences for reading mediums. This review on the existing literature provided greater insight into students' reading behaviours in the digital age. Its prime concern was to compare reading comprehension across mediums.

However, the dearth of evidence about the effect of medium while reading longer texts in a foreign language has been noticed. Therefore, the remaining chapters of this dissertation attempt to fill this gap by studying the Algerian EFL students' reading comprehension on paper and screen as a sample in EFL context.

CHAPTER TWO

EFL Reading in the Algerian Context

Chapter2 : EFL Reading in the Algerian Context**2.1 Introduction**

The current chapter aims to provide a clear picture of the fate of reading among Algerian students in the EFL context. Therefore, it is imperative to describe the context where the English language has been adopted. Furthermore, it is essential to depict the potential effects that may influence the backbone of the English language which is reading.

The first section in this chapter scrutinises the subject of language policy in Algerian education. It gives an overview of the Algerian linguistic background, and how linguistic plurality may affect the implementation of the language in the educational system. The second section discusses the prominence of the English language and its significance in the globalised world. The following section about LMD (License- Master- Doctorate) system explains the reforms taken by Algerian education to meet the requirements of the 21st century. It focuses on the state of the English language under LMD system in the Algerian context. The final section delves into what has been conducted about Algerian EFL students' reading practices. It identifies the obstacles that hinder students' reading performance.

2.2 Language Policy in Algerian Education

The topic of language education policy in Algeria is a thorny, contested, and sensitive issue since its independence in 1962. Which languages should be fostered to build up a solid educational system has been the subject of considerable debate in the country. Despite Algeria gained its independence politically, it is still bound to France culturally through the dominance of French language use in the Algerian society. This heavy colonial legacy stands as an obstacle in the way of any extensive attempt to plaster the cracks in the educational system. In addition, the profile of the country which is known for its linguistic diversity such as Algerian Arabic,

Berber and Tamazight vernaculars is the issue that has been overlooked by decision-makers and politicians to satisfy their preserves at the expense of the Algerian identity and nationalism. Moreover, the unconsidered decisions that lack pedagogical and educational logic such as the inclusion of foreign languages at early stages in the Algerian schools have failed in presenting panacea for ills in the education system.

After independence, Algeria's educational system was the legacy of French colonialism. The colonial policy aimed to subjugate and assimilate the Algerian people into the French culture by ousting and undervaluing the Arabic language the mother tongue of the Algerian people and replacing it with French as the official language of the country in an attempt to shake the Algerian identity and nationalism (Le Roux, 2017). Meanwhile, Algerians believe that " Islam and Arab language were effective forces of resistance against the attempt of colonial regime to depersonalise Algeria" (Gordon, 1966 as cited in Benrabah, 2007, p. 229). French colonialists sought to use education as a means to reflect French interest, and classes were considered a suitable space to instill the French culture: curriculum and syllabi were copied from French education, the majority of teachers were French, and the language of instruction was French too.

Upon achieving independence, the Algerian government began to make major educational reforms in an attempt to regain the lost national identity. Ahmed ben Bella, the first Algerian president, initiated the policy of Arabisation as a substitution for the French language. The cardinal tenet of this policy is to introduce Literary or Classical Arabic as the language of instruction in all subjects at all levels by devoting much time to teach this language in addition to religious instructions and civics (Benrabah, 2007). During Boumediene's policy (1965-1978), a staunch proponent for Arabisation, Arabisation gained much interest through the recruitment of Arabic teachers from Arabic- speaking countries in the Algerian schools. The government's

advocation for that policy was well presented in the words of the First Minister of education, Ahmed Taleb Ibrahimi when he states, “Arabisation will not work, but we have to do it” (as cited in Benrabah, 2007, p. 230).

The Algerian turning point in the educational system was in 1976 when all private schools were abolished and a fundamental school was created through the fusion of primary school (5 years) with middle school (4 years) under a total Arabisation with great emphasis on teaching the Islamic culture as a step to restore the deprived nationalism. As far as foreign languages are concerned, French was taught as the first mandatory foreign language in Grade Four whereas English was taught as the second mandatory foreign language in Grade Eight (Benrabah, 2007; Mami, 2013).

According to educationalists, maintaining a monolingual system in a context known for its diverse sociolinguistic profile makes any attempt toward effective educational reforms prone to failure (Benrabah,2005; Mami, 2013; MILIANI, 2001). The linguistic pluralism distinguishes Algeria from other Arabic countries as explained by Tabory and Tabory (1987):

The Algerian language Situation is complex, as it is at a crossroad of tensions between French, the colonial language, and Arabic, the new national language; classical Arabic versus colloquial Algerian Arabic; and the various Berber dialects versus Arabic. The lessons from the Algerian Situation may be usefully applied to analogous situations by states planning their linguistic, educational, and cultural policies.

(P.64)

Furthermore, the recruitment of teachers from other Arabic countries who were ignorant of the Algerian sociolinguistic diversity was the major cause of the educational system’s failure (Benrabah, 2005). In addition, those teachers were not competent enough to transmit the

knowledge in a very adequate way to the Algerian students either because of their incomprehensible dialects or due to their inefficient and traditional teaching approaches as illustrated by Saad (1992) when he claims:

Indeed, the Egyptian teachers had been long trained in the tradition of learning by rote and class recitation. They were also accustomed to exercising strict hierarchical control over the class, and they thus demanded full obedience and respect from their students. Moreover, the majority of these teachers were members of the Muslim Brotherhood. They' were interested more in the ideological indoctrination of the students than in teaching.

(as cited in Benrabah, 2005.p.442)

In the course of the constant failure the educational system was witnessing, there was a pressing need to take action to reduce the instability and save the system from other setbacks. With the appointment of Mostefa Lacheraf as a Minister of Primary and Secondary School in 1977, the French language gained its momentum through adopting bilingual education that introduced French as the language of instruction for scientific subjects such as Science and Mathematics and the gradualism of Arabisation in the Algerian schools (Benrabah, 2005). However, these reforms widened the gap and created a kind of hostility between the Arabophone group who supported Arabisation as a symbolic value of Arabic and Islamic identity, and the Francophone who stuck to the French language as the language of modernization.

When Mohamed Cherif Kharoubi came to office, educational reforms were launched to restore Arabisation as a viable strategy to improve the educational system. Among these reforms were:

- Resuming the policy of total Arabisation;

- ▶ Implementing the Fundamental Schooling System;
 - ▶ Imposing Compulsory teaching of religious instructions at all levels;
 - ▶ French language was introduced in Grade 4 as a first mandatory foreign language whilst English was introduced as a first foreign language in Grade 8
- (Benrabah, 2007)

The early 1993 witnessed the adoption of a new policy resulting in implementation the English language at an early stage aiming to establish a serene climate for languages to develop naturally without conflicts (Miliani, 2001). Pupils in Grade 4 in primary school had to choose between French and English as the first compulsory first foreign language. However, this reform did not reach the setting goals due to the negligible number of pupils who chose English and the children's parents' preference for learning French, the most frequently used language in Algerian society (Benrabah, 2007; Nadia, 2011)

The inclusion of foreign languages, namely English, in primary school was an endeavour to produce individuals capable of facing up the evolving and globalised world. However, The Algerian government's intention does not fit the facts. According to Milain (2000), the choice of the English language to the detriment of French comes to satisfy political intentions rather than to attain pedagogical goals that best respond to the needs of the society. He adds that educational reforms were planned by politicians who overlooked the multilingual context of the Algerian society and who have limited expertise in the pedagogical field. In Miliani 's view (2000):

Language policy is not planned according to objective and realistic criteria. It is mostly the outcome of individual or group political take-over. The educational system is also taken hostage by jingoistic attitudes expressed in hasty and unrealistic educational reforms. This is

no less than the case of English teaching and its early introduction in the primary level, a roundabout way to end the influence of French inside and outside the school system. (p.13)

When it comes to the topic of English language's inclusion in Algerian schools, most of us will readily agree that English is the language of science and technology, and its enhancement will add incremental changes to the educational system. Where this agreement usually ends, however, is on the question of whether this educational reform will restore stability in the educational realm. Whereas some are convinced that the introduction of English is a way to get rid of the use of the French language, others maintain that enhancement of the English language especially at the university level will prepare future generations able to face the demands in the era of globalisation.

2.3 English Language: The Prominent Language in the Age of Globalisation

English language becomes a global language that dominates all aspects of people's life. The latter is known as "Lingua Franca" which has been used as a means of communication between different communities of speakers across the globe. Above all, the English language is recognised as the language of globalisation that gained prominence in the realms of science, technology, academia, economy, and business. Knowing that language offers limitless opportunities for individuals to get better jobs and ensure a privileged position in society. These advantages increase Arab's world impetus to enhance English learning as a prerequisite for preparing future generations able to cope with the requirements of the globalised world.

According to Zughoul (2003), the English language is characterized as the " Language of Globalisation" whose prevalence is obvious in the Arab world, particularly in the educational arena. He attests that:

The spread of English in the Arab world is so clear in the field of higher education. With the exception of Syria who maintained a strong teaching tradition through the medium of Arabic, the schools of science, engineering, medicine and business teach through the medium of English (French in Arab North Africa) or a hybrid variety which uses a blend of English and Arabic.

(Zughoul, 2003, p. 19).

The impulse of learning English in the 21st Century comes from the utmost significance this language has, as explained by Crystal (1997):

1. English is the working language of international organizations and Conferences... about 85% of the international organizations now use English as one of their working languages, 49% use French and fewer than 10% use Arabic, Spanish or German. English is also a major language of financial institutions.
2. English is now "the international currency of science and technology".
3. English is the language of international banking, economic affairs, and trade.
4. It is the language of advertising for global brands
5. It is the language of audio-visual cultural products (e.g., film, TV, popular music).
6. It is the language of international tourism.
7. It is the language of tertiary education
8. It is the language of international safety
9. It is the language of international law.
10. It is a "relay language" in interpretation and translation.
11. It is the language of technology transfer.
12. It is the language of internet communication (as cited in Zughoul,2003.p,12).

The aforementioned advantages provide the English language an eminent status in the world and demystify its function as a global language. Today, English is spoken and learnt almost everywhere as a first, second, or foreign language as illustrated in the following Figure:

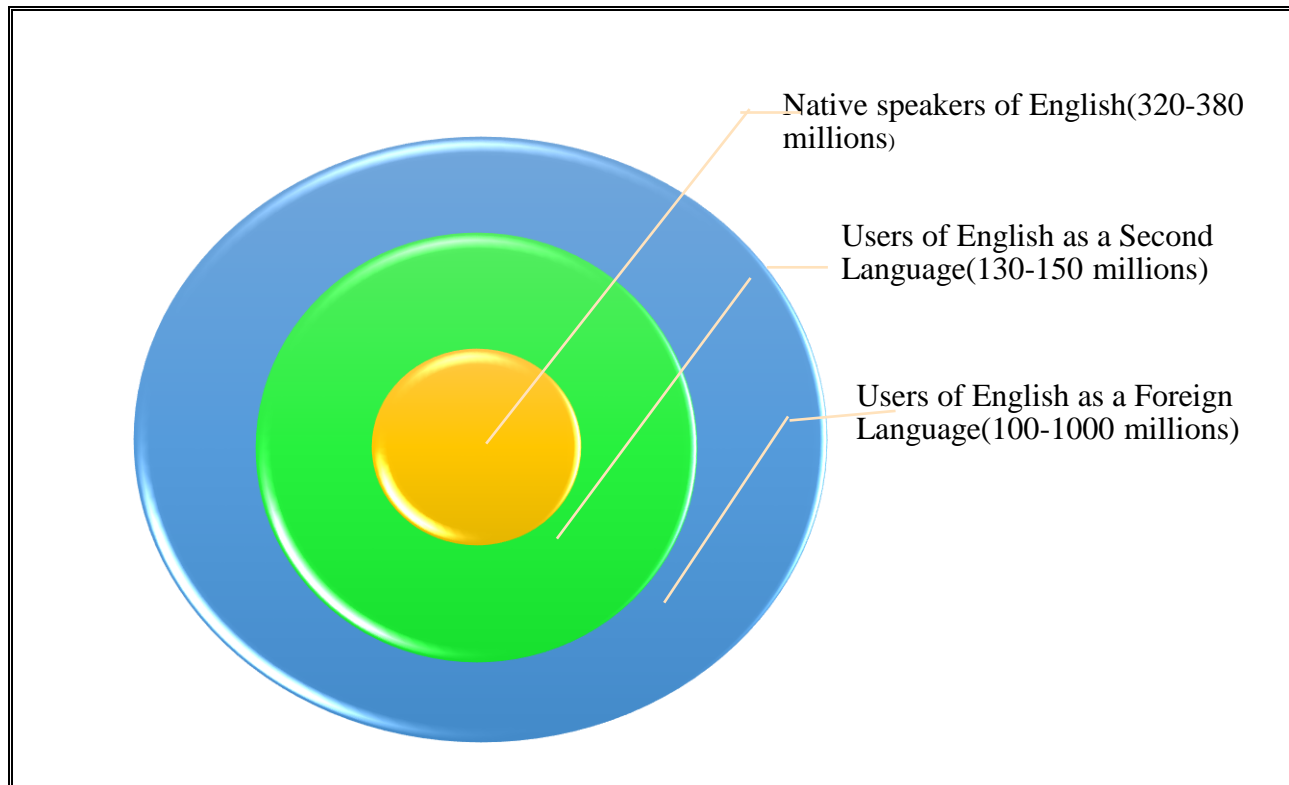


Figure 2.1 The three circles of English speakers (Zu ghoul, 2003.p,12)

English is being so entrenched in most the Arab countries and the emphasis on its teaching becomes the prime concern of Arab governments: educational authorities introduce English to all educational levels and launch major reforms aiming at improving students' English proficiency. As Al- Khatib concedes:

With the increase in the use of English as a lingua franca, most Arab governments began to recognize its importance by introducing the teaching of English into the school curriculum. At

present, in most Arab countries, all students who finish the public secondary school education must have had at least eight years of instruction in English as a school subject. It is also worth noting that formal training was is still compulsory in most elementary, preparatory, and secondary Arab private schooling. So, because of the widespread use of English as a second language, the subject of language teaching in general, and teaching of English as a foreign or second language in particular, has become the focus of attention of most Arab researchers. (as cited in Shunnag, 2016, p. 6).

Learning English becomes a formidable endeavour many countries, namely Arab ones, strive to meet. The motives to master that language are increasingly strengthened as the world becomes more demanding due to the evolution of technology and the openness to the free economic market.

2.4 The LMD System Between Intention and Reality

Due to the problems that are plaguing the educational system, Algerian university sees an urgent need to revamp the entire education of system. Moreover, the growth of globalisation prompts the authorities to rethink educational policy by adopting new initiatives and reforms to enable students to meet the demands of the 21st century.

Algerian higher education has been undergoing significant changes. Raising the quality of education is the priority on its agenda to prepare the Algerian students for the based-knowledge society. To meet this endeavour, a new system has been adopted known as LMD System (License, Master, Doctorate).



Figure 2.2 LMD structure

The notion of LMD traced back to 1999 when the Bologna process had been initiated under the aegis of 29 European Ministers of Higher education whose central premise is to create a solid and effective educational system “in a coherent and cohesive European Higher Education Area (EHEA)” (Djebbari, 2014, p. 128). Countries such as Algeria, Morocco, and Tunisia were the pioneers in the African content which adopted the LMD system (Curaj, Deca, & Pricopie, 2018). Algeria has aligned its system with the Bologna process and implemented LMD in pursuance to find room among other countries in the context of the ongoing process of globalisation with its incessant and increased demands by enhancing the quality of its educational system through attaining the setting objectives of LMD.

LMD system advocates learner autonomy and underlines the role of the teacher as a facilitator in the teaching and learning process. The teacher is no longer the omniscient power and learners are not seen as recipients of information rather they are regarded as the producers of knowledge (Sarnou & Bouhadiba, 2012). This system relies on the use of technology as a teaching tool to enhance the teaching practices and widen students’ horizons to expand their knowledge and equip them with adequate toolkits to meet the demands of the socio-economic markets.

In the Algerian context, the higher education authorities highlight the fundamental importance of LMD in creating an environment conducive to collaboration between universities that share the same interest and objectives (Mami, 2013). Undoubtedly, this collaboration will contribute to raising of education quality through exchanging knowledge, ideas, and expertise that in turn boost students’ learning outcomes.

When it comes to practice, the implementation of the LMD system in Algerian universities confronts various obstacles that make the success of this system difficult if not impossible to achieve. For instance, Nadia (2011) opines that the prevalence of Arabisation policy since independence produced teachers with low proficiency in foreign languages, especially French and English. She adds that a lack of training on the part of teachers before LMD's implementation stands in the way of the efficiency of this system. In a similar vein, Miliani (2010) spotlights that to meet the real objective of the LMD system 'the country must develop a real policy of 'linguistic diversification' by a multilingualism synonymous with survival (Miliani, 2004, P .24 as cited in Miliani 2010). Miliani (2010) opines that the issue of time management creates hurdles for better learning outcomes. In his view, authorities favour scientific and technical subjects over social sciences and foreign languages as he puts it 'mornings are given to the 'hard' sciences while afternoon are left for the 'remaining'. Because of such discrimination, quality education will remain just a trendy term" (p.68).

From the aforementioned constraints, it seems that the success of LMD remains an aspiration rather than a reality. Neither the context nor the quality of human resources allows to establishment of a fertile ground for the LMD to prosper. However, if authorities change their vision and provide university teachers a proper training under good conditions in addition to giving much interest to teaching foreign languages in a serene climate, at that time it may be possible to talk about the success of the LMD system in the Algerian context.

2.4.1 English Language Teaching Under LMD System

"Being able to share meanings with others in more than one language is an even more remarkable achievement. There is no question about the value of biliteracy and bilingualism both for the individual and society. It opens options for self-

expression, economic viability, and common problem solving across language group”

(Lems, Miller, & Soro, 2010, pp. 1–2)

Like many countries around the world, Algeria gives utmost significance to teaching English at the university level. Algerian university has realised that promoting English in higher education is the primary engine of development in many fields: education, economy, technology, science...etc. For this reason, new initiatives and major reforms have been adopted for the sake of raising the quality of education and improving students' English language proficiency in particular.

The former Minister of Higher Education, Tayeb Ben Bouzid, introduced an initiative on July 2019 to promote the use of English as an official language of teaching and administration. A referendum has been presented to investigate university teachers and students about that proposal. Results revealed that the majority of participants (over 94%) have embraced the initiative of inclusion of English as a means of instruction, they consider this reform a basic step towards a better future in the realm of education, whereas nearly 5% of respondents favour keeping French as an official language in the Algerian universities either for their low proficiency level in English or because of their adaptation with the use of French for many years.

It is evident from a plethora of studies (Mami, 2013; Messekher, 2014; Sarnou & Bouhadiba, 2012) that English Language Teaching (ELT) has received much interest from Algerian universities to keep up with regional and global advancement. For instance, Sarnou and Bouhadiba (2012) point out that ample efforts made to enhance teaching (EFL) under the LMD

system to help students access opportunities for better jobs and ensure the legibility of their degrees since English becomes the gateway towards international mobility and employability.

Sarnou and Bouhadiba (2012) investigated both teachers' and students' attitudes towards the effect of the LMD system on teaching EFL in the Department of English at Mostaghanem University. Findings indicated that students and teachers have positive attitudes toward the profound impact of the LMD system on the acquisition of English. Authors acknowledge that learning English under this system is more specialised and focused. They argue that the rigorous programme and extensive content lead students do more research and perform more efforts to grasp their learning materials and expand their knowledge. In other words, LMD offers students lifelong learning opportunities to enhance their autonomy and continue their studies outside the classroom. Above all, the authors extol the pivotal role technology plays in enhancing EFL learning. First, ICTs (Information Communication Technologies) enable teachers to adjust their teaching practices and innovate new teaching approaches. Second, technology provides unprecedented freedom for the learners to exchange ideas and knowledge to develop their learning skills. Third, ICTs bring students to contact with authentic materials that demystify their English learning. Authors conclude that learning English under the LMD system maximises the chances for students to get a good job with acknowledged degrees.

Nevertheless, both followers and critics of the LMD system will probably argue that LMD does not ensure employment for graduates in our country. Furthermore, a recent study (Nadia, 2011) showed that despite Algerian university students are motivated to study and learn English, however, their achievement is too low which is partially attributed to the incompetent and ill-trained teachers.

Under such adverse conditions, it is impossible to ensure the complete promotion of English under the LMD system. Therefore, Algerian experts and particularly teachers should rethink their approaches and methods in teaching English more efficiently. According to Mami (2013,p.913):

The misconceptions inherent to the teaching of English in Algeria are misconceptions in the distinction between the theory and practice, between the “know” and “know-how”. It is not enough to do our best; we should know what to do, then do our best to achieve it.

If teachers invest more efforts in improving the four language skills (Listening, speaking, reading, and writing) with the help of technology, our teaching of English will result in fruitful learning outcomes.

2.5 The Fate of Reading in the Algerian EFL context

English Language learners are required to master the four language skills, and reading is one critical skill. It is indisputable that reading plays a crucial role in academic achievement and opens up avenues for language learners to develop their intellectual capacities and improve their critical thinking. Furthermore, reading is regarded as the primary source for language learning: it provides learners with more vocabulary and enables them to be in direct contact with the target language. For this reason, Algerian EFL students need to develop their reading habits in order to increase their English proficiency. Nevertheless, various constraints appear to hamper their willingness to boost their reading habits either inside the university or outside.

In their recent work, Arab and Benaissi (2019) have offered harsh critiques of Algerian EFL students' reading habits for the lack of parental support and absence of encouragement on the part of the university teachers. Through the questionnaire that was administered to 61 EFL undergraduate students (first and third year) at Djillali Liabes, Sidi Belabbes, the authors found

that participants hardly read to expand their vocabulary and improve their language learning. They claim that despite students having positive attitudes toward reading, their reading habits are dramatically declining due to the negative role of parents in enhancing their children's reading behaviours. According to them:

When parents do not serve as models for their children either because they are illiterate or they cannot afford the books, or simply because they are themselves unmotivated to read, children are more likely to grow up with a lackadaisical attitude towards reading.

(Arab & Benaissi, 2019, p. 6)

Another plausible reason that disrupts students' reading performance is the inadequate reading programme that does not give more space for students to develop their reading skills, in addition to the teachers' lack of support and encouragement to motivate students to conduct extensive reading outside the classroom through suggesting assignments that may help them to increase their vocabulary and thereby improve their English proficiency. The essence of Arab and Benaissi's argument is that neither the home nor university environment provides a reading space for students to develop their reading habits.

These conclusions, which the author discusses in poor reading habits on the part of students add weight to the argument that the Algerian new generation is not avid readers and EFL students in particular.

Another assertion that indicates that Algerian students are poor readers has been confirmed by Mohammed's study (2017) at English Department at Telemcen University with EFL students who study literature: he argues that students lose interest in reading due to their dependence on the Internet in getting information. He claims that the growth of the Internet and technological devices has a detrimental effect on students' literacy. According to him, despite online reading

offers limitless electronic sources at students' disposal, it creates a kind of superficial reading that lacks concentration and deep understanding of the information they read. Mohammed (2017) further explains that the Internet threatens extensive reading, the core of reading that contributes to the building students' background knowledge. This kind of reading becomes a daunting task for students to perform in the digital environment.

Furthermore, Mohammed (2017) points out that the scarcity of academic resources at the university library stands in the way of students' attempt to read more and boost their reading practice. He emphasises that poor reading impacts negatively enhancing writing skills. He concludes that Algerian students still ignore the utmost significance of reading in their life and are addicted to the Internet which distracts them from the good virtue of reading as he puts it:

Unfortunately, despite the immeasurable merits of reading, many students today tend to neglect it as they have become much more interested in other things; they have encapsulated themselves in texting and messaging and other social media instead of immersing themselves in reading which is not only for language mastery, but the route to enlightenment.

(Mohammed, 2017, p. 59).

Here many researchers (Assia, 2012; Group, 2002) would probably object that the Internet may have a negative influence on students' reading habits. For instance, Baiche (20015) spotlights the importance of websites and multimedia as a source of information and knowledge. Basically, Baiche claims that the Internet serves as a vital source in fostering one's knowledge and thereby enhancing his reading process.

In a similar vein, Assia (2012) stresses the positive impact of technology in enhancing students' reading performance. According to her, integrating technology into teaching reading

will create a new learning paradigm that makes teaching extensive reading more enjoyable and motivate learners to develop their reading practices.

Although reading has a substantial role in academic achievement and language learning in particular. However, Algerian EFL students are still reluctant to develop their reading habits and still ignore the indispensable role of reading in their academic careers. Despite Algerian researchers focus on the negative role of home and university, they overlook the deep problem of students' role in taking charge of their own learning and boosting their reading habits, especially with the abundance of electronic books in an age known of its proliferation of information.

2.6 Conclusion

Unquestionably, good reading is underpinned upon three pillars: the reader's characteristics, the type of the text, and the environment where the act of reading takes place. From empirical studies that have been done in the EFL Algerian context, one can deduce that EFL Algerian students are not proficient readers. Research refers this deficiency to a host of reasons among them: readers' ambivalence to develop their reading habits, in addition to the Algerian universities that do not prioritise reading skill as a significant tool that opens avenues for academic success. However, these researchers overlooked the role of the medium on which students read in enhancing their reading performance in general and reading comprehension in particular. Therefore, this study will attempt to investigate the effect of the reading medium (paper and screen) on Algerian EFL graduate students' reading comprehension in the academic context. Furthermore, understanding this group's reading preferences concerning which medium will best suit them to achieve effective learning outcomes, would probably help in understanding the constraints that hinder their progress in the reading realm.

The next chapter will explain in more detail the methodology that this study's research adopts to collect the relevant data that would provide insightful findings about the effect of medium on reading comprehension, in addition to the reasons that lay behind the choice of one medium over another.

CHAPTER THREE:

RESEARCH METHODOLOGY

Chapter3 : Research Methodology**3.1 Introduction**

The objectives which guide the present study were to investigate the effect of reading mediums (paper and screen) on EFL graduate students' reading comprehension when reading academic texts and to elicit information on EFL graduates' preferences for reading mediums in the academic context. The present explanatory study employed the quantitative research approach as an investigation framework. "Methodologically, [this] approach relies on deductive design aimed at refuting or building evidence in favour of specific theories and hypotheses" (Leavy, 2017, p. 87). This approach is suitable because quantitative methodologies are viewed as appropriate for investigating the causal relationships among variables, the researcher places a priority on quantitative data collection and analysis followed by primary qualitative data collection.

In the present study, the quantitative data were collected first by conducting an experiment to investigate the effect of the independent variables (paper and screen) on the dependent variable (reading comprehension). In addition, a questionnaire was designed as an attempt to elicit insightful data about students' preferences for reading mediums. Qualitative data were collected through a semi-structured interview with four EFL university teachers to obtain more detailed and in-depth information about students' reading patterns in the digital age. Table (3.1) presents a brief overview of the quantitative and qualitative data collection procedures used in the present study.

Table 3.1 An overview of the data collection methods

	Sampling method	Time	Data collection	Data Analysis
Primary Quantitative Data	SimpleRandom Sample (SRS) N= 30: 20 Females, 10 males)	April 2020 to July 2021	1. Experiment	Independent T-test
			2.Questionnaire	Descriptive analyses
Qualitative Data	Purposive Sample 4 EFL University teachers	January 2022	Semi-structured interviews	Theme-Based

This chapter will discuss in detail the research design and the philosophical background of the research. It explains the research paradigm that orients this study and discusses the rationale behind the choice of design, setting, participants, data collection methods, and analysis.

3.2 Research Design

The research design is the architecture of the research project that provides a framework with a clear and complete description of the steps needed for an effective research process.

Research design is a set of decisions related together to create the overall blueprint of the research. These decisions constitute the research setting, population, research methods for collecting data and appropriate approaches to measure and analyse these data. Jurf (2012) adds that research design is the systematic quest that researchers undertake to investigate a phenomenon effectively. To meet this formidable challenge, the researcher should be cautious about the choice of the appropriate research design that best suits his research project. In fact, a rigorous research design is critical in the research process that should be adopted from the

beginning to ensure the possibility of getting pertinent data that address the research purposes (Kothari, 2004).

Cohen, Manion, and Morrison (2018) assert that the research purposes direct the research design through a logical connection between purposes, questions, hypotheses, and data arriving at conclusion supported by convincing evidence. “A research design is a plan or strategy that is drawn up for organizing the research and making it practicable so that research questions can be answered based on evidence and warrants” (Cohen et al., 2018, p. 173).

3.2.1 Research Paradigm

Researchers have to adopt specific standards and guidelines to approach their research. These guidelines and rules for conducting research are known as research paradigms. As Johnson et al. (2013) put it “research paradigm [is] a set of beliefs, values, and assumptions that a community of researchers has in common regarding the nature and conduct of research” (p.24). The research paradigm is the theoretical framework of any research that serves as a practical lens for the researcher to meet the overarching aims of the research.

On the other hand, Creswel (2009) chooses the term “Worldview” instead of paradigm to provide a comprehensive picture not only of the phenomenon being studied but also of the conditions that may affect the process of research. This worldview is regarded as a “general orientation about the world and the nature of research that a researcher holds. These worldviews are shaped by the disciplines area of student’s area, and past research experiences” (Creswell, 2009, p. 6).

The nature of research, research problem, and purposes are the basic blueprints that determine the choice of one paradigm over the other. Good research identifies the adopted paradigm from the beginning and makes the framework explicit while conducting the study (Creswell, 2009).

One of the prominent paradigms in quantitative research is positivism. The underlying assumption of this paradigm is that human behaviour should be studied under the scientific method as a phenomenon in natural sciences (Howell, 2013; Johnson et al., 2013). According to this school of thought, knowledge is attained through direct observation and careful measurement of the phenomenon. Positivists call for the exclusion of any factor that cannot be assessed such as feelings that may affect the conduct of the study (Howell, 2013). Furthermore, the researcher should seek objectivity by being detached during the study; the researcher has to observe the phenomenon, and formulate and test the hypothesis without being biased to reach absolute truth (Creswell, 2009).

However, positivism has been criticised for seeking absolute truth while studying human behaviours (Creswell, 2009; Phillips & Burbules, 2000). Human actions are changing and affected by other factors that may prevent researchers to state claims as absolute truth. “Reality or truth existed, however, it could only be understood imperfectly and or probabilistically (Howell, 2013, p. 41). According to Cohen, Manion, and Morrison (2018), the complexity of human nature results in a vain application of positivism. “This point is apparent in the contexts of classrooms and schools where the problems of teaching, learning, and human interaction present the positivistic researcher with a mammoth challenge” (p. 10). This criticism leads to the adoption of a new paradigm so that all possible constraints can be eliminated to best understand human behaviours. This paradigm is known as postpositivism.

Under the postpositivist doctrine, researchers should seek knowledge not look for absolute truth when studying human nature. Their quest to find an accurate answer to a specific issue may

fail. This failure should not stop the continuity of research, on contrary, this stage should be the starting point of questioning and looking for remedies to keep the ongoing process of research (Phillips & Burbules, 2000). As Phillips and Burbules (2000) put it “ if the investigator needed to have “ absolute” evidence in order to get a warrant, there would be no need for him or her to conduct further research at all” (p. 3). Researchers should change their mindset about convincing others to accept their models as axioms that should not be questioned, their aim instead is to enquire whether their models are workable or not (Patton,2015). Patton (2015) concludes that reaching unsatisfied results in research is not a failure, it is rather a window to learning and knowledge.

The current study chooses the postpositivism paradigm due to the literature review’s discussion of its assumptions that appropriately suit the investigation of human behaviours. Furthermore, this paradigm embraces the quantitative approach that the researcher adopts to address the research questions and meet the aims of this study.

3.2.2 Quantitative Research

Any type of research in education seeks to study a phenomenon to arrive at a conclusion that best fits the research purpose. Unlike qualitative research, quantitative research maintains that researchers should be objective to meet the validity and reliability of their inquiries. According to this kind of research, educational researchers should eliminate their biases and remain separate from the object of the study. The researcher’s objectivity contributes to the development of accurate measurements that result in precise data that in turn lead to trustworthy and defensible claims.

Many researchers reach a consensus that a tenet of quantitative research is that quantitative researcher endeavours to test hypotheses or theories through collecting

numerical data to be analysed and interpreted statistically to confirm or disconfirm predetermined hypotheses (Creswel, 2009; Muijs, 2004; Yilmaz, 2013). According to Muijs (2004), quantitative researchers attempt to provide information in breadth seeking the generalisability of their findings. Furthermore, Creswell (2009) argues that the underlying assumption of quantitative research is to study and explain the relationships among variables thoroughly to offer the best opportunities for addressing research questions and hypotheses.

Creswell (2009) has given a very concise definition of quantitative research when he states “quantitative research is a means for testing objective theories by examining the relationship among variables. These variables, in turn, can be measured, typically on instruments, so that numbered data can be analysed using statistical procedures” (p.4)

In a similar vein, Jurf (2012) adds that quantitative research is the appropriate approach to compare groups and evaluate their performance in a specific setting.

In light of the above advantages, it is valuable for the researcher of this study to adopt quantitative research. This type of research aims to measure the effect of variables and test specific hypotheses for the sake of generalisation. The current research adopted the quantitative approach because the prime aim of this research is to investigate the effect of reading medium on students’ reading comprehension. Furthermore, quantitative research is found to be well-suited for statistical comparison between groups in terms of achievements and performance, in addition to its usefulness in investigating individuals’ preferences towards a specific issue.

3.3 Research Setting and Population

This study took place at the English department at Mustapha Stambouli University in Mascara which is located in the West of Algeria. The target population of this study was EFL graduate students more specifically ninety Master two students. They were distributed to three specialties: didactics of teaching English as a Foreign Language, English for Specific Purposes (ESP), and Civilisation. Every specialty has nearly 30 students aged from 20 to 24 years old. They studied English for seven years (4 years in middle school and 3 years in secondary school) before enrolling in the university. Arabic is their first language, and English is their second foreign language after French. Thus, their exposure to English is so limited outside the classroom.

3.3.1 The Rationale behind the choice of this Population

The rationale behind the choice of Second Year Master students has twofold. First, this group of students presumably use online sources and engage in reading electronic documents more intensively than undergraduates due to the rigorous programme of the graduate year. For instance, second year master students are required to write theses to be submitted by the end of the year. Therefore, they are expected to do extensive reading to fulfil this requirement. Second, the majority of previous studies investigated the digital reading of undergraduate students whose English is not their first language. Thus, in order better to understand EFL graduate students' reading comprehension across mediums and preferences in the academic context, the researcher believes that involving Master two students is particularly important.

3.4 Sampling Method

Sampling is a crucial element in the research process that research should adopt from the early stages of this process. A sample is a group of elements selected from a larger group in the hope

that studying this smaller group (the sample) will reveal important information about the larger group (the population) as shown in this figure:

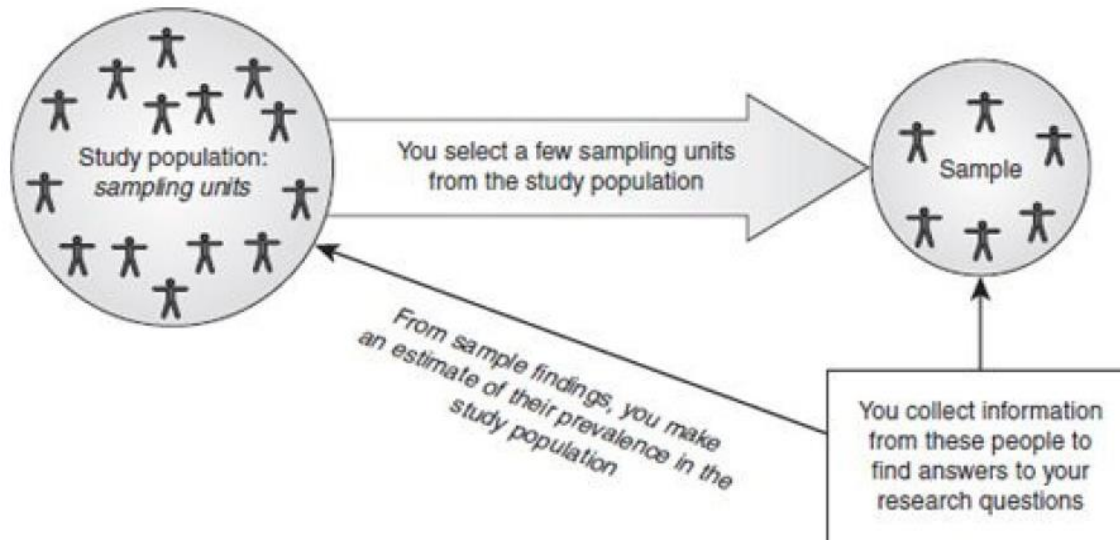


Figure 3.1 The concept of sampling (Kumar, 2011, p.176)

In any kind of research, the fundamental goal is that the sample should be representative of the population from which is drawn (Cohen et al., 2018; Gideon, 2012). For this reason, the researcher should be cautious about the method of sampling he adopts to solicit insightful data.

The method of sampling used in this study is probability sampling (also known as random sampling). The reason behind this choice is that probability sample seeks the representativeness of a wider population. Unlike a non-probability sample, in a random sample, the number of the entire population is known and determined from which the sample is drawn. Moreover, a probability sample is suitable for quantitative research that paves the way to conduct a valid statistical test (such as a t-test, independent- t-test...etc.) Furthermore, every element of this wider population has an equal chance of being included in the selected sample. Finally, random sampling is undertaken to avoid bias and seeks for generalisation, as Fisher (1962) puts it “

randomization intended to overcome individual differences, is sufficient to guarantee the validity of the test in the experiment,...randomization has the potential to address external validity, i.e generalizability, and internal validity i/e to avoid selection bias” (as cited in Cohen et al., 2018, p. 214).

Randomisation goes through two different stages: a random selection from the wider population and random allocation which refers to the sample assignment to control and experimental groups (Cohen et al., 2018). Since this study is experimental research that aims at investigating the effect of reading medium on students’ reading comprehension, randomisation seems to be representative and helpful for the researcher to collect accurate data.

The adopted type of probability sample is Simple Random Sample (SRS). The researcher chose this type of sampling because it allows each member of the population have an equal chance of being selected either for the control or experimental group. Therefore, the researcher selected at random from a list of the population (the sample frame N= 90 students) the required number of participants for the sample (n= 30), they are 10 males and 20 females. The researcher wrote every number of the 90 students on slips of paper, put them in a hat, mixed them well, and draw the number planned for the sample of 30 participants.

In pursuance of meeting the purpose of this study in investigating the effect of the reading medium on reading comprehension, the experimental research design seems noteworthy to come to fruition. The incentives of adopting the experiment research will be discussed in the following sections.

3.5 Experimental Research

There is no doubt that experimental research is the cornerstone of the quantitative approach that makes a significant contribution to investigating the physical world. It was this fact that led

many scholars in the educational realm to designate experimental designs to obtain accurate data and make legitimate claims.

The cardinal tenet of experimental research is the rigorous control of the conditions in a research setting where the experimenter sets up treatment conditions to measure its potential effects(Cohen et al., 2018). “ An experiment is a scientific investigation in which the researcher manipulates one or more independent variables, controls any other relevant variables, and observes the effect of the manipulations on the dependent variable (s)” (Ary, Jacobs, Sorensen, & Razavieh, 2010, p. 265).

The primary objective of experimental research is to establish cause and effect relationships among variables. The experimenter seeks to “ test the impact of a treatment (or an intervention) on an outcome, controlling for all other factors that might influence that outcome”(Creswel, 2009, p. 145).

Muijs (2004) emphasises that the researcher should carefully choose an effective treatment that best tests the hypothesis of interest. According to him, an inappropriate level of treatment will likely result in unsatisfying results. Therefore, from the start, the experimenter should be certain about the accuracy of the treatment.

3.5.1 Types of Experimental Design Research

There are three primary categories of experimental design: pre-experimental design, quasi-experimental design, and true experimental design as shown in the table below:

Type	Summary description
Randomised or true experiment	Participants are randomly assigned to treatment conditions including a control (see also <i>randomised controlled trial</i>)
<i>Means of control</i>	Extraneous variables controlled via random assignment and comparison with a <i>control condition</i>
<i>Capable of demonstrating</i>	Cause and effect, high quality of evidence
Quasi-experiment (natural experiment)	Participants are non-randomly assigned to treatment conditions (participants can also be assigned by forces beyond the experimenters control in the case of <i>natural experiments</i>)
<i>Means of control</i>	Extraneous variables controlled via comparison with a <i>control condition</i>
<i>Capable of demonstrating</i>	Correlation
Pre-experiment or pseudo-experiment	Follows experimental design conventions, but no control condition is used. Sometimes called a <i>pseudo-experiment</i>
<i>Means of control</i>	Extraneous variables mitigated via comparison with a no-treatment group (i.e. a group that receives no intervention at all) or using a single group pre-design versus post-design
<i>Capable of demonstrating</i>	Correlation, weak generalisability, low quality of evidence

Figure 3.2 An overview of basic types of experimental design (Cash, Stankovic, and Storga, 2016, p.7)

3.5.1.1 Preexperimental design

The central premise of the pre-experimental design is the study of one single group (only the experimental group) and the investigation of the effect of an intervention during the experiment (Ary et al., 2010; Creswel, 2009). This design has been criticised for the absence of a control group, lack of randomization, and lack of control of extraneous variables (variables that are not related to the study but are supposed to affect the outcome of the experiment).

3.5.1.2 Quasi-experimental Design

This type of design involves taking advantage of real world settings such as schools, institutions...etc, when random assignment is impossible. It uses both control and experimental groups. It is similar to true experimental design in that they involve the manipulation of independent variables as Shadish et al. (2002, p. 104) write “ quasi-experiments are experiments

that lack random assignment of units to conditions but that otherwise have similar purposes and structural attributes to randomised experiments”.

3.5.1.3 True Experimental Design

The essential feature of true experimental design is that the researcher deliberately controls and manipulates the independent variables to assess their effect on the dependent variable. The true experimental design is represented diagrammatically in Figure:

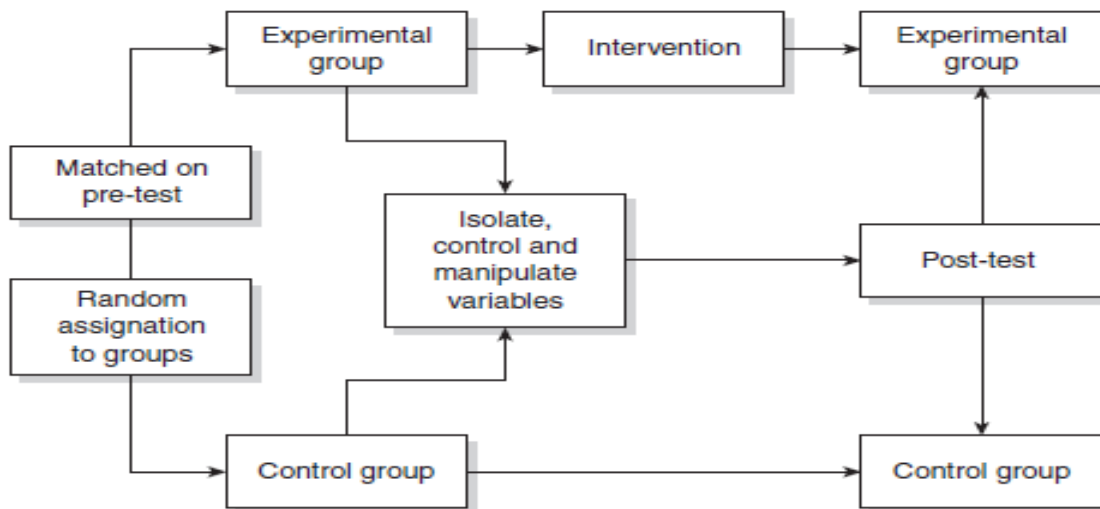


Figure 3.3 The true experimental design (Morrison, 2009, p. 143)

The true experimental design provides rigorous evidence about a phenomenon under investigation. It also provides the experimenter to have total control over the experimental setting to obtain a greater understanding of relationships among variables. This study adopts a true experimental approach or what is called Randomized Control Trials (RCT) as a research design for many reasons:

3.5.1.4 Hypothesis Testing

The major target of a true experiment is to test a hypothesis. Since the purpose of this research is to test whether the reading medium affects students’ reading comprehension, a true experiment

would be helpful and useful to achieve this aim. Testing a research hypothesis is the primary concern of experimental studies. Lodico et, al. (2015, p. 29) write:

A hypothesis is a conjectural statement regarding the expected outcome of a research study. Simply put, it is an educated guess based upon a review of the research conducted on the research problem or the variables that are being investigated.

Once the variables are clearly defined after conducting extensive literature and formulating clear and precise research questions, the researcher has to develop his research hypothesis that serves as the overarching foundation of the study.

The essence of testing a hypothesis in quantitative research is to support or not support the alternative or the null hypothesis. The null hypothesis (H_0), as its name indicates, states that there are no relationships between the variables, the negation of what the experimenter predicts. In contrast, the alternative or directional hypothesis (H_1) states the direction of the expected effect that the independent variables have on dependent variables or the differences between them. The following tables show the dependent and independent variables, and the null and alternative hypotheses that guide the current study:

Table 3.2 Research questions and variables

Research Question	Independent Variables	Dependent Variables
What is the effect of reading on paper and screen on EFL graduate students' reading comprehension when reading academic texts?	<ol style="list-style-type: none"> 1. Reading on paper 2. Reading on screen 	Reading comprehension

Table 3.3 Null and alternative hypotheses of this study

Variables	Null Hypothesis H_0	Alternative Hypothesis H_1
Reading mediums (paper and screen) Reading comprehension	There is no significant difference in reading comprehension when reading on paper and screen	There is a significant difference in reading comprehension when reading on paper and screen

3.5.1.5 Randomisation

Increasing attention has been given in the literature to the process of conducting true experiments in education, particularly to the role of the researcher in manipulating the variables through the process of randomization. Ary et.al (2010, p.271) write “randomization is the single best way to achieve the necessary control. Experimental studies utilizing randomization provide the best evidence for determining the effectiveness of educational practices and programs, and they are considered the gold standard for determining “what works” in educational research”. Therefore, a true experiment (RCT) was an appropriate design to investigate the effect of reading mediums on Algerian EFL students’ reading comprehension. Moreover, the true experimental design which deploys the technique of randomization enables the experimenter to overcome the extraneous variables’ influence (the unknown and irrelevant variables) on the outcome of the study. Cohen et.al (2018) acknowledge that “randomization is a way of reducing the effects of allocation bias, ensuring that baseline features or characteristics, which may not be known to the researcher, are evenly distributed between the control and experimental group” (p.394). In this study, the researcher opts for randomization as a powerful tool to eliminate the impact of other variables such as EFL students’ different learning styles and reading abilities that might conceivably affect the independent variables (paper and screen) in which the researcher is interested.

3.5.2 Reading Materials

Three reading texts were selected from Straightforward Book's second edition. This book is designed to provide teachers in an ELT environment with useful lessons and rich reading texts to develop EFL students' reading skills.

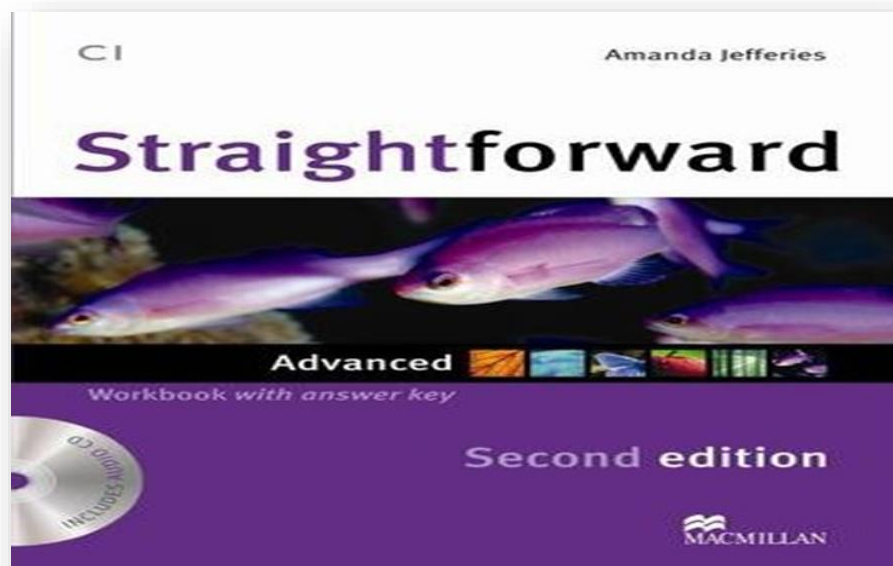


Figure 3.4 Straightforward book

Its content is as follows:

- Lesson-by-lesson practice activities
- Extra reading texts
- Complete 12- a page writing course for use in the classroom or at home
- Audio CD with dictation exercises and audio versions of reading texts
- Extract from a short story by F. Scott Fitzgerald

3.5.2.1 Experimental Texts

Three experimental texts were used in this study (see Appendices, A, B, and C). The choice of these topics was made for several reasons. First, the extract from the novel *Pride and Prejudice* was supposed to have a rich vocabulary for EFL students when studying a narrative text. Furthermore, this novel was one of the fascinating works of the British novelist Jane Austen that had wide readability among readers. Second, the text, which was about the Bangladesh millionaire ‘Muhammed Yunis’, was chosen because it conveyed a noble message about helping poor people through loans to invest their efforts not only to improve their living conditions but also to develop the economy of their country. Third, the chosen text about ‘Stem Cell’, covered an important topic about cloning in the 21st century with the advancement of technology. Such a topic increased students’ critical things and stimulate their prospects about the fate of cloning activity from a humanistic and religious perspective.

The length of each text and its readability is shown in Table. (The formula of readability was tested using Fry’s formula.

Table 3.4 Reliability level of the experimental texts

Text	Length(word count)	Number of sentences	Number of Syllables	Average Words per Sentence	Average syllables per Word
Pride and Prejudice	541	27	837	20,04	1,55
Banker to the Poor	602	24	980	25,08	1,63
Stem Cells	723	21	1187	34,43	1,64

*The average of words per sentence and syllables per word indicated that these texts were suitable for college students with fair difficulty according to Fry’s formula

The chosen texts were accompanied by tests to evaluate participants’ comprehension. Each test includes multiple choice questions, matching words with their synonyms or definitions,

identifying the main ideas of the text, and giving an opinion about the topic discussed in the given passage (see appendices A, B, C). What makes the reading comprehension tests of this study distinct from previous studies is the inclusion of different types of questions to test the two levels of reading comprehension: the literal and inferential levels. Chen et.al (2014) describe these two levels as follows:

Literal comprehension also called shallow comprehension, is a minimally coherent mental representation which is achieved by readers from the meaning of explicit knowledge in the text. On the other hand, inferential comprehension, namely deep comprehension represents a highly coherent, richly integrated, plausible presentation. The readers can use the explicit knowledge in the text and their own prior knowledge to build a deeper understanding from the text

(p.05)

Table (3.5) illustrates the literal and inferential levels tested in this study:

Table 3.5 A selection of questions to gauge the literal and inferential levels of reading comprehension

Text	Measuring the literal level of reading comprehension	Measuring the inferential level of reading comprehension
<p>Pride and Prejudice</p>	<p>.Read the extract from the classic novel Pride and Prejudice, written by the English author Jane Austen. Choose the best title for the extract, a, b, c, or, d.</p> <p>1. A happy engagement <input type="checkbox"/></p> <p>2. A marriage proposal <input type="checkbox"/></p> <p>3. An angry confrontation <input type="checkbox"/></p> <p>4. A declaration of mutual</p>	<p>2. What do you think? Choose the sentence that best matches your opinion, 1,2,3, or 4, and say why.</p> <p>1. Mr. Darcy’s proposal was insulting to Elizabeth.</p> <p>2. Elizabeth reacted too rudely to Mr. Darcy.</p> <p>3. Elizabeth should have accepted Mr. Darcy’s proposal</p> <p>4. Mr. Darcy was right to express</p>

	love <input type="checkbox"/>	his feelings honestly. The sentence that best matches my opinion is:..... Why?.....
Banker to the Poor	<p>.Read the article. How does the writer describe Muhammad Yunus?</p> <p>1. An impossible dreamer <input type="checkbox"/></p> <p>2.A hard-headed businessman <input type="checkbox"/></p> <p>3. A visionary philanthropist <input type="checkbox"/></p> <p>4. A successful billionaire <input type="checkbox"/></p>	<p>What do you think? Which is the best way to help people in developing countries? Choose the phrase, 1,2,3, or,4 which best matches your opinion, and say why.</p> <p>1. Give financial aid to the most destitute</p> <p>2. Improve the education system</p> <p>3. Develop the overall national economy</p> <p>4. Provide loans for small businesses</p> <p>The phrase that best matches my opinion is.....</p> <p>Why?....</p>
Stem Cells	<p>1 Read the text and say where you think it comes from,1,2,3 or4.</p> <p>1 A research paper <input type="checkbox"/></p> <p>2 A scientific journal <input type="checkbox"/></p> <p>3 A medical report <input type="checkbox"/></p> <p>4 A popular magazine <input type="checkbox"/></p>	<p>.What do you think? Choose the sentence,1,2 or3, that best matches your opinion and say why.</p> <p>1 . Scientists should be free to develop ESC technology</p> <p>2. ESC technology should be banned.</p> <p>3. ESC should be allowed, but subject to regulation</p> <p>The sentence that best matches my opinion is....Why?</p>

3.5.3 Comprehension Scoring Rubric

A scoring rubric for the comprehension test was created to gauge students' reading performance on both paper and screen platforms the total score had 20 points. For that rubric, each multiple-choice question was scored on a 0-1 scale. A scale of 0 was given if participants did not answer the questions or give an incorrect answer. As for an open-ended question, a score of 2 was awarded if the given justification was convincing and had ample evidence to support the students' point of view. For example, an open-ended question was to choose the best way to help people in developing countries from the given phrases and provide a justification for each choice:

1. Give financial aid to the most destitute
2. Improve the education system
3. Develop the overall national economy
4. Provide loans for small businesses

When the student explained his point of view clearly, he got a total score of 2.

3.5.4 Validity and Reliability

Validity and reliability are the touchstones of quantitative research. They are important keys that determine the quality of any research. Validity and reliability are appropriate concepts for attaining rigour in quantitative research.

3.5.4.1 Validity

According to Ary et.al (2010) "validity is defined as the extent to which scores on a test enable one to make meaningful and appropriate interpretations" (p.225). They explain that the focus in research should be on the validity of interpretation and what evidence and warrant reflect the reality under investigation. In other words, to reach validity, the

obtained results must describe accurately and correctly the phenomenon being studied, and this can be achieved by adopting solid and sound instruments.

The validity of this study's instruments was judged by *construct validity and internal validity*. Construct validity refers to the validity of inferences made about the nature and manifestations of the theoretical factors (Cohen et al., 2018, p. 246). Construct validity is the fundamental type of validity because it concerns with explanation and providing concrete evidence about an abstract concept. It is further concerned with the degree to which the test or tool measures what it claims to measure. Construct validity in this study is concerned with questions like:

Do the tests used in the experiments measure what they claim to measure in terms of reading comprehension?

Are the tests accurate enough to generate meaningful results?

“Internal validity seeks to demonstrate that the explanation of a particular event, issue or set of data which a piece of research provides can be sustained by the data and the research” (Shadish et al., 2002 p.37, as cited in Cohen et al., 2018, p.252). This kind of validity is established when the research demonstrates a causal relationship between two variables, as in the experiment of this study where the researcher defines both the independent (paper and screen mediums) and dependent variables (reading comprehension) and then examines the relationship among variables. Internal validity tends to investigate the reasons behind the researcher's assumption that a relationship between variables is existing, and to what extent the gathered data sustain his assumption.

In this research, the researcher aims to test students' reading comprehension. Comprehension is a hypothetical construct like intelligence, motivation, and anxiety that cannot be measured directly like length, volume, and height in physical sciences (Ary et

al., 2010). According to Ary et.al (2010),” to measure the hypothetical constructs, you must move from the theoretical domain surrounding the construct to an empirical level that operationalizes the construct” (p.225). As in the case in the current study, a set of tests are designed to observe the students’ ability to answer the informational and inferential questions stated in the tests. Then, the scores of the students reflect the particular construct of interest, which is reading comprehension. For instance, if students score better on the given tests, it will be an indication that their reading comprehension is significant and vice versa. Ary et.al (2010) conclude that “this validity deals with how well the operational definition fits the conceptual definition” (p.225).

To sum up, it is impossible in any research to reach absolute validity to 100 degrees, however, the researcher may eliminate the threats of validity by designing accurate and reliable instruments of measures to gather meaningful data.

3.5.4.2 Reliability

Reliability refers to the consistency of the measurement’s scores (Taherdoost, 2016). It also refers to the stability of the results when the measurement is repeated with the same participants under the same contexts. In fact, the stability of the results indicates the reliability of the measurement instruments that ensure the quality of research.

Testing for reliability is necessary for quantitative research. One of the most important forms of reliability is repeated measures. According to (Muijs, 2004), “ repeated measure has to do with our ability to measure the same thing at different time... the same instrument should come up with the same answer when used with the same respondent” (p.72). In order to check if the tests used in the current study are reliable, *Test-Retest Method* is used.

In the current study, the reading comprehension tests have been given to 15 students in each group (paper and screen). The second administration of these tests has taken place after one week. According to Muijs (2004), specialists in quantitative research did not determine an appropriate length of the interval, he states:

If we leave too little time, then respondents might remember how they answered last time and simply give the same answer because of this. This is called a *carryover* effect and can lead to us overestimating the reliability of the test. However, if we leave too long between test and retest, the respondents' attitudes or opinions might have genuinely changed...One to two weeks is often recommended as an optimal time, though the risk of some carryover effect remains.

(Muijs, 2004, p.73)

A Pearson- correlation was computed to assess the test-retest reliability of the reading comprehension tests. Test-retest reliability coefficients (also called the coefficient of stability) vary between 0 and 1, where:

1: perfect reliability

$\geq 0,9$: excellent reliability

$\geq 0,8 < 0,9$: good reliability

$\geq 0,7 < 0,8$: acceptable reliability

$\geq 0,6 < 0,7$: questionable reliability

$\geq 0,5 < 0,6$: poor reliability

$< 0,5$: unacceptable reliability

0: No reliability

The table below shows the value of the Pearson coefficient of every test in paper and screen conditions.

Table 3.6 Reliability (Pearson- Correlation Results)

Tests	Reading on Paper	Reading on Screen
Pride and Prejudice	.707	.954
Banker to the Poor	.962	.894
Cell Stems	.951	.783

As shown in the above table, the test-retest reliability of the reading comprehension tests varies between 0.707 to 0.962 i.e., from acceptable to excellent reliability that indicates the consistency and stability of the test measurements.

3.5.5 Procedure

Prior to the conduct of the study, the researchers obtained permission from the head of the English department to have the 30 master two students as a sample of this study. All 30 participants have briefed on the aim of the study.

The 30 participants were randomly assigned to one of the two conditions: the control group (15 participants) read the texts and did the test in print in their respective classes, and the experimental group (15) performed the reading comprehension tests on the computer lab of the university, which would provide a quiet and isolated testing environment. The researchers did not conduct a usability test to check students' familiarity with the computer because they had already used it when studying the phonetics module

The experimental group received the three texts digitally on computer displays that were 15 LCD monitors operating at 60Hz at a resolution of 1280x 1024 pixels. Texts were presented digitally as Word document files using version 10 for Windows XP. The font size was black, 12 points, Times New Roman with 2 line spacing. The texts were displayed on two pages where students have to scroll down followed by two other pages that include the reading comprehension test. The computer devices used in the experiment had internet access, however,

students were not allowed to use it to reduce any extraneous variables that may affect their reading comprehension.

The same texts that were typed on screen were printed on A- 4 size paper (21cmx 29, 7 cm) with the same font size and line spacing to make conditions across medium as same as possible.

The first session started on April 2020, and the control group received the first reading. In both test conditions, participants were not allowed to use their dictionaries to reduce any confounding factor that might affect their reading comprehension. They were told that they had to finish the test in 90 minutes as documented in the literature that reading comprehension was better under time pressure than under unlimited time (Singer& Patricia 2017).

The three reading tests were administered on three, but consecutive weeks. In the first week, the control group received the first reading comprehension test about *Pride and Prejudice* in the classroom. They read the text and then completed the reading comprehension task. Students could move back and forth between the text and the questions. They were allowed to use draft paper to take points and answer the questions.

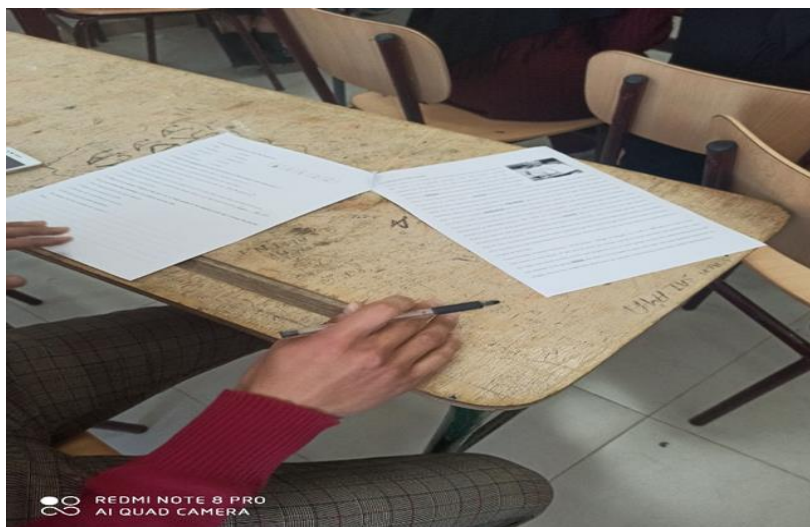


Figure 3.5 Participant reading on paper

On the other hand, the experimental group, with a research assistant, had to read the same text on the computer screen. They used the mouse to scroll down and up and to click the correct answer and the keyboard to answer the open-ended questions. When they finished the test, they had to save it on the computer document and send it to the central computer that received all the students' responses.

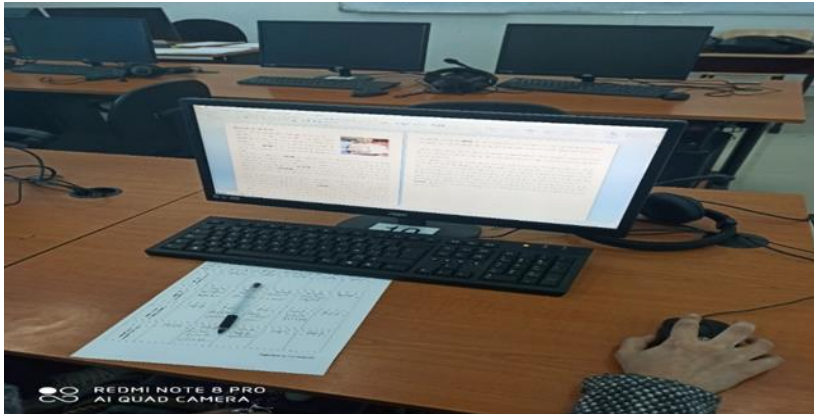


Figure 3.6 Participant reading on computer screen

In the second week, participants in both paper and screen conditions, received the second reading comprehension test about Banker to Poor following the same procedure mentioned in the first stage. In the last week, the test about 'Stem Cells' was administered to both groups on two platforms to test their reading comprehension of the given text. Afterward, participants' reading comprehension tests were scored according to the scale rubric and analysed.

3.6 Questionnaire

Understanding students' beliefs, attitudes, and behaviours is a central preoccupation of educational research. Since the second main purpose of this study is to explore EFL Second Year Master students' reading preferences when reading academic texts, the research adopted a questionnaire as an investigation tool to solicit accurate data about the reading medium (paper or screen) that students prefer when approaching academic materials. Many researchers

acknowledge that questionnaire is the most powerful and common research instrument in quantitative research that seeks to provide a rich description and explanation of a phenomenon under investigation (Cheng, 2016; Cohen et al., 2018). Furthermore, Cohen et al. (2018) note that “questionnaires offer benefits of standardized and open responses to a range of topics from a large sample or population. They can be cheap, reliable, valid, quick, and easy to complete” (p.471).

3.6.1 Questionnaire Design

In designing the questionnaire for this study, the researcher followed the sequenced stages outlined by Cohen et al (2018):

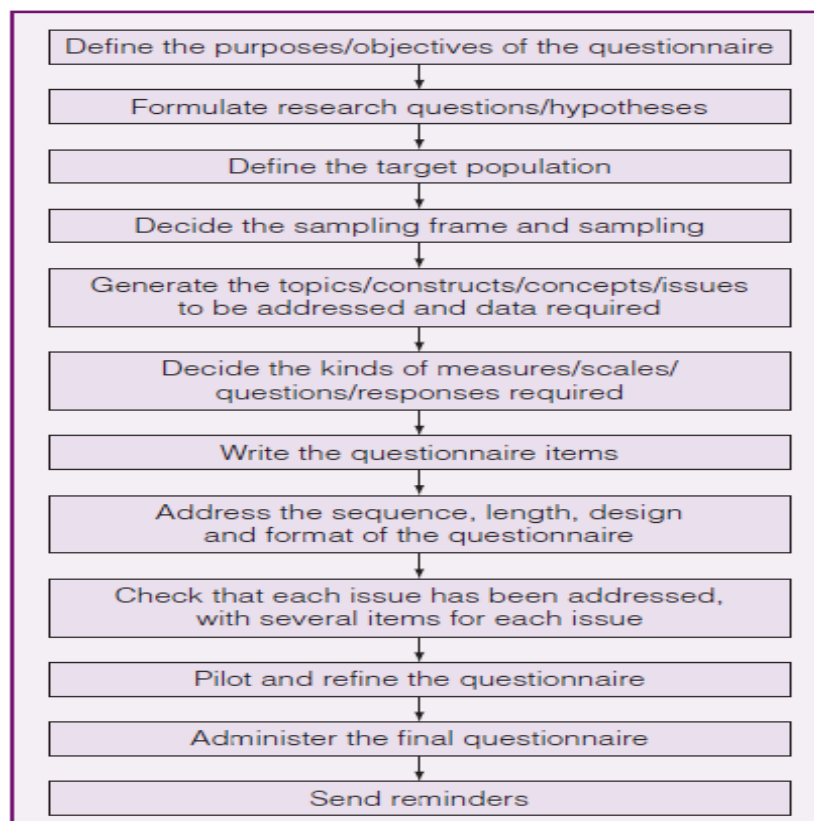


Figure 3.7 Strategies in questionnaire design (Cohen et.al, 2018, p.472)

Stage 1 has been outlined above with the central purpose of the questionnaire to explore the participants' reading mediums preferences when reading for academic purposes. Identifying the purpose of the questionnaire led the researchers to formulate the research question that orients the second part of this study. As Cohen et al. (2018) state “for many kinds of research, the framing of the research question (s) is critical; it focuses, centres, shapes, steers and drives the entire research and it is the answers to the research questions in which the researcher is interested” (p. 165)

The research question that underpins this questionnaire is:

- **Which reading medium (paper or screen) do EFL Second Year Master Students at Mascara University prefer when reading for academic purposes?**

To address the above research question, the researcher hypothesised that:

EFL Second Year Master Students prefer reading their academic texts on paper for better understanding.

Stages 2 and 3 were about the target population and sampling. As mentioned in the section on the rationale behind the choice of Second Year Master students, the researcher believed that this group of students would help provide accurate data about their reading medium preferences when processing academic texts. Furthermore, this generation of students is known as ‘digital natives’ who have grown up in an environment known for its advancement of technology and digital devices, and in a culture, that rewards immediacy and speed of information. According to Tapscott (2009), this generation is savvy in technology and has more experience in this digital age than their elders. These were among the impulses that led the researcher to choose second-year master students to understand better their reading preferences.

As far as the other stages that deal with the main topic are concerned, understanding students' reading preferences should address significant topics like reading habits, strategies, and learning engagement which will be explained in more detail in the next section.

3.6.2 Questionnaire Development

The questionnaire included different types of close-ended questions, such as dichotomous, multiple-choice questions, Likert scale, and open-ended questions. It has six sections. The first section was a demographic section in which the participants were asked to answer questions regarding their age, gender.

The second section attempted to investigate the time spent by participants on reading both print and electronic documents in a form of multiple-choice questions (i.e., more time, less time, I don't know) (see appendix D).

Section three is the longest because it aims to seek answers from the respondents about their preferred platforms when reading academic texts (print or digital). For instance, students were asked to choose from the given items the response that matches their preferences as illustrated in the following question:

1. I prefer reading academic texts on

Paper Screen no preferences

Section four was designed to elicit information regarding frequency of students' reading strategies and practices.

E.g:1. I highlight and annotate academic texts in print

Very often often sometimes rarely never

2. I reread academic texts when they are in hardcopy

Very often often sometimes rarely never

In section five, participants responded to the statements on a five-point Likert-type scale (5 strongly agree, 4 agree, 3 neither agree nor disagree, 2 disagree, and 1 strongly disagree). This section included learning engagements on both mediums (paper and screen).

Table 3.7 Selected items from Likert scale of the study's questionnaire

Items	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1.I remember more information when I read in hardcopy	5	4	3	2	1
2. I enjoy reading onscreen than hardcopy	5	4	3	2	1

Section six included four open-ended questions investigating students' likes and dislikes about reading on paper and screen. These questions were adapted from (Baron, Calixte, & Havewala, 2017a) (see appendix D). The last section aims to get qualitative data to better understand students' preference for reading mediums when reading academic texts.

3.6.3 Administering the Questionnaire

Prior to the administration of the questionnaire, a pilot study for the questionnaire was conducted on May 2021 with 15 graduate students from the department of English at Mascara university. The purposes of piloting the questionnaire was threefold: 1) to examine the clarity and relevance of items; 2) to ensure validity instrument; and 3) to evaluate the content and the format of the questionnaire.

The link of the questionnaire was sent to the participants through their Facebook pages. Only 13 of them answered the questions and sent them back. A sample of questionnaire was then

given to two experts: Alexander Patricia from the university of Maryland and Pablo Delgado from the university of Valencia to evaluate its content and relevance.

Students' feedback suggested to add more questions about reading strategies and practices such as highlighting and annotating while reading on screen and paper. Furthermore, some comments obtained from the experts included to add open-ended questions to leave a space for the participants to justify their choice of one medium over another.

With regard to the experts' comments and students' feedback, some questions were developed and refined. The final draft of the questionnaire was ready to be administered (see Appendix D).

After the pilot study, data were collected from June to July 2021. The questionnaire was delivered online during the lockdown of CORONA Virus. Two EFL teachers from the university of Mustapha Stambouli helped the researcher to administer the questionnaire to the target population.

3.7 Interview

The interview is the most common and powerful method of data collection in qualitative research. It is a valuable tool for gaining insights into individuals' experiences, understanding, and perspectives about a subject of interest. This feasible mechanism provides in-depth information through active interaction between two persons or more, as Kvale (2007, p. 5) puts it " the term interview is literally an *inter-view*, an interchange of views between two persons conversing about a themes of common interest."

In contrast to everyday conversation, interviewing may be regarded as a conversation with a purpose. Kvale (2007, p. 7) claims that:

The interview is a conversation that has a structure and a purpose determined by one party- the interviewer, it is a professional interaction, which goes beyond the spontaneous exchange

of views as in everyday conversation, and becomes a careful questioning and listening approach with the purpose of obtaining thoroughly tested knowledge.

Since the interview is a social interaction, the relationship between the interviewer and the participants is of paramount importance in eliciting useful data. From the beginning, there must be a trust and rapport relationship between the interviewer and the interviewee (Lune, H. & Berg, 2017; Ryan, Coughlan, & Cronin, 2009). The interviewer should create an appropriate environment for the respondents to feel comfortable when responding to questions. “A relaxed, confident, and attentive approach demonstrated by the interviewer will help a good interview relationship develop. The role of the interviewer is to ensure that the interviewee is at ease and not threatened” (Ryan et al., 2009, p. 311).

3.7.1 Types of Interview

Lune and Berg (2017) give three basic types of interviews: the standardised (formal or highly structured) interview, the unstandardised (informal or nondirective) interview, and the semi-standardised (guided semi-structured or focused interview):

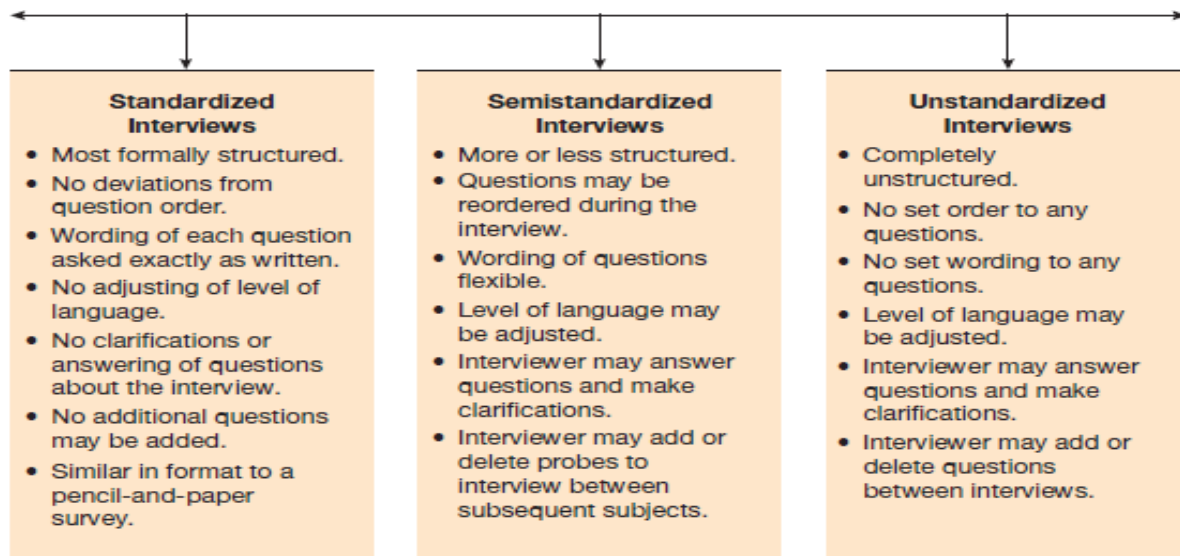


Figure 3.8 Types of the interview (Lune et.al 2017, p. 68)

3.7.1.1 Standardised Interview (Structured Interview)

This type of interview adopts the approach of a “ schedule interview” to get responses from participants (Ryan et al., 2009). The interviewer designs a set of predetermined questions. These questions are formally structured in advance in a way that participants do not find room to deviate from the direction of the interview. “In the structured interview the content and procedure are organised in advance, the sequence and wording of the questions are determined by means of a schedule and the interview is left little freedom to make modification” (Cohen et al., 2018, p. 511). Thus, standardised interview is similar to the questionnaire that requires informants to respond to the sequence and wording of questions to get comparable responses.

3.7.1.2 Semistandard Interviews (Semi-structured Interviews)

The central premise of semi-standardised or semi-structured interviews is to offer flexibility during the interview. Although this type of interview involves a set of preestablished questions, unanticipated responses and issues may emerge that alter the flow of conversation. In other words, these unexpected responses may open a door to new themes that are relevant to the topic

of interest. “ This facilitates the collection of richer more textured data from the participant than that obtained through formally structured scheduled questions” (Ryan et al., 2009, p. 310).

The emergence of new themes during the process of the interview invites the interviewer to seek additional information for clarification or elaboration through the use of the probe technique. “A probe is a technique employed in interviewing to solicit a more complete answer to a question. It is a nondirective phrase or question used to encourage a respondent to elaborate on an answer” (Neustadtl & Babbie, 2016, p. 269).

The flexibility of semi-structured interviews is one of the advantages that facilitates the collection of in-depth insights into informants’ attitudes and perspectives.

3.7.1.3 Unstandardised Interview

In contrast to the rigidity of standardised interviews, unstandardised interviews are nondirective and informal conversations that involve themes rather than specific and fixed questions. Ryan et al., (2009, p. 310) state that “unstandardized interviews are underpinned by the assumption that little knowledge exists about the topic of interest therefore there are no predetermined questions to pose”. In this type of interview, the interviewer encourages the informant to take control of the conversation and gives room for their responses to guide the direction of the interview.

To sum up, unstandardized interviews help the researcher to discover new topics and construct knowledge about the research issue through considerable and varied responses from every participant.

3.7.1.4 The Rationale for Choosing Semi-Structured Interview

For the purpose of this study, the researcher used a semi-structured interview. This type of interview provides participants with more flexibility and freedom. It entails open-ended

questions that required open-ended answers where interviewees find room to express their points of view freely. Besides, semi-structured interviews are suitable for small-scale research, the researcher's incentive for using them is to emphasise the participants' elaborating points of interest (Denscombe, 2014). Moreover, Denscombe (2014) claims that the major aim of a semi-structured interview is that of 'discovery' rather than 'checking'. For this reason, the semi-structured interviews in this study contributed to triangulation on one side and served as an investigation tool where teachers' thoughts and opinions were discovered.

Although the experiment and questionnaire provided the researcher with a full and clear picture of the effect of the reading medium on students' reading comprehension and their preferences for one platform over the other, the researcher felt the need to get deeper insights and explore the teachers' opinions and experiences in that concern. Denscombe (2014) pinpoints that interview as a method of data collection, provides researchers with privileged information when speaking with experts in the field who can give particularly valuable insights and wisdom based on their experiences.

3.7.1.5 Teachers Interview

Teachers interview was considered valuable source to gain data to meet the objectives of this study. The participants who were interviewed were four EFL teachers at the department of English at Mascara university. The teachers were purposefully chosen to be interviewed since they taught second master students and their perspectives contributed towards understanding the topic of interest from different angles.

All teachers speak Arabic as their native language. However, they were interviewed in English since they had high proficiency in English. Eleven open-ended questions (see Appendix

E) were used to get in-depth and broad information about teachers' perspectives about students' reading behaviours while reading in print and on screen for academic purposes.

In this study, an online interview administered via e-mail was adopted since it was conducive to research during a global crisis. The outbreak of COVID-19 and the increase of Omicron variant on January 2022 caused the closure of all the educational institutions across Algeria. The virtual nature of online interviews made empirical research possible in a time of social separation. Furthermore, online interviews provide several advantages. Denscombe (2014, p.197) states that:

Online interviews can be conducted with anyone who has access to a computer and the internet. The costs are negligible and this mode of conducting interviews allows the researcher to interview people across the world without worrying about the time and costs of travel. This is an attractive proposition.

Added to that, one distinct advantage of e-mailing interviews is that the participants' responses are provided in written format which means that there is no need to transcribe the respondents' verbal statements (Cohen et al., 2018; Denscombe, 2014). Furthermore, the remoteness of participants reduces the interviewer's effect when responding to the questions (Denscombe, 2014). Besides, interviewees will have enough time to reflect on the questions to give comprehensive and accurate answers.

3.8 Triangulation

Triangulation plays a pivotal role in good social research. It is a prerequisite for enhancing validity and establishing credibility to develop a comprehensive understanding of a phenomenon (Denzin, 2012). This valuable research strategy entails the use of several methods and data sources to study a phenomenon from different standpoints. There is a consensus that the

combination of multiple research methods reduces bias and enhances objectivity that provides researchers with a complete picture of the research problem, therefore findings may be cross-checked (Bryman, 2012; Cohen et al., 2018; Denzin, 2012). Denzin,(2009, p. 300) adds “by combining methods in the same study, researcher/observer can partially overcome the deficiencies that flow from one method”.

Denscombe (2014) identifies four types of triangulations:

- Data triangulation (use of contrasting sources of information) refers to collecting and comparing data from different participants at different times from different backgrounds
- Investigator triangulation (use of different researchers) refers to gain data from different investigators to check the consistency of findings and reduce one researcher’s bias
- Theory triangulation (the use of more than one theoretical position when collecting and analysing data)
- Methodological triangulation (this is the most common form of triangulation adopted by social researchers). The use of a variety of methods enables researchers to see things from different perspectives as possible

In the present study, the researcher adopted methodological triangulation that was achieved through three different methods: experiment, questionnaire, and semi-structured interview as shown in the Figure (3.9):

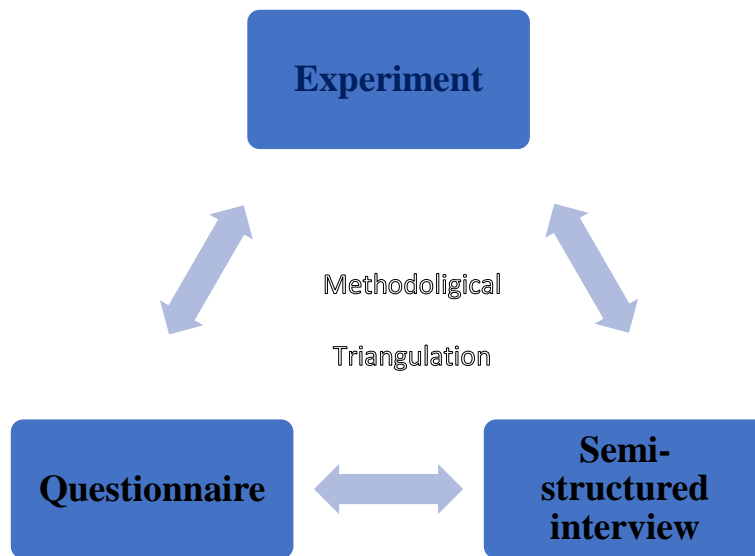


Figure 3.9 Methodological triangulation used in this research

Lune and Berg (2017, p. 14) insist that “the important feature of triangulation is not the simple combination of different kinds of data but the attempt to relate them so as to counteract the threats to validity identified in each”. Because of this, this research includes such methods as experiment, questionnaire, and interview not only to complement each other but rather to bridge reliability with validity so that bias can be reduced and credibility for the study would be established.

3.9 Ethical Considerations

If social research is to remain of benefit to society and the groups and individuals within it, then social researchers must conduct their work responsibly and in light of the moral and legal order of the society in which they practice. They have a responsibility to maintain high scientific standards in the methods employed in the collection and

analysis of data and the impartial assessment and dissemination of findings (Mertens & Ginsberg, 2009, p. 528)

In light of the above saying, Mertens and Ginsberg (2009) emphasised the importance of taking into account the research ethics that arise throughout the entire research process. Denscombe (2014) regards research ethics as an “over-riding concern when it comes to the choice of strategy” (p.5). Cohen et al., (2018) state that ethics are a set of principles of conduct that orient researchers about what is wrong and right while undertaking their inquiries.

Any research is a moral enterprise. In her endeavour to solve research problems and produce worthwhile findings, the researcher needs to ensure that the individuals who take part in her research are in ‘no harm’. The paramount purpose of social research is to contribute to knowledge that will benefit human understanding and enhance dignity. The preamble to the American Psychological Association’s ethical principles states,

Psychologists respect the dignity and worth of the individual and strive for the preservation and protect of fundamental human rights. They are committed to increasing knowledge of human behavior and of people’s understanding of themselves and others and to the utilization of such knowledge for the promotion of human welfare (American Psychological Association [APA] (as cited in Kvale, 1996, p. 109).

Keeping the aforementioned ethical concerns in mind, Thomas (2021) proposes a list of reflective questions which guided the researcher in the current research:

- Who is the research benefiting?
- Do you have the right to take up people’s time and energy?
- Is there any possible discomfort that participation will have to experience?
- Are you invading their privacy? (p.85).

In order to reduce some of the ethical issues that might arise in this study, the researcher provided consent forms to both teachers and students to voluntary participation in this research. Consent in this context can be described as an agreement given by participants to take part in this study(Thomas, 2021). Informed consent is a “norm in which subjects base their voluntary participation in research projects on a full understanding of the possible risk involved (Neustadt & Babbie, 2016, p. 64).In addition, the researcher gained oral consent from the head of the department to conduct this research with their students in their classes and lab. Furthermore, all participants’ identities remained anonymous throughout all phases of this research, and they were briefed about the purposes of this study and that they would benefit from their cooperation.

3.10 Data Analysis

The purpose of analysing something is to gain a better understanding of it. Through a detailed examination of the thing that is being studied the analysis aims to do the following:

Describe its constituent elements; or

Explain how it works; or

Interpret what it means (Denscombe, 2014, p. 243)

Statistical Package for the Social Sciences (SPSS) Version 22 for Mac was used to analyse the quantitative data of this research. The researcher used SPSS because it “is probably the most common statistical data analysis software package used in educational research and it is also quite user-friendly (Muijs, 2004, p. 85).

3.10.1 Analysis of the experiment

In educational research, and experimental research, in particular, researchers often seek to investigate the relationships between two variables or more. Therefore, to address the first research question of whether the two independent variables (paper and screen) affected the dependent variable (reading comprehension), a t-test was conducted to determine whether there was a difference in reading comprehension performance when reading in both conditions. T-tests are statistical tests widely used in educational research when comparing the means of two groups. To run the t-test, the researcher had to state the null and alternative hypotheses. To test these two hypotheses, a p-value is required. The p represented the probability that a certain pattern measured is statistically significant. A p-value is a number, calculated from a statistical test that describes how likely you are to have found a particular set of observations if the null hypothesis were true. The most common threshold is $p < 0,05$ that is the smaller the p-value, the more likely the null hypothesis to be rejected: a researcher could conclude that there was a statistical relationship which means there was an effect between variables. On the contrary, if the p-value is greater than 0, 05, the null hypothesis would be supported.

3.10.2 Analysis of the questionnaire

The researchers used descriptive statistics to organise and summarise the questionnaire data in a manageable form. The initial stage in analysing the quantitative data arising from close-ended questions of the questionnaire is coding. According to Dörnyei (2010), “The coding process for each item involves converting the participants’ answers into numerical scores... The coding phase is to define each variable and then compile coding specification for every possible “value” that the particular variable can take” (P.84-85).

Descriptive statistics have been used to organise, summarise, and describe the questionnaire data in a meaningful way. For the analysis of open-ended questions, the researchers utilised a thematic analysis approach, which will be explained thoroughly in the following section, then the qualitative data were presented in graphic forms.

3.10.3 Analysis of the Interview

The aim of a qualitative approach is not to reach absolute truth, it is rather an endeavour to tell a story in a meaningful way that is related to the overall research questions. In fact, qualitative inquiries include rich, diverse, complex, and nuanced data that require the researcher to take a careful choice about the method of analysis. Therefore, the analysis of the teacher interviews for this study followed the principles presented in the work of (Braun & Clarke, 2006).

Thematic analysis was the main approach chosen for the analysis of the teacher interviews in this study. Braun and Clarke (2006) describe thematic analysis as “a method for identifying, analysing, and reporting patterns (themes) within data. It minimally organises and describes your data in (rich) detail. However, frequently it goes further than this and interprets various aspects of the research topic” (p.79). As its name implies, this approach is based on identifying themes and managing them in a coherent and meaningful way. A theme is a category or label that the researcher generates after a thorough reading and rereading of the transcripts (Braun & Clarke, 2006; Bryman, 2012). What determines a theme is its recurrence and prevalence across the entire data set, in addition to its relevance to the research question (Braun & Clarke, 2006).

Researchers choose thematic analysis as an approach to qualitative data analysis due to its flexibility (Braun & Clarke, 2006; Bryman, 2012). In other words, this approach is not limited to a specific theoretical paradigm; instead, it can implicitly be employed in different contexts within

different theoretical frameworks such as grounded theory, narrative analysis, critical discourse analysis, and qualitative content analysis (Braun & Clarke, 2006). It is this flexibility that gives prominence to thematic analysis as a method of conducting qualitative data analysis.

The flexibility of thematic analysis allows the researcher in this study to adopt it as an appropriate method for the post-positivism paradigm. Kiger and Varpio (2020) suggest that post-positivists should use thematic analysis to understand individuals' thoughts and experiences more objectively and realistically. They believe that the combination of both interpretivism and positivism helps researchers to employ thematic analysis in a trustworthy and rigorous way that yields meaningful and useful analysis. Kiger and Varpio (2020) posit that "thematic analysis as a method that can bridge the chasm between the post-positivist pursuit of understanding a reliable, objective, fact-based reality and the more interpretive aims of many social science researchers" (p.02). In this way, post-positivist analyses will search for themes within the data to test the research hypothesis.

In this study, the researcher employed the deductive approach to theme identification. In this approach, the researcher relies on pre-existing theories, or other researchers' studies to generate the main themes (Braun & Clarke, 2006). To put it in other words, the central goal of the deductive approach is not to develop new theories, it rather aims to test an existing theory.

3.10.3.1 Thematic Analysis Phases Used in this Research

In analysing the teachers' interview, the researcher adopted the thematic analysis method as outlined by Braun and Clarke (2006) as it has become the widely used method in analysing qualitative data (Kiger & Varpio, 2020). Braun and Clarke (2006) offer six steps to do thematic analysis (see Figure 3.10). They emphasise that this process is recursive, rather than linear, in

which the researcher can move forward and back through the data set to adjust the previous themes or develop new emerging ones.

Phase	Description of the process
1. Familiarizing yourself with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes:	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

Figure 3.10 *The six main phases of thematic analysis (Braun and Clarke, 2006, p. 87)*

The starting point in the analysis of qualitative data is to familiarize oneself with the breadth and depth of the content (Braun & Clarke, 2006). In this stage, the researcher must engage and immerse herself in reading and rereading the data thoroughly to identify meaningful patterns. Through active and repeated reading, the researcher can draw a clear picture of the important themes and the orientation of the data analysis that will become the cornerstone of the other stages.

In this study, once the necessary data were gathered, the researcher read and reread the transcripts of the four teachers' interview to have an idea about EFL teachers' thoughts and perspectives about their students' reading patterns in the digital age. During this stage, the researcher printed all the interview transcripts to familiarise herself with the data and take notes about the main ideas and interesting topics that were raised in the teachers' answers.

<p>and many other book formats</p> <p>I prefer to provide them with hardcopy books because they can feel that they are reading, holding a hardcopy book isn't like reading through screens causing seeing problems</p>	<p>different forms</p> <p>Preference for hardcopy materials to make real reading</p> <p>Touching the material gives a sense of reading</p> <p>Digital reading causes eyesight problem</p>
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Braun and Clarke (2006) stated that the third stage involves organising and listing codes into relevant themes. In this study, the researcher used Microsoft Word to classify the listed codes into their corresponding themes. After a detailed examination and comparison between themes, all similar themes were listed under an initial theme. For example, the researcher had several themes related to teachers' perceptions of the effect of reading on EFL students such as vocabulary acquisition, developing writing skills, developing pronunciation...etc. All these themes were collated into an initial theme called the benefits of reading (See Figure 3.12). The most important themes that emerged from the data will be discussed thoroughly in the result section.

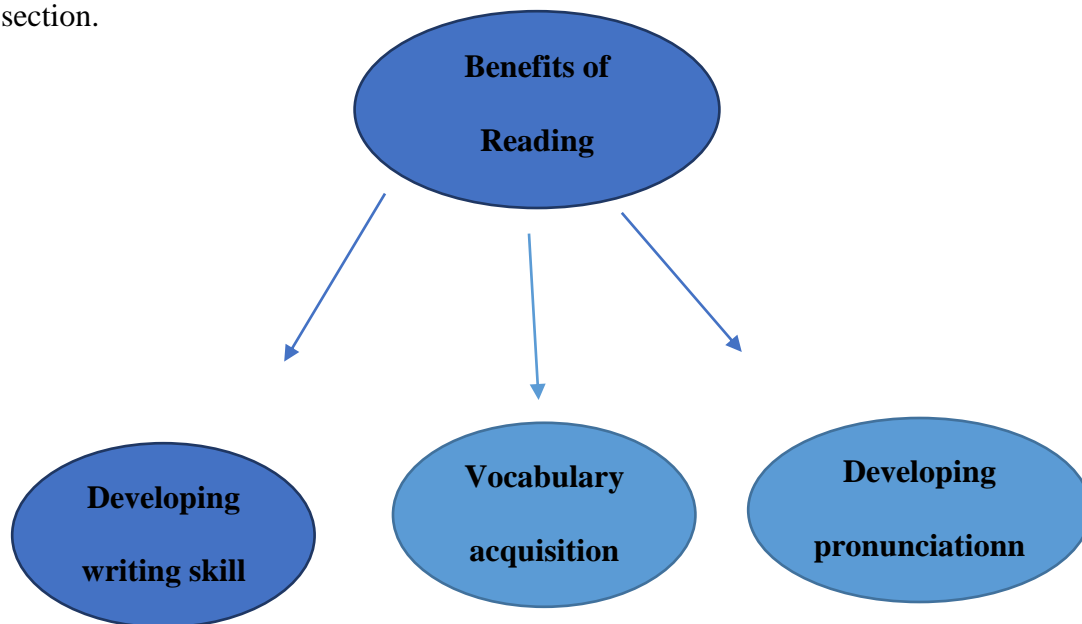


Figure 3.12 Preliminary themes

3.11 Conclusion

This chapter provided an in-depth discussion of the methodology used in this study. It explained the postpositivist paradigm and the quantitative approach that guided this study. It showed that for the purpose of this empirical study, various research tools were used to meet the research aim. Using multiple methods of data generation such as experiment, questionnaire, and interviews, offered a window to investigate the reading practices of Algerian EFL graduate students in the digital age. The quantitative data gathered from these methods were analysed through independent t-tests and descriptive statistics, whereas qualitative data were analysed using thematic analysis. The following chapter will present the analysed data in more detail.

CHAPTER FOUR:
RESULTS

Chapter 4: Results**4.1 Introduction**

The primary purpose of this study was to investigate the effect of the reading medium (paper and screen) on EFL graduate students' reading comprehension while approaching academic texts. While the particular focus of the study was on EFL students' reading comprehension in both mediums, the study also aimed to explore EFL students' reading medium preferences when engaged in reading. The study also considered the teachers' attitudes towards EFL students' reading habits in the digital age to get insightful data about reading behaviours in the electronic era.

A quantitative analysis of the data generated for this study to answer the following questions:

- 1- What is the effect of reading on paper and screen on EFL graduate students' reading comprehension when reading academic texts?
- 2- Which reading medium (paper or screen) do Students prefer while reading academic texts?

A general background of the study's participants is presented in the first part to put the gathered data in a clear context. Next, the findings are reported logically to answer the aforementioned research questions. The chapter concludes with an overall summary of the main points to be discussed in the following chapter.

4.2 Demographic Analysis

Participants in the study included 30 EFL graduate students (10 Male and 20 Female) from English Department at Mustapha Stambouli University in Mascara. 26 participants ranged in age from 20-24 years, and 4 participants were over 24 years. Figure (4.1) presents an overview of the participants' age and gender. None of the participants reported handicapping vision problems.

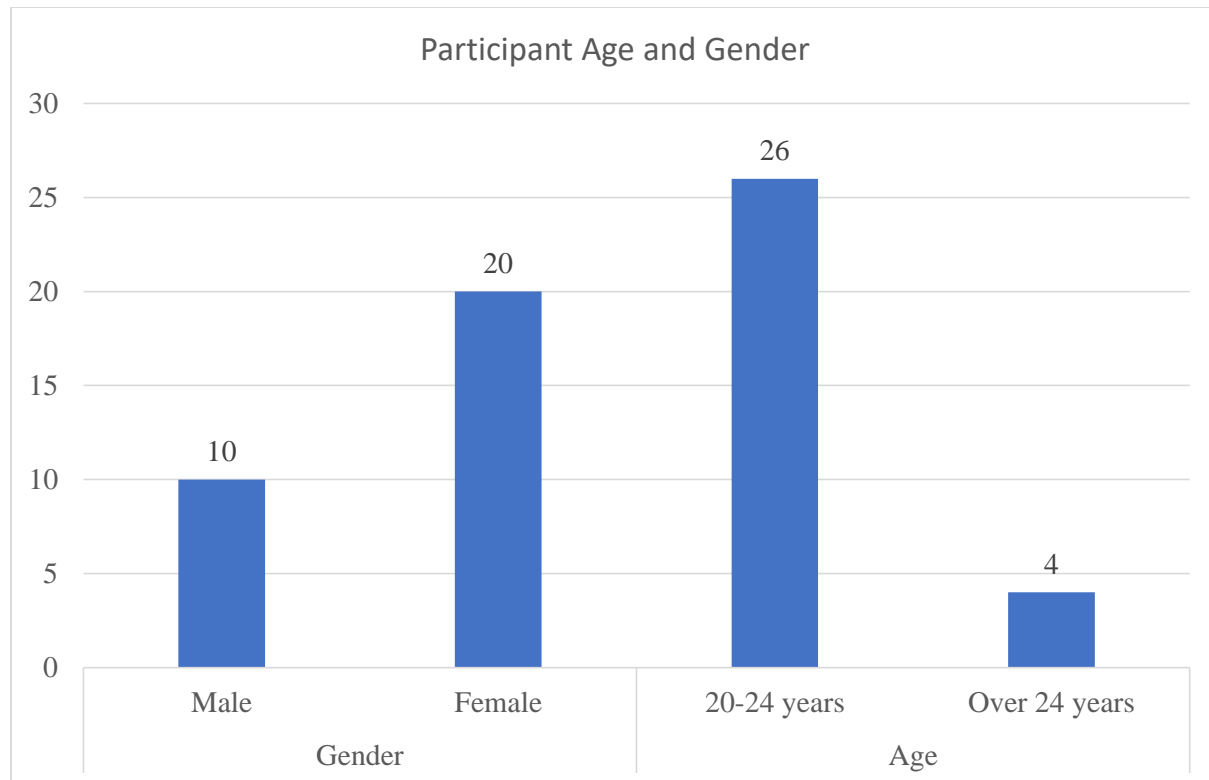


Figure 4. 1 Demographic variables

4.3 Results of the experiment

4.3.1 The effect of Reading medium on reading comprehension when reading narrative texts

The first research question asked whether the paper and screen mediums had an effect on EFL students' reading comprehension. Participants read the narrative text about *Pride and Prejudice* in both conditions: The paper group (N=15) was associated with a score of reading comprehension of $M=12,4667$ ($SD= 3,04412$). By comparison, the screen group (N= 15) was associated with a small difference in score $M= 11,9333$ ($SD= 2,89005$). To test the hypothesis that reading comprehension was associated with the reading medium, an independent t-test was performed. As can be seen in Table (4.1), the difference was not statistically different $t(28) =$

0,492 , $p= 0,626 > 0,05$). These findings, thus demonstrate the Null hypothesis that there was no significant difference in reading comprehension when reading on paper and screen.

Table 4.1 Reading comprehension scores of each group when reading narrative text

Group	Number	Mean	Std. Deviation	T	P-Value
paper	15	12,4667	3,04412	.492	.626
Screen	15	11,9333	2,89005		

4.3.2 The effect of Reading medium on reading comprehension when reading autobiography text

As can be seen in Table (4.2) There was a statistically significant difference between the two groups (paper and screen) $t(27,832) = 2,364, p= 0,025 < 0,05$. Thus, the paper group was associated with a statistically significantly larger mean reading comprehension score than the screen group. Therefore, the alternative hypothesis was supported.

Table 4.2 Reading comprehension scores of each group when reading autobiography text

Group	Number	Mean	Std. Deviation	T	P-Value
paper	15	12,8000	3,68782	2,364	0,025
Screen	15	9,7333	3,41147		

4.3.3 The effect of reading medium on reading comprehension when reading expository text

Table (4.3) shows the results of the independent t-test for reading comprehension when reading informational text (expository text). It shows the mean scores of the two groups. The paper group (N=15) was associated with a score of reading comprehension $M=13,00$ ($SD=3,162$). By comparison, the screen group (N=15) was associated with a score of $M= 10,33$

(SD=2,769). As can be seen in the mean scores for reading comprehension between the two groups, the hypothesis that students would perform better when reading on paper than reading on screen was confirmed. Significant difference emerged from the analysis: $t(28) = 2,457, p=0,020 < 0,05$). These findings, therefore, supported the alternative hypothesis that participants who read on paper conditions performed better when reading informational text than those who read on screen.

Table 4.3 Reading comprehension scores for each group when reading expository text

Group	Number	Mean	Std. Deviation	T	P-Value
paper	15	13,00	3,162	2,457	0,020
Screen	15	10,33	2,769		

4.4 Results of the questionnaire

4.4.1 Section One: Time Spent on reading

Reading is a very significant language skill that helps EFL students to enhance their English proficiency. When participants were asked about how much time they spent reading a day, the majority of them (73, 33%) reported that they spent from 1 to 2 hours reading, (13, 33%) said that they read from 3 to 5 hours, and only (6,67%) of participants stated that they did not read, whereas (6,67%) indicated that they read over 5 hours a day as shown in the following table:

Table 4.4 Time spent on reading

Hours	Frequency	Percent (%)
0 hour	2	6,7%
1 - 2 hours	22	73,3%
3 - 5 hours	4	13,3%
Over 5 hours	2	6,7%
Total	30	100%

4.4.2 Questions 2 and 3: Time Spent on Reading printed and electronic documents

Table (4.5) provides basic summary statistics of the percentages of time devoted to reading print and electronic documents (for academic purposes). Overall, an average of nearly (50%) of the 30 participants reported that they spent “more time” reading printed texts. Table (4.5) also shows that (30%) of the participants reported that they spent “less time” reading printed documents, with (20%) of participants stated that they don’t know. On the other hand, over (36,7%) of participants in this survey reported that they spent less time reading electronic documents (see Table (4.5)).

Table 4.5 Print and electronic reading time

Time Spent on Reading	Printed Documents	Electronic Documents
More time	50%	36,7%
Less time	30%	50%
I don’t know	20%	13,3%
Total	100%	100%

4.4.3 Section Two: Reading Preferences

This part of the questionnaire aimed at gathering general information about students’ preferences for reading mediums when reading for academic purposes. Which reading medium do students prefer to use when reading for academic purposes was determined?

Figure (4.2) illustrates the distribution of four reading mediums, i.e., books, e-books, handouts, and Web articles that students preferred to use when reading for academic purposes. The majority of students preferred to use Web articles (76, 67%). This is followed by books (10%), handouts (10%), and e-books (3, 33%).

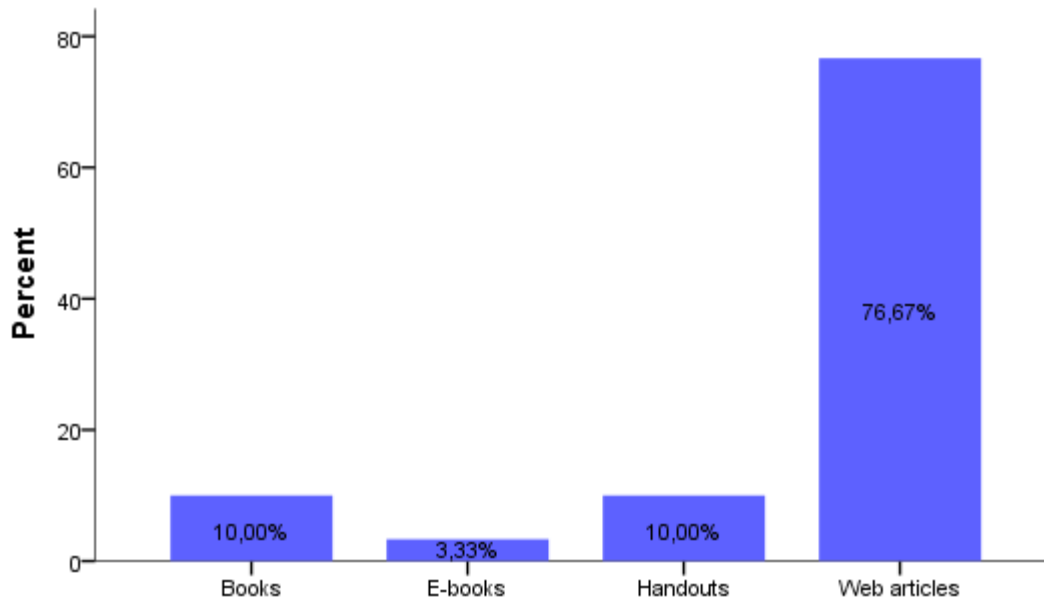


Figure 4.2 Preferred reading medium for academic purposes

When asked which type of information sources participants consult first when searching for academic texts, the great majority of participants (90%) turn first to the electronic library and only (10%) to the traditional library.

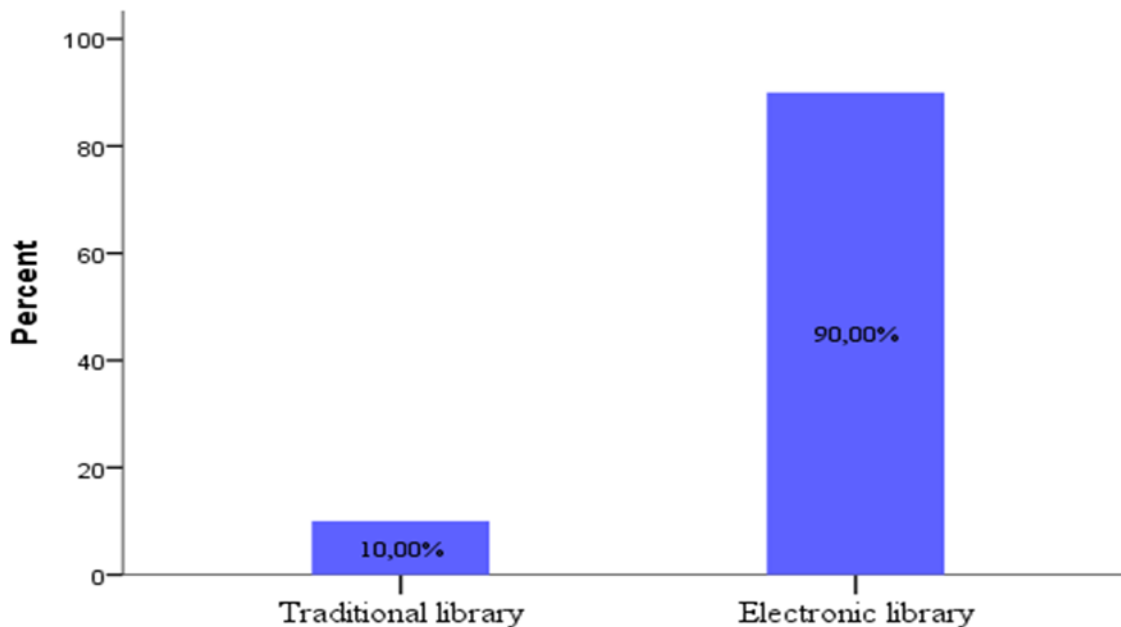


Figure 4.3 Preference for traditional and electronic library

4.4.3.1 Reading Medium preference for academic purposes:

Question 3 states “I prefer reading academic texts on _____, students have to respond to one of the three items: paper, screen, or no preferences. As illustrated in Figure (4.4), nearly (54%) of the participants reported that they preferred a paper medium to read their academic texts, and over (33%) stated that they preferred a screen medium, whereas (13,33%) indicated no preferences.

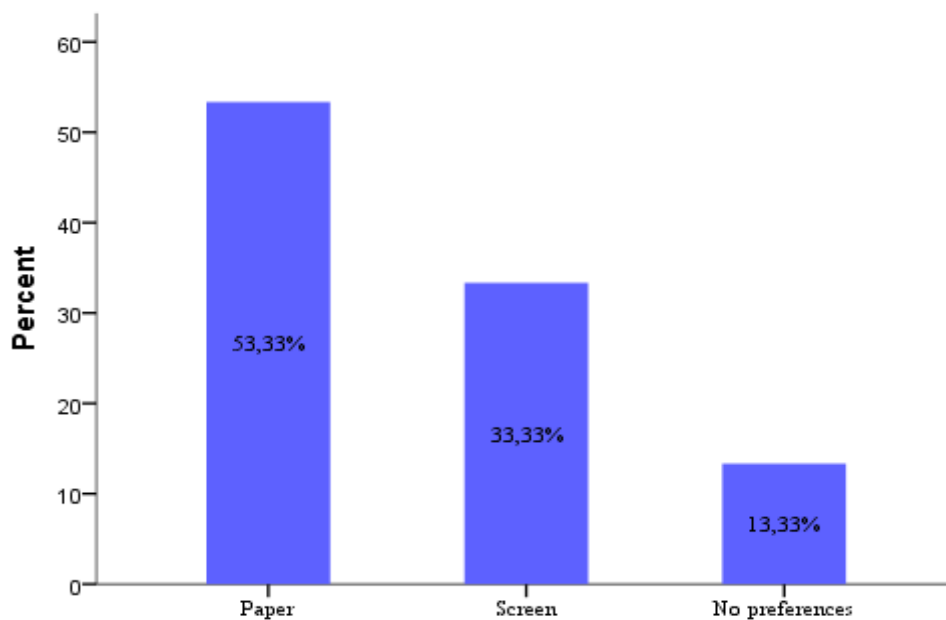


Figure 4.4 Reading medium preferences (paper/screen)

4.4.3.2 Reading medium preference when reading shorter and longer texts

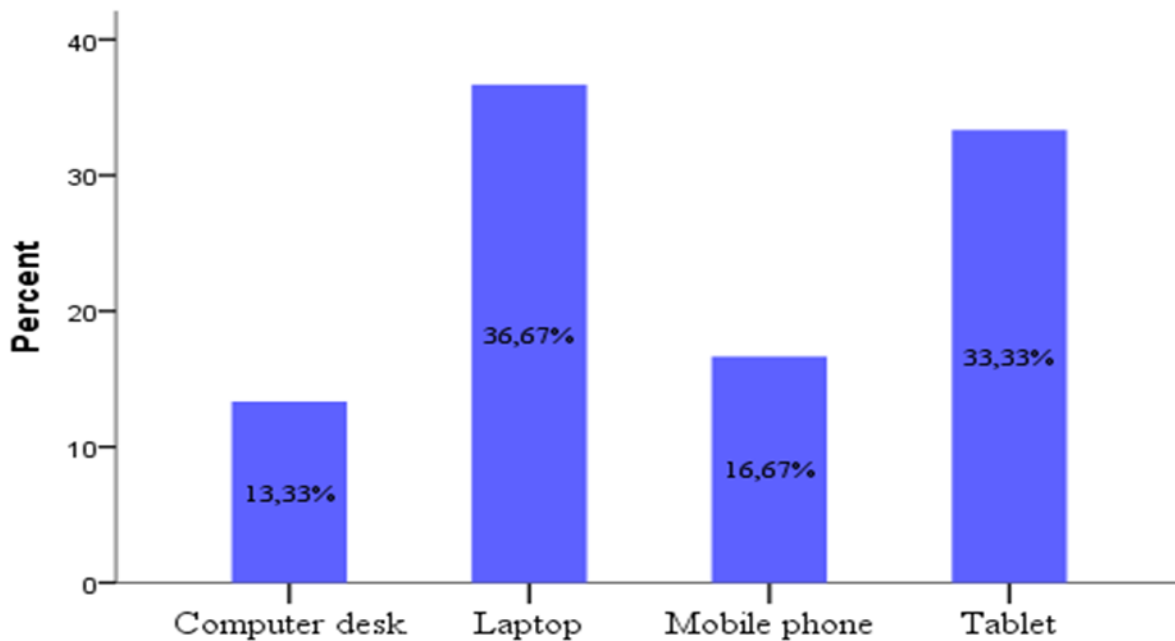
Questions (04) and (05) ask for format preference depending upon the length of the text. Over (53, 3%) of the participants chose the paper medium to read shorter texts whereas (46, 7%) stated that they preferred to read less than 5 pages on screen. Preference format when reading longer texts that are more than 5 pages is illustrated in Table (4.6): over 73% of the respondents' favoured paper medium, and 26, 7% preferred to read longer materials on screen.

Table 4.6 Reading medium preferences for longer and shorter texts

Reading medium	Shorter texts (less than 5 pages)	Longer texts (more than 5 pages)
Paper	53,3%	73,3%
Screen	46,7%	26,7%
Total	100%	100%

4.4.3.3 Preferred Devices for Reading Academic Texts

Question 6 states “when I have electronic texts, I prefer reading them on _____, students may choose more than one of the four devices listed in Figure (4.5). All 30 participants responded to this question. As shown in Figure (4.5), nearly (37%) of the participants in this study used a laptop for reading electronic documents for academic purposes. And over (33%) indicated a preference for tablet. Responses for computer desk and mobile phone are nearly identical: almost (17%) and (13%) respectively. Figure (4.5) displays the preferred devices by graduates in this study when approaching electronic texts for academic purposes.

*Figure 4.5 Devices used for reading electronic academic texts*

Question (5) states ‘When I find important texts on the net, I prefer to _____, participants have to choose either the item read them electronically or print them out. As shown in Figure (4.6), the majority of participants (66, 67%) claimed that they preferred reading important materials they found on the Net electronically, and (33, 33%) of them tend to print them out for reading.

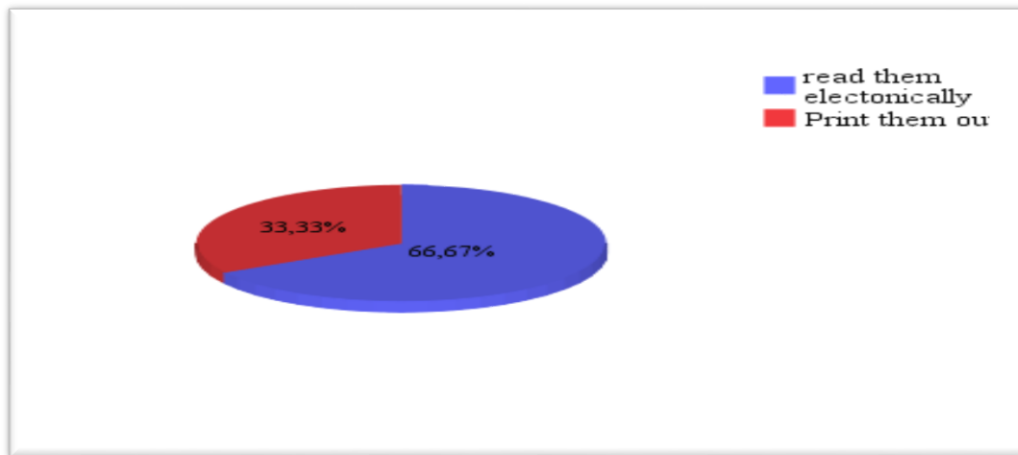


Figure 4. 6 Reading important texts preferences

4.4.4 Section Three: Reading Practices Across Both Mediums

This section was designed to solicit insightful data about students’ reading practices and strategies on paper and screen.

4.4.4.1 Highlighting and Annotation in Both Mediums

Highlighting and annotating are significant learning strategies that students deploy to be fully engaged and immersed in the reading act. The first question in this section tends to compare annotating and highlighting in print and on screen. Figure (4.7) shows that a considerable number of participants (64%) reported that they highlight and annotate their academic materials when reading in print, compared to (40%) who “very often” or “often” annotate and highlight electronic documents.

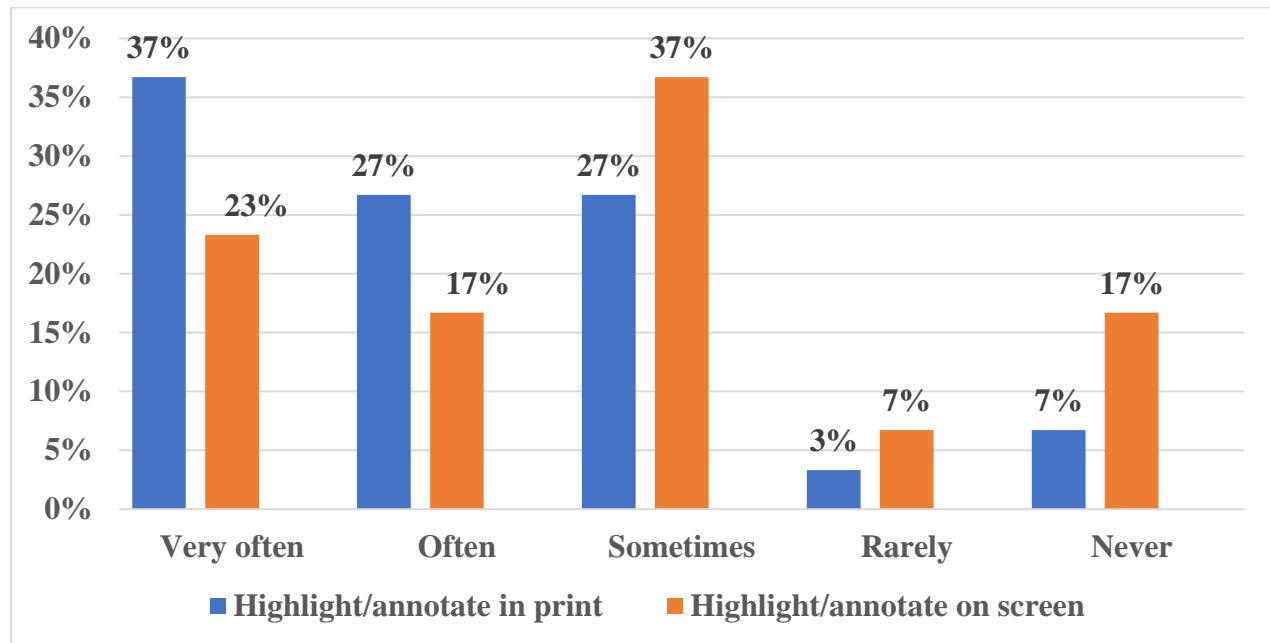


Figure 4. 7 Comparison of frequency of highlighting and annotating in print and on screen

4.4.4.2 Rereading Academic Texts in Print and Screen

Rereading is an effective practice that helps students to retain more information and most importantly pay attention to the details that might be missed in the first reading. Undoubtedly, this strategy is indispensable to academic reading that requires students to delve into the heart of the text to extract the full meaning of it. For this reason, the researcher aims to find out how EFL graduates practise rereading in hardcopy and on screen. The second question asks participants about the frequency of rereading their materials for academic purposes on both mediums print and screen. Their responses are summarised in the following Figure:

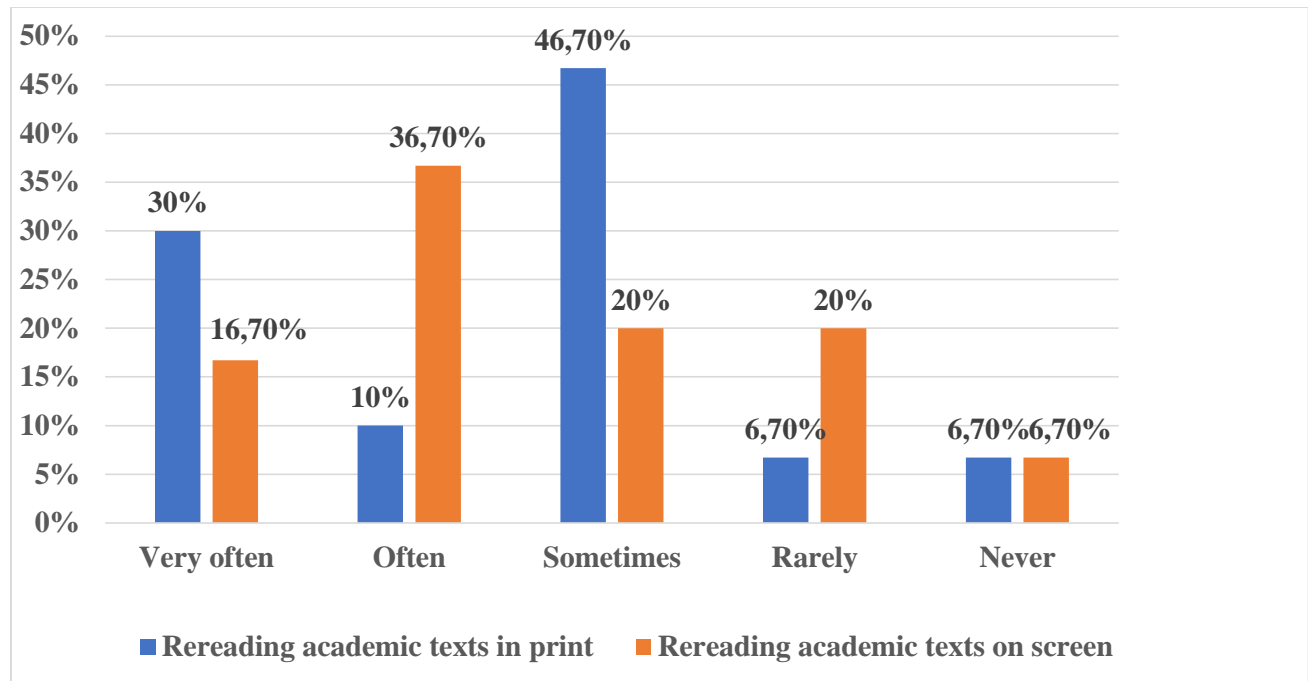


Figure 4.8 Rereading academic texts in print and screen

It is interesting to note that nearly (53,4%) of participants reported that they “very often” or “often” reread their academic materials on screen, compared to (40%) of them who “very often” or “often” practice rereading in print. Approximately (47%) of participants sometimes do their rereading in print and only (20%) on screen, leaving only a small percentage who “rarely” or “never” reread in print (13, 4%) and over (26%) digitally.

4.4.4.3 Multitasking When Reading in Print and on Screen

Multitasking, or shifting from one task to another at the same time, is a common and pervasive activity when reading on screen. In the survey, (60%) of the participants indicated that they very often or often multitask while reading electronically, compared with only (6, 60%) when reading in hardcopy. While (50%) reported that they sometimes multitask when reading in print, and (16, 70) on screen. Combining responses of never and rarely, (43, 30%) of respondents

reported that they never or rarely multitask when reading in hardcopy, compared to (24,30%) while reading digitally as illustrated in Figure (4.9) below:

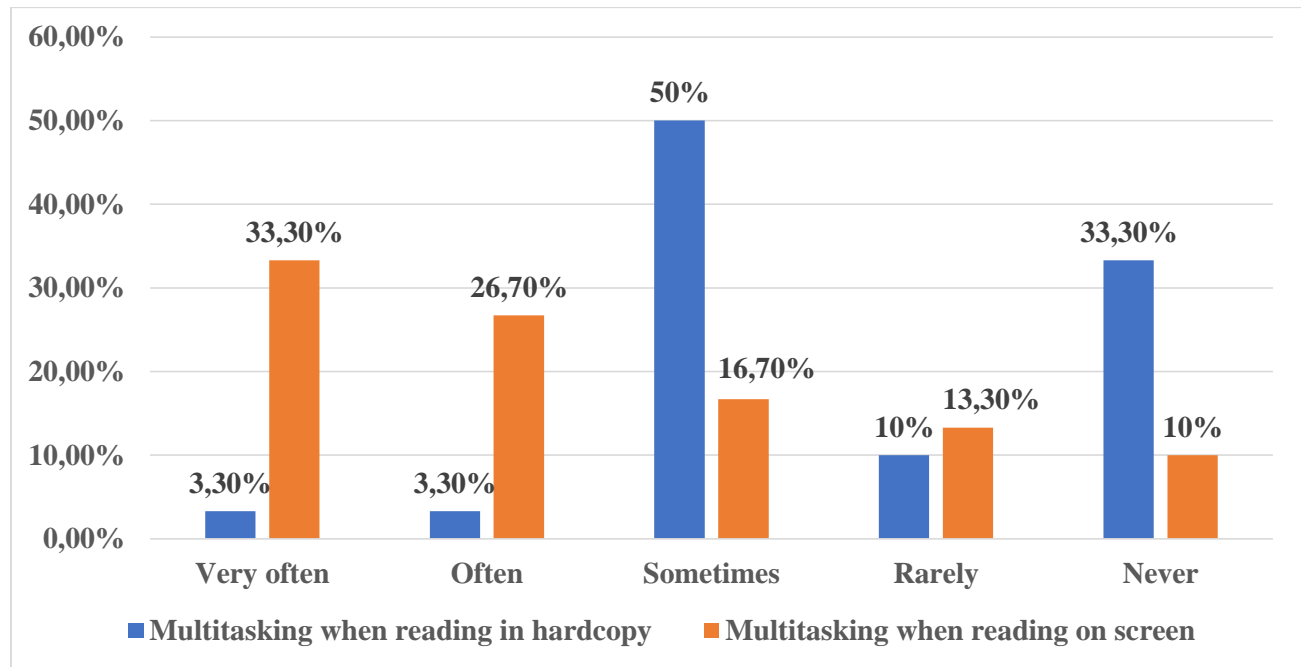


Figure 4.9 Multitasking in hardcopy and screen

4.4.5 Section Four: Learning Engagement on Paper and Screen

This section includes 8 statements on the five Likert Scale that inquire about students’ learning engagements while reading in print and screen.

4.4.5.1 Remembering and Understanding when Reading in hardcopy

Statements 1 and 6 ask students about their preferences for hardcopy medium when they want to remember more information and understand deeply during the act of reading. Table (4.7) shows that (3, 3%) of the participants strongly disagree or disagree that they remember more information when reading in hardcopy, whereas 23% strongly agree or agree. As far as understanding deeply when reading in hardcopy is concerned a considerable number of

participants over (76,7%) strongly agree or agree that they understand deeply when reading in hardcopy, compared with only (8%) who strongly disagree or disagree.

Table 4.7 Remembering and understanding when reading in hardcopy

Value	Remembering information in hardcopy	Understanding deeply when reading in hardcopy
Strongly disagree	3,3%	6,7%
Disagree	0%	3,3%
Neither agree nor disagree	20%	13,3%
Agree	7%	16,7%
Strongly agree	16%	60%
Total	100%	100%

4.4.5.2 Enjoying reading on screen than on Hardcopy

Reading on screen becomes common practice among college students. Statement 2 asks participants if they enjoy reading on screen than in hardcopy. Responses from respondents indicated no significant differences: 30% of total respondents strongly disagree or disagree that they enjoy when reading digitally than in hardcopy, whereas 30% strongly agree or agree that they enjoy reading on screen comparing to reading on paper

Table 4.8 Enjoying reading on screen than in hardcopy

Value	Frequency	Percent
Strongly disagree	4	13,3%
Disagree	5	16,7%
Neither agree nor disagree	11	36,7%
Agree	6	20%
Strongly agree	4	13,3%
Total	30	100

4.4.5.3 Feeling distracted when reading on screen

Earlier studies often stated that the major challenge when reading on screen is distraction. Statement 5 seeks to find out if students in this study feel distracted when reading on screen. The

majority of respondents (70%) stated that they agree or strongly agree that they feel distracted when reading electronically. Responses are illustrated in Table (4.9)

Table 4.9 Feeling distracted when reading on screen

Value	Frequency	Percent
Strongly disagree	2	6,7%
Disagree	3	10%
Neither agree nor disagree	4	13,3%
Agree	12	40%
Strongly agree	9	30%
Total	30	100%

4.4.5.4 Concentrating Well When Reading in Hardcopy

Concentration (and not being distracted) is a significant cognitive skill that is indispensable to reading comprehension. Results of this questionnaire indicated that a considerable number of participants (over 76%) strongly agree or agree that they concentrate well when reading their materials in hardcopy compared to only (6,7%) who strongly disagree or disagree (see Table 4.10).

Table 4.10 Concentrating well when reading in hardcopy

Value	Frequency	Percent
Strongly disagree	2	6,7%
Disagree	0	0%
Neither agree nor disagree	5	16,7%
Agree	2	6,7%
Strongly agree	21	70%
Total	30	100%

4.4.5.5 Reading Faster when Reading on Screen than with Hardcopy

Does the medium affect the reading pace? Statement (3) seeks to solicit information from participants about whether they read faster when reading electronically than reading in hardcopy. Findings showed that nearly (50%) of participants strongly agree or agree that they read faster

when reading on screen, and (26,7%) stayed neutral whereas (26,7%) of them strongly agree or agree that they read faster when reading in print

Table 4.11 Reading faster when reading on screen than with hardcopy

Value	Frequency	Percent
Strongly disagree	2	6,7%
Disagree	6	20%
Neither agree nor disagree	8	26,7%
Agree	9	30%
Strongly agree	5	16,7%
Total	30	100%

4.4.5.6 Reading on Screen Is More Convenient than in Hardcopy

Students were asked if reading on screen is more convenient than in hardcopy. As shown in Table (4.12). 20% of participants disagreed or strongly disagreed that reading on screen is more convenient, with 30% agreeing or strongly agreeing that it is more convenient to read electronically. While 50% were neutral about the convenience of the screen medium.

Table 4.12 Convenience of screen reading

Value	Frequency	Percent
Strongly disagree	3	10%
Disagree	3	10%
Neither agree nor disagree	15	50%
Agree	5	16,7%
Strongly agree	4	13,3%
Total	30	100%

4.4.5.7 Preference for Having All Course Materials in Hardcopy

As table (4.13) below illustrates (73,3%) of the respondents agree or strongly agree with statement 8, showing a preference for all course materials in hardcopy while only (6,7%) strongly disagree or disagree.

Table 4.13 Preference for having all courses materials in hardcopy

Value	Frequency	Percent
Strongly disagree	2	6,7%
Disagree	0	0%
Neither agree nor disagree	6	20%
Agree	7	23,3%
Strongly agree	15	50%
Total	30	100%

4.4.6 Section Five: Results of the Open-ended questions

This part of the questionnaire presents results from open-ended questions that sought to solicit insightful data about what students like most and least about reading in each medium.

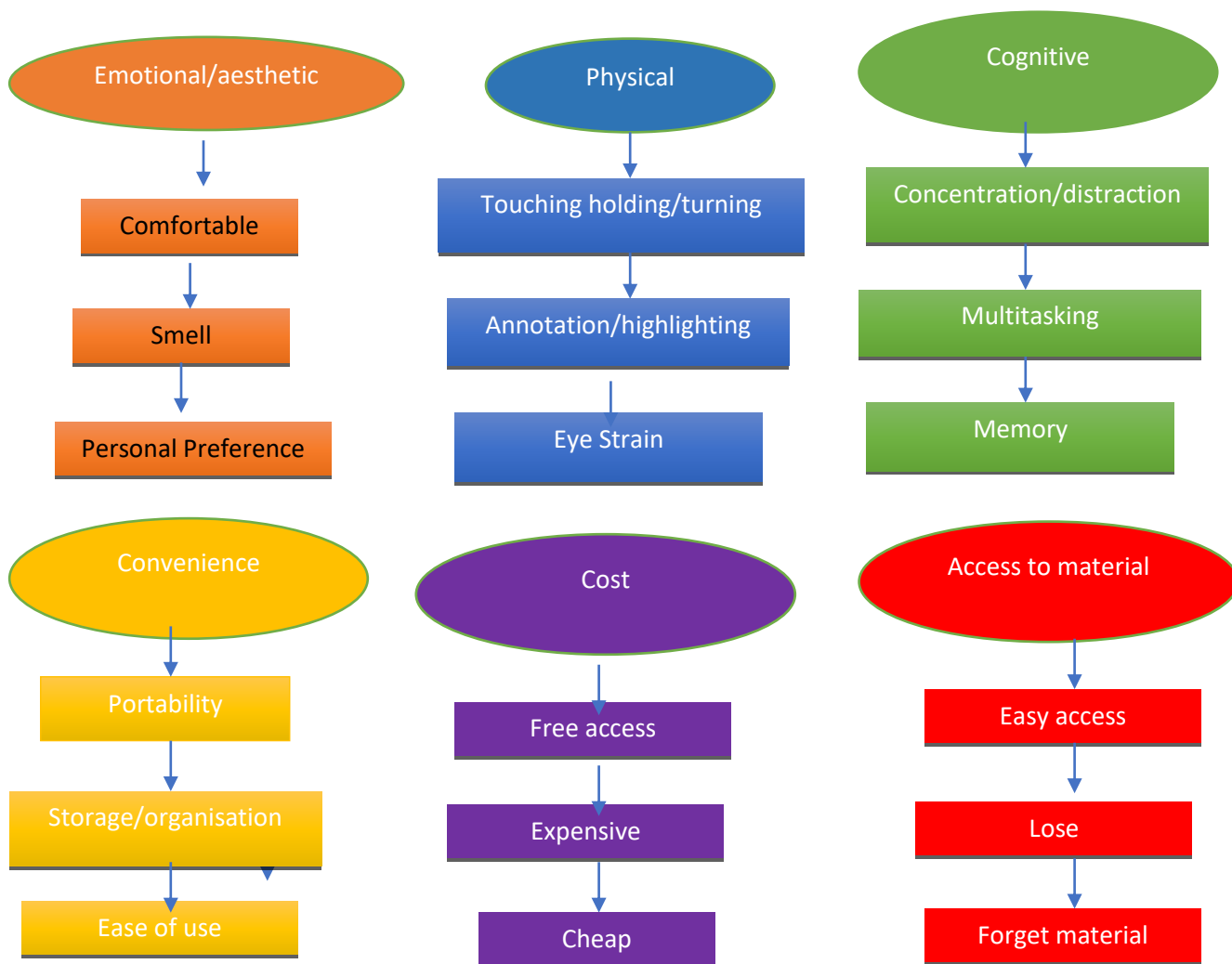


Figure 4.10 Coding scheme for "like most"/ "like least" questions

4.4.6.1 Like Most About Reading in Hardcopy

Figure (4.11) presents the participants' responses regarding what they liked most about reading in hardcopy. The cognitive category was the prevailing theme for favouring hardcopy materials among participants. 38% of participants reported that hardcopy facilitates *concentration* (e.g., "I can concentrate better in hardcopy"), (e.g., "I feel more concentrated, and more information I get"), ("I get focused, no distraction or multitasking").

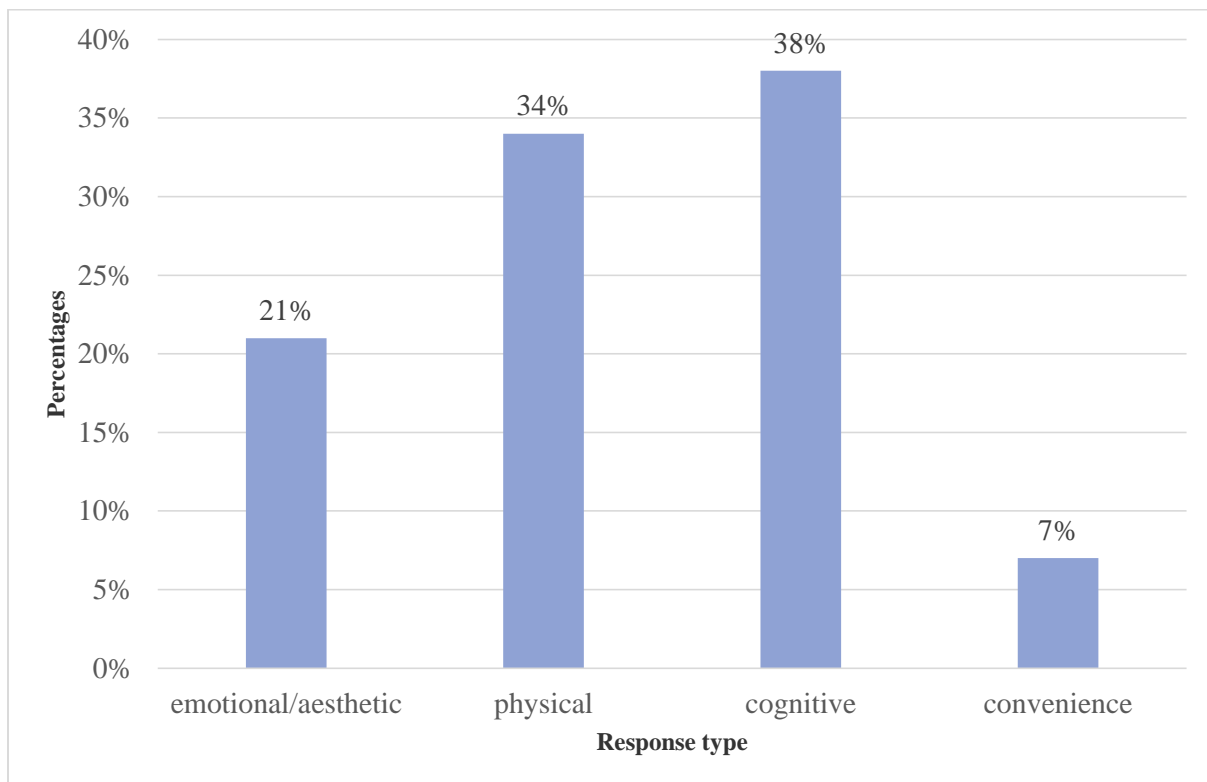


Figure 4.11 Like most" responses about reading in hardcopy

Further, participants stated that hardcopy materials were good for *memory* that help them *remember* more information (e.g., "you remember well what you have read"), (e.g., "remembering information easily").

34% of participants stated that hardcopy material has several physical features that distinguish them from screen material. The subcategories that were recurrent in participants' comments

were: *touching and turning the pages, annotating and highlighting, and eyestrain*. Here are some selected examples and comments that reflect their claims:

- “I love touching the pages, I am in love with the pages to speak”
- “I like to feel the book in my hands, I can have it with me everywhere”
- “You can write notes easily, like, within the copy, you are actually reading”
- “Highlight difficult words and important information”
- “Reading in hardcopy is healthy for eyes, I mean”
- “Doesn’t harm my eyes as much as screen does”

21% of participants described how hardcopy materials provided a sense of feeling the materials under the *emotional* and *aesthetic category*. The sub-categories that are relevant to emotional and aesthetic categories include comfortability, smell, and other personal preferences.

The following quotes show examples of how students felt they liked reading hardcopy materials:

- “I love to feel the pages, smell the pages”
- “It is more comfortable”
- “It is relaxing”

Participants also explained that among the reasons that make them like reading in hardcopy is convenience. 7% of them reported that print sources are always available and don’t require more effort to get access to them (e.g., “because it is easy to distribute and can be read by anyone at any time (given that they understand the material) since they don’t require an assistant for external drives”, (e.g., sometimes I can’t get access to the Internet due to the bad connection).

From this strand of data, various factors emerged to affect participants’ preference for hardcopy materials. Cognitive maintenance, ease of mobility, and the manipulation of the materials are major factors that give hardcopy readers a sense of ownership during the reading process.

4.4.6.2 Like Least About Hardcopy

Figure (4.12) presents results of what participants “liked least about reading in hardcopy”.

27% of participants reported that access to hardcopy materials was the major challenge.

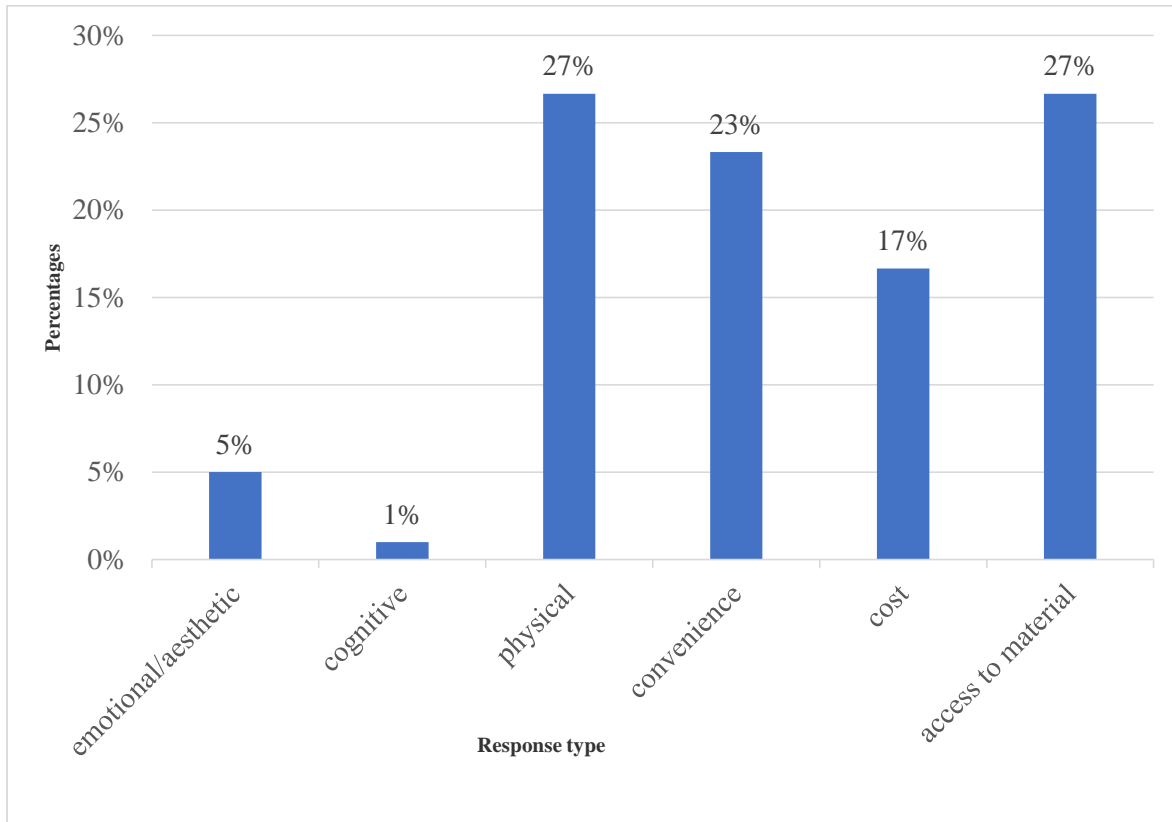


Figure 4.12 " Like least" responses about reading in hardcopy

Students encountered various difficulties when looking for targeted hardcopy materials as stated by the majority of participants:

- “Sometimes you can’t find the hardcopy that you want to read”
- “It’s not always available and affordable”
- “it takes time to find what I am looking for”

In addition to the lack of easy access, participants complained about losing their materials when they are printed (e.g., “sometimes I lose my files”).

Regarding convenience issues when reading in print, 23% of participants expressed their discomfort when approaching hardcopy materials. The “like least” responses focused on portability, organisation, and font size issues. Here are some selected examples from participants' quotes:

Portability issues

- “You can’t take all of your documents with you”
- “Not to read anywhere and anytime”
- “It’s heavy, so, I can’t have it when I go”

Organisation issue

- “I can’t read when the papers are disordered”
- “I don’t really like the messy of it. Having too many papers and books lying around”

Font size issue

- “When the writing is so small, the inability to zoom in and at”
- “The small font size”

27% of participants’ responses were negative toward physical aspects. For example, the majority of participants complained about the difficulty of copying and pasting the needed information directly from the source when reading in hardcopy materials. Here are some selected quotes:

- “I can’t copy and paste a passage I need to include in a work”
- Not being able to copy and paste the content”
- “... can’t direct quotes or look for direct meaning”
- “I can’t search for other related data”

Another recurrent issue in participants' responses about what liked least about reading in hardcopy materials was cost. 17% of participants indicated that cost was the major factor that impeded them to have all their materials in hardcopy. Here are some selected quotes:

- "Hardcopy materials are expensive; I don't have money to buy books"
- "It costs the students to print or buy"

When it comes to emotional/aesthetic and cognitive aspects, the percent of participants voicing those aspects when reading in hardcopy was fairly minimal: 5% of negative responses referred to emotional aspects and 1% referred to cognitive issues).

4.4.6.3 Like Most about Reading on Screen

Figure (4.13) presents the percentages for what participants liked most about reading on screen. 43% of participants chose screen medium for its convenience: portability, storage of myriad of information and their organisation, in addition to ease of use the digital devices were the prominent choices for what participants favoured screen medium over print. Here are some explanations from participants' comments:

- "It's practical, everybody reads on screen"
- "To read anywhere and anytime"
- "Time-saving"
- "Nowadays, most people depend on technology for their needs. The digital screen is all the time with us, we can use it anywhere"
- "The organisation of papers"
- Practically is probably the reason why I seek e-books and online articles. And I also love how it's less messy and again, very practical. (I can read while cooking when I can't

sleep at night, when I am waiting for the next session to start, and I can also highlight and annotate even when I have none of my stationary tools with me”.

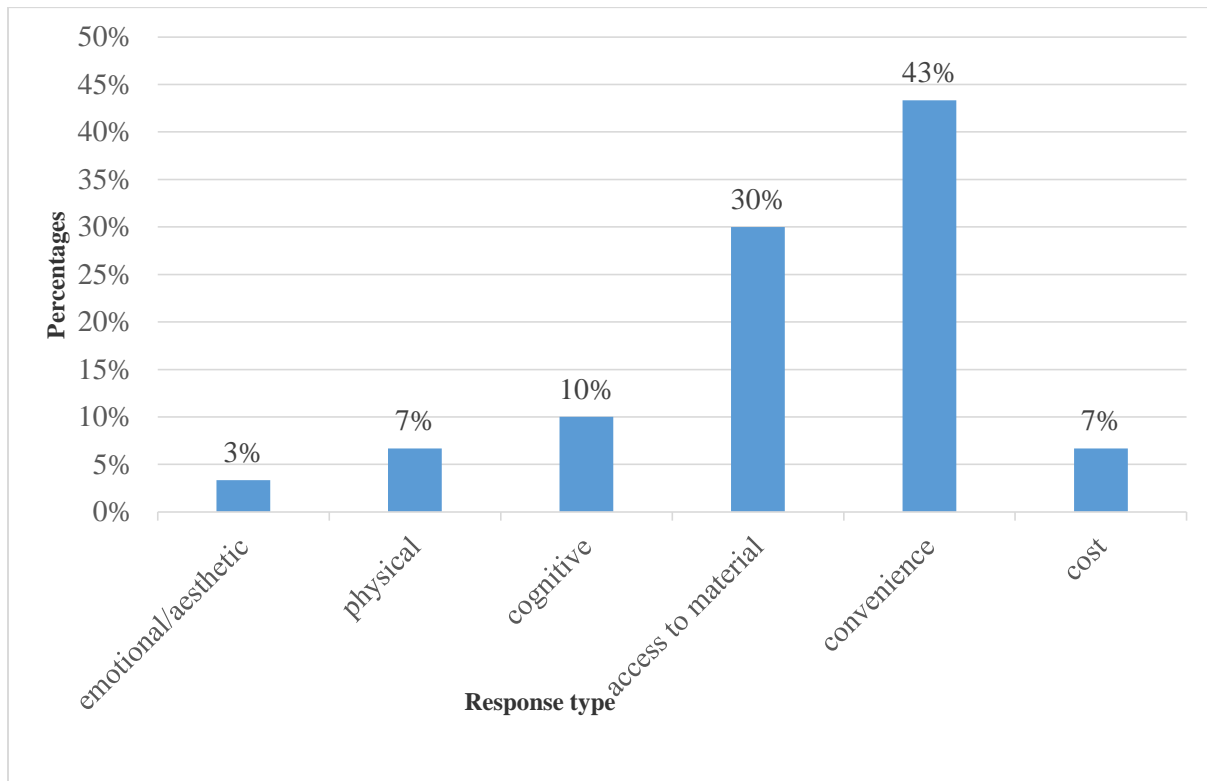


Figure 4.13 "Like most" responses about reading on screen

30% of participants reported that digital devices offer easy access to materials. They found that electronic information was instantly available through handheld devices that could provide a multiplicity of information in a very short time. These selected comments reflect the participants' views:

- “It is very easy to reach the document I look for”
- “Files are always available, and it’s very easy to access”
- “Easy to access”
- “The availability of materials and the possibility to copy, search and to modify the content”

- “Fun, practical, and affordable (PDF)”

When it comes to cognitive issues, 10% of participants claimed what they liked most about reading on screen was the ability to multitask and accomplish more than one task at a time. Here are some selected comments:

- “Multi-tasking and easy search”
- “Actually, for instance, when reading on a digital screen is also an interesting thing, for instance, you are chatting on social media and read some articles at the same time...also you can search for another article at the same time using just the internet”

The most common reason participants liked reading digitally involved the screen’s physical features (07%) and cost (07%). Many participants mentioned a plethora of positive aspects of reading on digital devices like the ability to edit the light screen and the font size of the text, finding information easily, and looking for words. The following quotes show examples of how students praised the physicality of screen reading:

- “Easy and lucid to find and checkout”
- “I like that I can easily shift to other resources while I’m reading on screen (sometimes we need to check or seek more information or explanations of what we are reading either to extend our understanding or check credibility”
- “I can read at night when I’m in bed”
- “You can zoom and edit the text”

Regarding cost, most of the participants approved the affordability of materials when reading digitally. Here are some comments that match students’ claims:

- “Easy to access”
- “Free no money to spend”

4.4.6.4 Like Least About Reading on Screen

Students were asked to indicate what they liked the least about reading on screen. As shown in Figure (4.14), almost half of students (47%) stated that screen reading caused an increase in cognitive load. Students overwhelmingly reported that reading on screen negatively influenced their concentration and increased distraction. These common drawbacks of screen reading were clearly stated in students' answers. Here are some selected quotes:

- "I can't stay focused for a long time"
- "Reading on screen has a lot of distraction like social media apps and listening to music while reading"
- "Lack of concentration while reading"
- "I get distracted easily"

Other top reasons by students included challenges related to physical aspects. (43%) of students in Figure below disliked reading on screen because of the inherent problem of eyesight that this medium caused. Here are some selected quotes from students' comments:

- "It is not good for your eyes"
- "The fact that it is unhealthy as the screen light harms my eyes and causes me a headache"
 - "It is dangerous for my eyes"
 - "It can affect the eyes if you use it for many hours"
 - "Easy to lose focus/ bad eyesight"

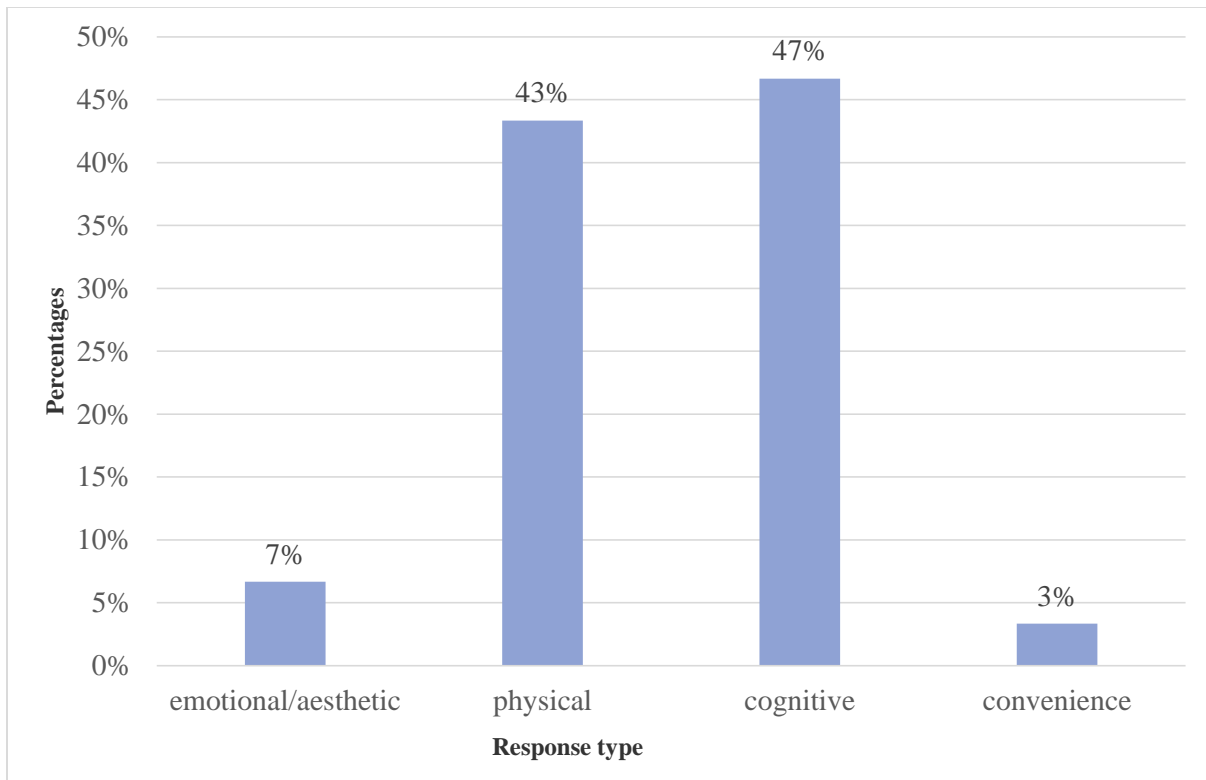


Figure 4.14 Like least" responses about reading on screen

(7%) of participants indicated screen reading as their least preferred medium due to emotional and aesthetic issues like the lack of tactile qualities of paper like touching and smelling the material, as one of the participants put it “When reading on screen, I can’t touch the text, the fact that makes me not enjoying my reading’. Other participant went further to indicate that reading on screen is not real reading, he said “For me, I don’t like reading on screen, I can’t feel that I am really reading”. (3%) of participants reported that reading on screen was inconvenient since the digital devices require batteries and losing the materials easily if the device broke.

4.5 The Interview's Results

Using thematic analysis to get an overall understanding of teachers' perspectives about EFL students' reading behaviours in the digital age, the data were developed and identified into six main themes: (1) benefits of reading, (2) reading motivation, (3) the challenges of reading, (4) the impact of digital age on EFL students' reading habits, (5) medium's appropriateness, (6) reading instructions in the digital age. These themes were used as key headings in the data analysis. Before addressing these themes, it was necessary to have an overview of the four language teachers asked in the interview, Table (4.15) showed the demographic analysis of the participants.

Table 4.14 Teachers' Profile

Participants	Gender	Teaching Experience
Teacher 1	Male	12 years
Teacher 2	Female	13 years
Teacher 3	Female	3 years
Teacher 4	Male	2 years

Coding of the interview's data was conducted manually on paper and with the help of concept-mapping software (see Figure 4.15), the researcher attempted to use Nvivo- a qualitative research software to assist the coding process and organise the obtained data. However, the analysis of the interview data using Nvivo was more time-consuming and required the researcher to purchase its new version license, thereby, it was appropriate for the researcher to refer to everything on paper.

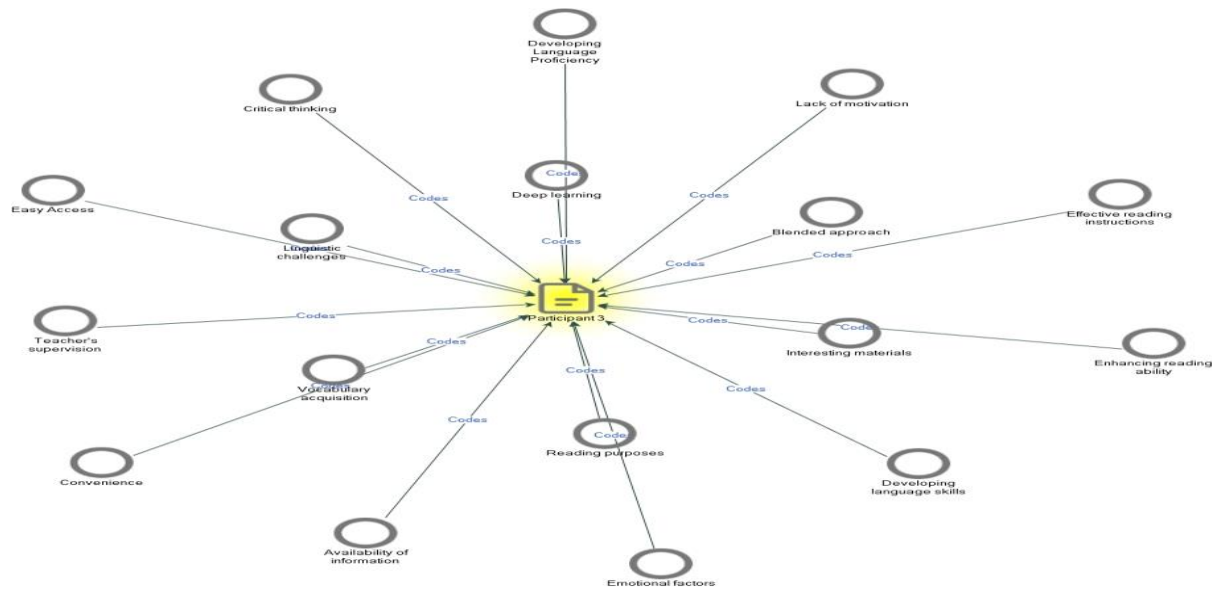


Figure 4.15 Coding map using Nvivo

4.5.1 Reading Benefits

The first part of the interview aimed to solicit insightful data about teachers’ perspectives on the benefits of reading for EFL students. All teachers stressed the importance of reading in increasing language proficiency. The thematic analysis of the benefits of reading identified five sub-themes describing the tremendous advantages of reading in the EFL context. These sub-themes are depicted in Table (4.15). With quotations showing the positive effect of reading on students’ language proficiency.

Table 4.15 Themes of the benefits of reading identified in teachers' interview

Themes	Examples from the teachers’ interview
1. Vocabulary acquisition	“In fact, reading increases learner’s vocabulary knowledge”
2. Developing writing skills	“Reading helps EFL students get the input to writing”
3. Developing pronunciation and speaking confidence	Reading plays an important role in boosting students’ English pronunciation Reading reduces their stress while speaking
4. Critical thinking	Reading enables students to be avid readers and critical thinker

One of the teachers summarised the main advantages of reading for EFL students by saying, *“Well, reading is of paramount significance for students, its benefits are numerous for EFL students. Reading enhances other skills that any EFL learner has to develop in his process of learning. Reading allows my learners to expand their vocabulary and grammar. In addition, it exposes them to a wide range of sentences and language forms. And all that has been mentioned so far is the core of language which allows them to engage in speaking, writing, and listening activities. Hence, learners’ self-esteem increases, and so does their motivation to learn.”*

Based on the four themes of reading benefits, the second round of the analysis sought the varied means which, according to teachers, contributed to motivate students to read.

4.5.2 Reading Motivation

Based on the literature, motivation serves as the driving force to sustain students’ interest in learning. In EFL context, students need to be continuously motivated during their arduous language learning process. Therefore, the researcher in this study aimed to find out the different strategies used by EFL teachers at Mascara University to motivate their students to read. Through teachers’ interview, various means were provided which formed the theme of reading motivation.

Teacher 3 and 4 reported that they aimed to choose interesting reading materials, such as books and novels, for their students to make them engaged in the reading process. In response to the same question about the way of motivating students to read, teacher 2 also reported that she was always seeking to *“choose documents that suit their field of study, facilitate the task of reading for them, and prepare questions so that their reading will be a guided activity”*.

Teacher 1 went to state that making reading more enjoyable is the key way to motivate students and create a conducive environment to meaningful learning, he opined that making reading a

pleasure, was one of his priorities to motivate his students, by “*suggesting interesting topics to learners to read about, suggesting short stories or biographies of famous people (famous to today’s generation, football players, singers, youtubers, tiktokers, artists, actors, etc).*”

The aforementioned findings highlight the varied means suggested by EFL teachers to motivate students to read. Nevertheless, in teaching a foreign language, teachers may confront with many challenges that impede their reading instructions. This leads to third theme that focused on reading challenges.

4.5.3 Reading Challenges

One of the primary findings that was identified at the beginning of the teachers’ interview was EFL students’ reading challenges in their field of study. This finding was explicitly uncovered in the teachers’ answers in which most teachers acknowledged that their students had problems with vocabulary knowledge during the process of reading. In other words, EFL students while reading in their specialty may confront with unfamiliar words or technical concepts that impede their reading comprehension. For example, Teacher 2, an ESP teacher, affirmed this finding by saying, “*specialised vocabulary, they are not familiar with. Their level of English language proficiency often has a negative impact on their motivation to either read or accomplish task related*”.

It is important to note from the previous saying that students’ limited vocabulary in English may lead to negative affective factors, such as anxiety and lack of motivation, that contribute to poor reading performance.

In a similar vein, Teacher 1 added that when students failed in reaching the reading goals, such as getting the general idea of the text due to the new concepts or complex grammar, they would be impatient to carry on reading the whole text.

In addition, Teachers 3 and 4 went further to state that among the obstacles that hindered EFL students to read were the lack of the targeted materials in the library of the university, or the high cost of the needed books if they were available.

In nutshell, teachers interviewed in this study pointed out that their EFL students' lack of vocabulary knowledge in addition to other challenges stand in their way to boost their reading ability in English. Therefore, solutions to alleviate such challenges should be found so that students would be able to increase their English proficiency.

4.5.4 The Impact of Digital Age on EFL students' Reading Habits

As technology is becoming an integral part of today's students, the researcher felt the need to explore the impact of the digital age on students' reading habits. This section aims to explore the impact of the digital age on Algerian EFL graduate students' reading habits at Mascara University from the teachers' perspectives. Teachers' responses revealed that the digital age contributed to the promotion of EFL students' reading. According to these teachers, students' reading habits increased thanks to the availability of information that the Internet offers. As explained by most teachers, the digital age provided limitless opportunities to EFL graduates to boost their reading habits. One teacher further elaborated that the proliferation of information on the Internet shaped a new profile for EFL students to be avid readers in the 21st century. He said, *"Students are more eager to read through screen because of the facilities Internet offers like quick search for the text...."* This explains the tangible shift of students' reading habits from paper-based reading to screen reading as teacher 2 expressed.

The other teacher added that today's students were known as digital natives who spent much of their time reading on their screens for different purposes. She pointed out that these students possessed technological expertise that enabled them to get the needed information quickly.

Furthermore, through the teachers' interviews, it was obvious that EFL students had positive attitudes towards the digital age when it came to English learning. Teachers highlighted the key role of technology in helping these students to improve their pronunciation through direct contact with native speakers, or through online dictionaries that enhanced students' vocabulary knowledge. In addition, the Internet provided authentic materials that motivated EFL students to read and expand their knowledge in the target language.

4.5.5 Medium's appropriateness

The findings from the teachers' interviews indicated that EFL teachers' perspectives varied concerning which medium suited students' reading performance. For instance, teacher 1 believed that *"electronic reading may be a shortcut"* for his students. According to him, the advantage of this type of reading not only helped his students to get easy access to information but also helped teachers to reach their teaching objectives, he said, *"electronic reading for an effective achievement of the pedagogical objectives (stated before like improving pronunciation, increasing vocabulary knowledge...etc.). Moreover, the 21 century EFL learners have adopted a completely different profile that the teachers may cope with for effective teaching"*

In contrast, teacher 3 and 4 stressed the significance of paper medium in enhancing deep and careful reading. In his response to the question about which medium he would choose to give handouts to students, teacher 3 strongly favoured paper medium. His incentive to choose hardcopy materials was due to the role of this medium in helping students to be involved and immersed in the reading process. He stated, *"I prefer to provide them with hardcopy books because they can feel that they are reading, holding a hardcopy book isn't like reading through scree causing seeing problems."* He further explained that paper was appropriate for reading academic texts when he said, *"analysing academic texts is the top reason, when students*

underline, colour, circle, or cross something on hardcopy, it's better than taking notes from screen."

In a similar vein, teacher 2 thought that students tended to focus better on the content when it was presented on paper. She acknowledged that paper medium enhanced students' concentration, especially when reading in English. She pointed out that to fully understand the text, students should read on paper for deep reading. She added that reading on paper allowed students to employ different reading strategies such as highlighting and annotating. She explained that electronic reading could cause the students to lose their concentration. Thus, staying focused when reading academic texts online was one of the main challenges screen readers may face. She said,

"EFL graduates heavily use online resources to get their needed documents, however, the online environment entices them to check from time-to-time e-mails, or friends' messages on Facebook. It is the fact that leads students to distraction so that they easily lose the track of their focus."

On the other hand, teacher 1 believed that both screen and paper were appropriate for EFL students when it came to reading for academic purposes, she stated, *"in fact, both of them... the first to read at home and the second to gain their attention during the course."*

4.5.6 Reading instructions in the digital age

Due to the significant changes that the digital age has brought to students' reading, there would be a pressing need to investigate the teachers' beliefs about the effective reading instructions they think will be useful for students to cope with the demands of the 21st century. For this reason, the researcher aimed to explore EFL teachers at Mascara university perspectives in this regard.

The data obtained from the teachers' interview showed that the majority of teachers questioned, were aware of the impact of the digital age on EFL students' reading comprehension. Consequently, they believed that it was of paramount importance to integrate technology into their reading teaching. One of the teachers acknowledged that devising innovative approaches through the integration of technological devices would maximise learning opportunities and most importantly motivate EFL students to be active readers and proactive learners in their efforts to attain impactful learning. She said, *"Technology has a great impact on enhancing students' reading habits, using audio- visual materials motivate students to read in the target language"*. The other teacher agreed with this view when he expressed explicitly that *"screen and the Internet may overcome reading hindrances"*, he emphasised that *"technology will definitely have impact on students' reading ability"*.

Notwithstanding the above advantages, one teacher thought that even though technology affected positively on students' reading habits, this tool could not replace teacher. He further explained that *"the supervision of the teacher will always remain a must"*.

Furthermore, teachers asked in the interviews elaborated on the reading instructions in the digital environment by expressing that the purpose of reading was mainly the factor that determined which reading medium would be suitable for students to attain effective reading comprehension. They explained that if students tended to conduct intensive reading (e.g. Reading for academic purposes or reading to get rich information from the material), paper would be the suitable medium. On contrast, teachers acknowledged that screen medium would be favourable for extensive reading.

To sum up, all teachers' responses revealed that blended approach for the use of both paper and screen would be adopted for better effective reading outcomes.

4.6 Conclusion

The overall findings of the data collected in this research study showed that students who read academic texts on paper scored better than those who read on computer screen. More specifically, students' reading comprehension for informational texts was more satisfying and higher on paper than those who read on computer. Additionally, the findings of the students' questionnaire revealed that EFL graduate students reported a strong preference for traditional print platform over digital devices due to the physical and mental experiences this paper medium affords. Furthermore, the teachers' interview results indicated that the digital age increased the students' reading habits and made a tangible shift from paper-based reading to reading on screen. This shift was explained due to many reasons such as: ease of access and time saving. Moreover, the students' questionnaire data and the teachers' interview findings revealed that students' preference toward either paper medium or screen medium was affected by their reading purposes. These results concluded that paper would be the appropriate means for deep and careful reading. The current study confirms that paper medium has a strong appeal among college readers. The following chapter will interpret the aforementioned results and provide thorough explanation to meet the overarching purposes of this study.

CHAPTER FIVE:

DISCUSSION

Chapter5 : Discussion**5.1 Introduction**

This study investigated the potential effect of reading mediums (paper and screen) on EFL students' reading comprehension when reading narrative and informational texts. It also explored students' perceptions of their preferences for the reading medium.

The present study focused on two parts. The first part presented the analysis of the experiment that investigated the reading comprehension differences between the paper group and the screen group when approaching narrative and informational texts. The results indicated that reading comprehension scores did not differ in both paper and screen groups when reading narrative texts. However, a significant difference has been noticed in reading comprehension in both conditions when reading informational texts.

The second part explored EFL graduate students' perceptions about their preferences for paper and screen. The results of the questionnaire indicated that students reported a strong preference for paper medium when reading academic texts.

The third additional part explored teachers' perspectives on the students' reading practices in the digital age. Its results showed that the digital age had significant changes in students' reading patterns that should not be ignored.

This chapter begins with the interpretation of the experiment's findings and the discussion of questionnaires and the interviews' results, then it places these findings in the context by comparing them to related previous research. This chapter further determines potential areas for future research in the field of traditional and digital reading.

5.2 Discussion of the Experiment's Results

5.2.1 Reading Comprehension across mediums when reading narrative texts

The results of this experimental study indicated no significant differences in reading comprehension between the screen and paper groups while approaching narrative texts. These results are consistent with many previous studies (Mangen et, al.; 2013, Delgado et, al. 2018). In their meta-analysis, Delgado et al. (2018) reported that studies that investigated reading comprehension of only narrative texts found no effect mediums. The current results reveal no significant difference when reading narrative texts on both paper and screen conditions due to many plausible explanations. One possible explanation may refer to the nature of narrative texts that contain easy and familiar words that do not require students to employ more cognitive skills to discern the meanings conveyed in the given text. In addition, participants' familiarity with the use of computer screens as digital natives contributes to reaching similar reading comprehension as on the paper platform. This result is important because it indicates that reading on a computer is not detrimental to comprehension when reading narrative materials, therefore, teachers should not be sceptical about the use of screen mediums when teaching narrative texts. More importantly, aligning with the Construction-Integration model, the findings reveal that participants can create a situation model representation of the text when reading on a computer screen. In other words, a screen reader can integrate his background knowledge with the information presented in the digital text to build the overall meaning of the text as they do while reading in print.

The lack of significant differences in comprehension when reading narrative texts on both paper and screen mediums referred to the exclusion of online reading (e.g. Hyperlinks, videos, audio, images...etc) that might disrupt participants' concentration. On the other hand, inserting

any kind of online reading, that is related to the topic at hand, may enhance students' comprehension. Thus, future studies should investigate the effect of online reading on reading comprehension when reading narrative texts.

It should be noted that the current study overlooked testing participants' prior knowledge before the experiment took place. For instance, participants' familiarity with the chosen narrative text (*Pride and Prejudice*) might yield in similar results in both conditions (i.e., paper and screen). Therefore, prior to conducting the study, it would be helpful to determine participants' prior knowledge to reduce any confounding factor that will affect testing students' reading performance.

Furthermore, future studies are invited to examine students' reading comprehension across different devices when reading longer texts. Comparing reading novels on E-readers or Kindle screens may result in significant findings in the educational realm. Today's students are digital natives, and their experience with different digital devices to process and comprehend a text would be helpful for teachers to create an enjoyable environment conducive to learning.

5.2.2 Reading Comprehension Across Mediums when Reading Informational Texts

The present study was designed to determine the effect of reading medium (paper and computer screen) on EFL students' reading comprehension when reading informational texts. The result of the experiment showed that students who read on paper scored better than those who read on screen. There are numerous potential reasons for this finding. The first reason was that students who read informational texts employed different strategies to grasp the meaning of the text due to the complex vocabulary and ideas they contain. Reading informational text, or expository text, for instance, requires students to read at a slow pace and deploy various strategies like rereading strategy to effectively comprehend the text (Sage, Piazzini, Downey, &

Masilela, 2020). Researchers suggested that to better understand informational texts, students should focus on minor details (Sage et al., 2020). Therefore, using a rereading strategy would be the appropriate approach to meet this aim.

Adding to these aforementioned concerns, reading on screen requires students to scroll down and up and adjust the font size when needed. These factors, consequently, were frustrating for students that may increase the cognitive load which in turn impedes reading comprehension.

On the other hand, significant research has reported that reading on paper increases one's ability to create an effective cognitive map of the text that yields better comprehension (Mangen et al., 2013b). This explains why students in the present study showed better comprehension of informational text on paper. The findings of this study are consistent with those of Delgado et. al (2018) who emphasized that print advantage for informational texts is due to the associated demand for higher-level processing. These findings confirm the association between reading mediums and text genre. For instance, sage et al. (2019) supported this claim when stating that "different genres can lead to students taking approaches to their reading process. Additionally, this approach might vary further based on reading device" (p,4).

These findings, while preliminary, suggest that students and teachers alike should be aware of the reading medium's weaknesses and strengths when engaging in texts that require a deeper understanding to prepare for exams or accomplishing any reading assignments.

5.3 Discussion of the Questionnaire's Results

5.3.1 Time Spent on Reading

The results of this study showed that EFL graduate students spent much time reading academic materials. These results are consistent with other previous studies' findings (Mokhtari & Sheorey, 1994; Noor, 2011). In their study of ESL students' reading patterns (Mokhtari &

Sheorey, 1994), researchers found that English proficiency and educational level are strongly related to the reading practices of university ESL students. They concluded that ESL graduate students who scored better in TOEFL exams spent more time (about 15 hours per week) reading their academic materials than their undergraduate counterparts. In fact, the research literature is replete with evidence that confirms the critical role of reading in the acquisition of language. One of the prominent researchers in this field is (Krashen, 2003) who advocated the significant role of reading when he writes “ reading is a powerful means of developing literacy, of developing reading comprehension ability, writing style, vocabulary, grammar and spelling” (p.22 as cited in Mokhtari et.al 1994 p.59).

EFL Master two students devote much time to reading due to their rigorous academic programme This group of students are expected to write theses, therefore, it is conceivable to read extensively to fulfill this requirement.

The findings of this study demonstrate the need to empower students’ reading skills from the first years of university. Simply, Algerian universities should give a higher priority to reading by devoting much time to teaching reading as a major module. Further, the authorities and teachers alike are invited to create more spaces for reading to develop students reading skills and most importantly to build graduate students who can read analytically in this globalised world, as Anderson (2013) acknowledges “it is difficult to imagine an academically successful individual in the twenty-first century who is not an avid and effective reader” (p. 218).

5.3.2 Time Spent Reading print and Electronic Documents for academic Purposes

Participants of this study reported that they devote more time reading print documents than electronic documents. This finding is surprisingly inconsistent with prior research studies (Liu 2005; Larhmaid, 2018). For instance, Liu (2005) found that about 83% of his participants spent

an increased amount of time reading electronic documents than print documents. He explained, “the arrival of digital media has changed how we spend a significant portion of our time reading digital documents, time that otherwise would have been spent reading printed documents” (p.705). Similarly, Larhmaid ‘s study (2018) reported that undergraduate students spent more time reading digital documents than print documents.

Participants in this study indicated that they spend more time reading print documents for many reasons. First, graduate students devote more time to reading print for academic purposes. To the best of our knowledge, academic reading is complex and effortful processing compared to reading for pleasure. In addition, this kind of reading requires more focus and attention on the part of the reader, therefore, print is best suited to reach the feat of academic reading.

5.3.3 Preferred Reading Medium When reading academic materials

Results showed that the majority of the participants approximately (77%) reported that they preferred to read Web articles while reading for academic purposes. The current result can be associated with other studies that argued that web site is the most usable reading among university students. In fact, Web sites offer students with enormous opportunities to enhance their learning and improve their reading comprehension. Through the exponential growth of hyperlinks in the online environment and the interactive nature of hyperlinks and multimedia, students can have immediate access to pertinent resources. Thanks to these advantages, websites become an important landscape for students to enhance their literacy while they expose to multiple and diverse perspectives on the Internet.

Despite websites offering unprecedented freedom for readers to choose their reading paths, however, what remained to be investigated is which reading skills and strategies students need to process web texts. Are the strategies used when reading conventional texts, the same as those

employed in the online environment? Another area that needs to be charted is to what extent does the ubiquity of website information enhance or impede students' reading comprehension? It would be interesting to empirically answer these questions in future research studies.

5.3.4 A Heavy preference for Electronic Library over traditional library

When asked what type of information sources graduate students consult first when performing their academic assignments, the majority of them (90%) reported that they consulted electronic libraries first than a traditional library. This finding is confirmed by Liu (2006) who claimed that graduate students are heavy users of library electronic resources. Multiple factors such as easy access, portability, and low cost contribute to this choice. In fact, digital libraries (e.g. E-books, Genesis library ...etc) provide students with access to a hybrid of up-to-date materials that tackle current topics which expand students' perspectives on an issue of interest. Indeed, electronic libraries can save students the trouble of going to the university library, checking the library catalogue, browsing the library shelves, and carrying heavy books with them. Furthermore, electronic materials are available and affordable with free access in the digital libraries that help students to build their repository of knowledge.

5.3.5 Reading Medium preference for academic purposes

The second aim of the study was to explore EFL graduate students' preferences for reading mediums (paper or screen) when reading academic texts. Based on predicted research, it was hypothesised that participants would prefer the paper medium when approaching academic materials. The findings of this study provided support for this hypothesis. The majority of participants preferred to read their academic materials on paper than on screen.

5.3.5.1 Cognitive Map

There are several possible explanations why, in the present study, participants preferred the paper medium. One plausible explanation is that paper medium helps the readers to construct an effective cognitive map of the text (Hou et al., 2017). In other words, readers of long texts on paper can see the entire passage with its four angles and from top to bottom on one single page (Jabr, 2013). Thus, paper readers can have a clear representation of the entirety of the text (Mangen et al., 2019). According to Hou et.al (2017), a paper text has a fixed layout that presents the reader with four corners and a frame- two long and two short borders. A fixed layout of the text on paper enables readers to localize a given part of the information within the text (Mangen et al., 2019).

Scholars have contended that having an effective cognitive map of the text supports reading comprehension (Hou et al., 2017; Jabr, 2013; Mangen et al., 2013a). For instance, Mangen et.al (2019) found that participants who read long texts (i.e. a story) in print pocketbooks were able to localise the events in the story, through *Where in the Text?* Test, than those who read on a Kindle: localizing events and recalling information in a text requires that the reader has constructed a solid mental representation of the structure of the text. Recent empirical studies have provided evidence to support this claim (Hou et al., 2017; Li, Chen, & Yang, 2013).

In his eloquent article, *Why the Brain Prefers Paper*, Jabr (2013) claimed that paper books have more obvious topography than screen-text. To put in other words, seeing the whole text from left to right and from the top to the bottom on one single page proffers a spatial dimension that tells the reader where things are in the text. This distinctive feature of paper medium, as Jabr (2013) asserted, makes it easier for readers to navigate information and form a coherent mental map of that text.

5.3.5.2 The Sensory Dimensions of Paper

Another potential factor that led participants in this study to prefer paper is its sensorimotor dimensions (i.e., tangibility and tactility). In fact, touching, smelling, and holding the print text, with its entirety at hand generates an emotional connection that triggers the reader's body and mind towards reading. Indeed, the readers enjoy the way their hands engage with the smoothness of the paper and the hardback cover. This description is well explained by the participants' comments:

“I like to feel the book in my hand. I can have it with me everywhere I go”

“I love to feel the pages, smell the pages, touch the pages, I am in love with pages to speak”

The literature has consistently documented the numerous virtues of the tangibility of paper (technically known as Haptics (Baron et al., 2017a) in getting the reader involved and absorbed in reading. For instance, Farinosi, Lim, and Roll's (2016) findings indicated that participants reported that their screen reading lacks the feature of tactility and tangibility that made them feel detached from the content. The immateriality of the screen content results in a shallower and less focused reading. By contrast, the paper platform, thanks to haptics cues and through turning the pages by fingertips, adds a sense of ownership and immersion in the content which duly improves learning.

Furthermore, the physicality of paper presents the reader with a good spatial representation of the text that enables him to build an effective mental reconstruction of the content which in turn consolidates and strengthens the reading abilities. As Mangen and Kuiken (2014) state “ readers' sense of location in the text may have been strengthened by the tactile-kinesthetics cues that supplement visual ones — and facilitate text memory and recall” (p.165).

Theoretically, scholars proved that the materiality of the medium influence text processing, however, the relationship between the haptic cues and reading comprehension is still an understudied area in need of attention.

5.3.6 Reading medium preferences for longer and shorter texts

Earlier studies have found that reading medium preference can depend on the length of the reading. In various studies (Baron, 2015; al.; Mizrachi, 2015; Mizrachi, Salaz, Kurbanoglu, & Boustany, 2018; Singer & Alexander, 2017), findings showed that paper is the suitable medium to read long academic texts, while screen reading is adequate and preferable for shorter texts.

Interestingly, the findings of this study showed that students preferred to read both long and short texts on paper. These findings are inconsistent with previous studies due to many reasons. One plausible explanation for this unexpected result is that participants in this study read their academic materials in English which is not their first language. Reading in a foreign language is a demanding and effortful process that required more cognitive skills on the part of the reader. For instance, when students read the academic text in a foreign language, they are certainly confronted with unfamiliar words which compel them to stop and figure out the meaning. To get the meaning of these unknown words, students need to employ support reading strategies such as using the dictionary, translating into the first language, and inferring meaning from the context to understand the overall meaning of the text. Research showed that screen reading in a second language is more taxing than first language reading (Vandenhoeck, 2013). Thus, students' low level of language proficiency can be a factor that influences students' preference for papers to read long and short texts. Chou (2012) pointed out that to enable ESL students to read effectively on screen, they need to increase their second-language proficiency. Many studies have stressed the pivotal role of extensive reading to increase language proficiency. Mason and Krashen

(1997) wrote, “extensive reading proved to be superior to traditional approaches on measures of reading comprehension, as well as a measure of writing and reading speed” (p.101). In fact, providing students with an opportunity to choose the reading materials that match their interests would be a promising step to improve their reading behaviour on paper and screen in particular. Indeed, screen reading is a good space to empower students’ reading skills through the use of more advanced digital devices with electronic dictionaries and other tremendous applications that contribute to effective reading comprehension and increase the level of language proficiency.

5.3.7 Preferred Digital Devices for Reading Academic Texts

It is indisputable that the ubiquity of digital devices such as computers desktops, smartphones, laptops, and tablets has led to a tangible shift from paper-based reading to screen reading. Today’s students approve of the use of these devices to enhance their reading practices. In fact, younger students are described as digital natives who have grown up in a digital culture that strengthens their plentiful experience with electronic platforms. In pursuing to discover which digital devices the participants of this study prefer to use when approaching academic texts, the findings of the current study showed that participants preferred tablets and laptops. A possible explanation may be related to the fact that students are familiar with the use of these digital devices.

Chen et, al (2014) questioned whether students’ familiarity with tablet medium affects their reading performance, they found that students who had a high familiarity with tablets scored better than those who had a low familiarity with the tablet. Researchers concluded that as familiarity with digital devices increases, learning outcomes with these devices might also increase. This conclusion was warranted by other research (Ismail & Zainab, 2005).

Moreover, Ansarin, Farrokhi, Mahboudi, and Jam (2017) found that Iranian EFL students had more positive attitudes towards tablets than smartphones. The large size of screen and the efficiency of the tablet are found (Curaj et al., 2018) to be significant factors in determining preference for using these devices.

A recent study (Sage, Piazzini, Downey, & Masilela, 2020) investigated the effect of paper, e-readers, and laptops on students reading comprehension. The findings showed that participants who read on a laptop gained similar scores as those who read on paper, whereas those who read on an e-reader scored unsatisfied results. Participants scored highest on reading on the laptop because of the suitable size and experience use of laptop.

Researchers go further to note that educators should integrate laptop into their teaching since students have enough experience with this device. They also claim that tablet as new mobile technology has become a popular educational technology because of their tremendous applications like dictionaries that help students to be more proficient in the English language proficiency. For this reason, schools all over the world have integrated laptops and tablets into the core of students' curricula as a promising step to enhance the process of learning.

5.3.8 Printing for Reading

This study sought to address whether EFL graduate students prefer to read important texts electronically or print them out. Results indicated that the majority of students preferred to read them electronically. This finding is inconsistent with prior research studies such as Liu's (2005) through which over 80% of the participants (including young and adults) reported that they 'always' or " frequently' print out electronic documents for reading. Perhaps the main factors that led participants in this study to read their documents on screen are ease of accessibility, cost, and convenience.

5.3.8.1 Ease of Accessibility

The major incentive that drives participants in this study to read their academic material digitally is the ease and free access to the targeted information. These incontrovertible virtues of online reading expose students to an array of multiple information sources to do their assignments and write their research papers. Soper (1978) studied the relationship between resource availability and the frequency of their use. She found that “the ease of accessibility to information affects its use, quite apart from the perceived value of the information” (p.401).

Further, the inclusion of hyperlinks within electronic documents can be extremely helpful when looking up the definitions of keywords or gathering information while writing a dissertation (Baron, 2015).

Another reason that influences students’ preference for electronic reading may be the speed of access to the needed information that saves students time and effort to look for them in the print environment. For instance, while reading an electronic journal, students are confronted with an exponential number of references that might be relevant to their research topic. By copying and pasting the URL of those references, students will get a hybrid of pertinent information at their disposal. Moreover, students’ preference for reading electronically over print equivalents is the feature of cutting and pasting quotations directly to their papers.

In a nutshell, speed access to the targeted information in the online landscape could be the major incentive of university students to praise the burgeoning presence of electronic reading.

5.3.8.2 Cost

Cost seems to be the primary consideration for students in favouring reading documents electronically than printing them out. As Baron (2015) pinpointed that university students frequently have cost-savings forefront in their minds. Undoubtedly, reading materials in

electronic formats helps students to save time, energy, and money as one of Mizrachi's (2015) participants put it "printing out articles to read takes too long and costs too much... just too much of a hassle, and I would rather have them in print but would not waste so much time and money printing them" (p. 10). The research found that by reading electronically, many papers and Pinter-ink are saved (Baron, 2015; Mizrachi, 2015).

Another way of considering cost is the influence of digital and print reading on the environment. Based on research, digital reading and writing are found to be environmentally friendly (Baron, 2015; Baron et al., 2017b). For instance, Baron (2015) suggested that when posting course syllabi online, sending e-books and handouts via e-mails, and having students submit their assignments and research papers electronically, lots of paper and printer ink are saved. The Book Industry Study Group reports that 72 percent of college students expressed a preference for digital textbooks over the print because digital was more environmentally friendly (as cited in Baron 2015). The same view is shared with other students across the globe (Baron et al., 2017b).

5.3.8.3 Convenience

The convenience of electronic documents such as portability and storage are the real hallmarks of a digital reading experience. Students are always complaining about the discomfort of carrying print documents when needed as stated by one participant "electronic readings make my life a little easier because instead of lugging around several books or bunch of papers, I just need my laptop" (Mizrachi, 2015, p. 9). For this reason, students preferred to have all their documents in a digital format to easily locate, retrieve, and use them at the university, on the bus, or wherever they go. Indeed, handheld devices enable students to download and store hundreds if not thousands of documents at one time. These documents can be held and accessed at any time

in any place. In addition, the digital reader can enlarge the font size of documents while reading, he also can share them with others with just one click.

Another obvious advantage of electronic reading is helping readers to be organised (especially for academic works) (Baron, 2015). While reading on the computer desktop, for instance, readers can store their electronic documents in different files and save them in many software like google drive and drop box.

The aforementioned benefits of digital reading lead university students to choose to read their important documents electronically rather than printing them out.

5.3.9 Reading Practices Across Both Mediums

5.3.9.1 Highlighting and Annotation on Paper and Screen

Highlighting and annotating are known to be effective learning strategies for improving reading comprehension, memory, and learning. “Highlighting and annotating important texts are common learning strategies that demonstrate an effort to engage with a reading for effective comprehension and retention” (Mizrachi et al., 2018, p. 13). And the relationship between the use of these engagement tools with the preference for paper format is documented in the literature.

In pursuing to explore which medium EFL graduate students feel comfortable when employing these reading strategies, results showed that 64% of them often highlight and annotate their print readings than do with electronic reading. This finding is supported by a vast number of research studies in disparate disciplines (Baron et al., 2017b; Mizrachi, 2015; Mizrachi et al., 2018). Writing notes in the margin and highlighting the selected parts of the text are an aid to maximizing students’ learning. Simpson and Nist (1990) suggested that college students performed effectively and efficiently on their exams when they annotated their textbooks. They

wrote, “annotation is a means to an end that it stimulates students into behaving like active learners who elaborately construct, monitor, and evaluate their own learning” (p.129).

Undoubtedly, the annotated pieces of text carry important and valuable observations that allure readers to reread and review the text which results in better learning outcomes. As Baron et. al (2017) put it “readers know that if they have annotated a work when they return to the text it is easier to locate issues, they initially found significant than if they encounter pristine pages. It, therefore, seems likely that ease of annotation in print encourages re-reading, which in turn should foster learning” (p.600).

Why are participants in this study more likely to annotate and highlight print documents? It seems that paper facilitates the employment of these strategies: with just one simple pencil and highlighter, students can easily interact with the text. However, annotating electronic documents is effortful and requires more resources and skills (Liu, 2005). According to Marshall (1997) “readers tend to annotate with a tool that is in hand... they found that annotation on paper was smoothly integrated with reading; online annotation was distracting” (p. 140). This argument is further supported by an empirical research study (O'Hara & Sellen, 1997).

More importantly, in a recent study (Ben-yehudah & Eshet-Elkalai, 2014), researchers found in print reading conditions, highlighting improved comprehension compared to digital reading comprehension. They explained that participants’ familiarity with the use of annotation tools for printed texts could explain the positive impact of these learning tools on the comprehension of printed documents.

The question that begs itself is: despite the advancement of computer software and hardware that support digital highlighting and annotating, students rarely utilized these strategies? The answer might be students’ lack of knowledge and limited expertise with using digital annotating

and highlighting could be the reason for students' reluctance to interact with electronic documents. Ben-yehudah et .al (2014) refer to usability perspectives. To put in other words, limited experience and discomfort with digital annotation might impose a high cognitive load that detracts text comprehension. This reason could explain students' ambivalence in using annotation and highlighting in digital conditions. Kawase, Herder, and Nejdli (2009,p. 251) agree when they write:

The act of annotating supports the learning process in paper situation. However, when it comes to online learning, annotation becomes an additional cognitive burden, due to the lack of suitable tools and intrinsic problems related to reading from screen and interacting via keyboard and mouse.

There are many avenues for future research stemming from the result of this study. One of them is the study of the relation between text annotation and highlighting and reading comprehension in the EFL context. Since the nature of that relationship is currently uncharted and needs further investigation.

5.3.9.2 Rereading Academic Texts in Print and Screen

Vladimir Nabokov writes: "A good reader, a major reader, an active reader, and creative reader is a re-reader" (as cited in Baron, 2015. p, 110). In light of this saying, it seems that rereading is indispensable to effective reading. Students need to practise rereading to deepen their insights and build a solid argument about their topic of interest. In fact, coming back to read and review important materials enables students to pay attention to the details that might be missed in the first reading. In this regard, " students reread to develop an aggressive, probing, an analytical approach to what the text says and how it says it- the function of details, for example; or logical order and relationships in text organization" (Roskos & Neuman, 2014, p. 509).

With the ubiquity of digital reading, the question that begs itself is: does the medium matter when it comes to rereading? Interestingly, the findings of this study revealed that over 54% of EFL graduate students reported that they often reread their materials on screen. This finding is dissimilar from various research studies that showed that most students were likely to reread their materials in print (Baron, 2015; Baron et al., 2017a; Mirza, Pathan, Khatoon, & Hassan, 2021). One more obvious fact about these research studies is they were undertaken before the outbreak of COVID-19.

The questionnaire of this study was administered online during the lockdown of COVID-19. This period witnessed the closure of all the Algerian educational institutions and libraries to hamper the virus's spread. The closure of these institutions has forced all learning, including reading activities to be carried out digitally. Like any other countries across the globe, the lockdown in Algeria has resulted in making students isolated at home and not allowed to go to library universities. It was this fact that led local universities to provide remote access to students for accessing e-books and dissertations. Consequently, the COVID lockdown at home has inspired students to invest their time in rereading their academic materials to extract and integrate pertinent information into their research. Therefore, it is expected to get results that proved students rereading behaviours digitally.

Based on the finding of this study and due to the outbreak of COVID-19, policymakers are invited to revisit and reconsider their educational system which has been transformed totally from a traditional learning environment to e-learning. "E-learning during unforeseen times has not only highlighted the role of internet-based learning, but it has also demonstrated a greater dependence on new media" (Habes et al., 2021, p. 65). Thus, training students on how to read effectively and study online is of paramount importance to encourage their academic

performance through e-learning which becomes a significant alternative to cope with unexpected events.

5.3.9.3 Multitasking across Mediums

Due to the influx of information and digital devices, multitasking has become prevalent among today's students. Chatting on Facebook and doing homework at the same time, learning during lectures and using mobile phones to send instant messages or looking up unknown words or additional information are examples of today's students' multitasking. Consistent with prior research investigating college students' multitasking, the result of this study revealed that 60% of the participants often multitask when reading electronically. This finding is expected given the fact that most of today's students own digital devices that have an access to the Internet. This has led 90% of them to multitask when they read on screen and only 1% are likely to multitask when reading on print media (Wolf, 2018).

In his book 'Growing up Digital', Tapscott (2009) acknowledged that the 'Net Gen', those who grow up in the digital environment, is armed with the required mental skills like scanning and quick mental switching to cope with the overflow of information. He adds that multitasking becomes natural in today's generation's life since they have enough experience with technology and their brain is adapting to this wired world. He writes (2009, p.291):

Because the Internet gives young people a world of information at their fingertips, they have to struggle to understand and synthesise it. It can be a great intellectual exercise. And yes, they do multitask, and switch from one stream of information to the next, with an ease that surprises their parents. Of course, they need to focus deeply to accomplish a complex task, but the rest of the time, they're developing multitasking skills that are very useful, even essential, in the modern digital world

According to Tapscott, the Net Generation are savvier than their elders: they can switch from one task to another and move attention from multiple streams of information, and they can easily multitask without diminishing their performance.

In fact, internet access and reading online have become an integral part of university students' life. So it is not surprising that this digital landscape offers powerful tools for getting information that encourages students to multitask. Therefore, multitasking is becoming this generation's mode of learning.

Although the current explosion of digital technology encourages students to switch from one task to another at one time, this multitasking behaviour scatters attention and diminishes students' ability to focus on one single task. As Willingham (2010) noted "one of the most stubborn, persistent, phenomena of mind is that when you do two things at once, you don't do either one as well as when you do them one at a time" (p.25) (as cited in Mokhtari 2015p.177).

Dozens of studies from different disciplines: psychology, neurobiology, and education reach the same conclusion that multitasking hampers the ability to sustain attention and impacts negatively on students' academic performance. For instance, in their study (Mokhtari, Delello, & Reichard, 2015), 60% of the respondents felt that multitasking affected their ability to concentrate when reading for academic purposes. This finding is supported by Rich (2008) who stated "some argue that the hours spent prowling the Internet are the enemy of reading-diminishing literacy, wrecking attention spans and destroying a precious common culture that exists only through the reading of books" (as cited in Mokhtari 2015 p.167).

Although today's students think they are good at multitasking, research evidence has shown the detrimental effect of multitasking on learning (Baron, 2017). Switching attention across

multiple streams of information provides students with superficial learning, thereby, their knowledge remains at the surface too.

Despite multitasking is omnipresent in students' life and all people's workplaces, its effect on brain plasticity and attention needs warranted evidence from a practical standpoint. No doubt, this question will be the subject of a great deal of research in the years ahead.

5.3.10 Section Four: Learning Engagement on Paper and Screen

5.3.10.1 Remembering and Understanding when Reading in hardcopy

Findings of this study showed that the majority of students believe the print format is more conducive to remembering and understanding information. These findings are in line with other existing literature (Johnston, Salaz, & Johnston, 2019; Mizrachi et al., 2018). A large international survey (Mizrachi et al., 2018) in over 21 countries with more than 10,000 participants, found that in total 72,37% of participants agree or strongly agree that they remember information best from print sources.

Research has illustrated that readers remember and understand what they read on paper better than what they read on screen, the physicality of paper is recognised as the major factor for this discrepancy (Hou et al., 2017; Jabr, 2013; Wolf, 2018). Jabr (2013) states:

The human brain may perceive a text in its entirety as a kind of physical landscape. When we read, we construct a mental representation of the text that is likely similar to the mental maps we create of terrain and indoor spaces. (p.51)

According to Jabr (2013), the concrete spatial dimensions of paper (i.e., the left and right-hand pages- a total of eight corners) serve as pathways that orient the reader to locate information in a text. The fixed layout of the print text helps the reader to form a mental

representation of the structure of the text i.e.: a cognitive map (Hou et al., 2017) which in turn leads to a successful reading process. As Mangen et al. (2013, p.66) put it

Good comprehenders were significantly better than poor comprehenders at remembering and relocating the order of information in a text [since there is] a relation between the mental reconstruction of text structure and reading comprehension. To this effect, the fixity of text printed on paper supports the reader's construction of the spatial representation of the text by providing unequivocal and fixed spatial cues for text memory and recall.

Baron (2015) noted that the topography of the text helps the reader to remember where he read something. Many researchers contend that the physicality of paper reinforces the memory to recall the details of the text and the sequence of information (Mangen et al., 2019; Wolf, 2018). This view is supported by a significant empirical study (Mangen et al., 2019). Results showed that students who read the story in print were superior to their screen-reading counterparts in their ability to reconstruct the plot of the story in chronological order. In other words, paper readers were better at localizing events and paying attention to the details than Kindle readers.

To sum up, the physicality of paper helps the reader to construct the mental representation of the text which results in better remembering and understanding.

While paper is proved to be the optimal medium to support remembering and understanding, research has reported that scrolling when reading on screen inhibits these reading experiences (Baron, 2015; Hou et al., 2017; Liu, 2005; Mangen et al., 2013b; Mizrachi et al., 2018; Sage et al., 2020). When reading a text on a screen, readers find it difficult to keep the track of where they are when scrolling. In other words, screen readers cannot see the text as a whole, only one portion of the text is revealed, therefore they have to move down and up to continue reading.

This behaviour leads them to lose attention and interrupts the continuity of reading which thus impairs reading performance.

Similarly, Hou et.al (2017) confirmed that receiving text as chunks and the instability of the text presentation impede readers to construct the physical layout of the text, which interrupts mental map formation. Researchers support this claim and go further to note that readers' inability to form a mental map of a text harms their recalling of information (Liu, 2005; Mangen et al., 2013b). They conclude that scrolling may place too great of a burden on the reader because it increases the cognitive load that may decrease reading performance and comprehension. Mangen et. al (2013) observed this significant challenge in their empirical study, investigating the effect of reading medium paper and screen on reading comprehension when they write "scrolling is known to hamper the process of reading, by imposing a spatial instability which may negatively affect the reader's mental representation of the text and, by implication, comprehension" (p.65).

Theoretically and practically, it is confirmed that the physicality of paper enhances to some extent the reader's ability to remember and understand more information: these cognitive skills are integral parts of the reading process. On the contrary, screen format encourages scrolling: the most significant challenge that impedes the effectiveness of reading. This fact explains students' tendency toward the preference for paper when it comes to better learning outcomes. It is important to note that the current improvement in digital screens that may display the whole text could influence the scrolling act. For this reason, designers are invited to take into account the scrolling factor when developing digital devices since these devices pervade more and more areas of education and learning.

5.3.10.2 Concentrating Well When Reading in Hardcopy

Reading is a mental activity that requires sustained concentration to extract the real meaning of the text. When asking students if they concentrate well when reading in hardcopy, over 76% of participants reported that they strongly agree and agree that they concentrate better when reading in hardcopy. This result supports the findings of previous studies which found that college students overwhelmingly believe that paper medium increases their concentration (Baron et al., 2017a; Isaias, Miranda, & Pifano, 2015). For instance, Baron et.al (2017) investigated university students' perception of their concentration across mediums, results revealed that over 93% of participants felt they concentrate better when reading in hardcopy than reading digitally. In a similar vein, Isaias et.al (2015) noted that students perceive paper as preferable for concentration.

Why is paper medium superior to screen when it comes to concentration? Unlike digital reading which encourages distraction, researchers praise the advantage of paper in sustaining concentration while reading more demanding texts, they think that this medium helps readers to be involved and engaged with the text (Baron, 2015; Hillesund, 2010; Mizrachi et al., 2018; Wolf, 2018). As Farinosi et al. (2016, p. 12) put it "Paper facilitates immersion into the contents... reading on paper is seen as better for long and complex texts because it is not so exhausting for the eyes and concentration". A systematic literature review of empirical studies (Singer & Alexander, 2017) found that when participants were reading lengthy texts (e.g. research papers or novels) that demand serious and in-depth reading, print was the more effective processing medium.

Many researchers acknowledge that paper is better suited to deep reading. Deep reading is recognized as close reading that compels readers to give books the time, patience, and

concentration they deserve (Prose 2006). Baron (2015) acknowledges that deep reading is the true reading that must be done slowly and not in a rush. She invites readers to take enough time for in-depth reading to extract the full meaning of the text. Readers should actively engage in deep attention and prolonged engagement to be immersed and involved in the reading process and uncover the invisible knowledge that resides in written words. In Bikert's view (2004) "the reader who reads without directed concentration who skims, or even just steps hurriedly across the surface, is missing much of the real point of the work; he is gobbling his foie gras" (as cited in Baron, 2015, p.102).

The aforementioned advantages of printed materials imply that the paper medium is still required today when readers have to engage in deep reading. As Miedema (2009) puts it "print persists because it is a superior technology of integrating information of any length, complexity or richness, it is better suited to slow reading" (p. 26)

Another potential explanation might be related to visual issues. Participants in this study felt they concentrated better when reading on paper because reading for a long time on screen may cause eyestrain that impacts negatively on concentration. Comments from students confirmed this claim here are some selected comments:

- I can concentrate better in hardcopy; it doesn't hurt my eyes.
- I feel more concentrated, and more information I get when I read in print
- Reading in hard copy keeps you concentrating more (avoid being distracted).
- Personally, when reading in hardcopy I could concentrate more than when I read from the screen. Second, I can check the book or the articles I want to re-read again or to remember some information, actually, I feel more comfortable when reading from a book or hardcopy.

- Hardcopy is healthiest for nighttime reading (or studying)
- It is safer for the eyes and at the same time the written texts are clearer

To sum up, from the participants' comments one may conclude that students feel comfortable when reading in hardcopy since this medium is optimal for concentration and is healthy to read for a long time. However, what needs an investigation is whether the reader's concentration will survive in a digital culture, where distraction is omnipresent and the reader's eye cannot be still in front of multiple stimuli in the internet world.

5.3.10.3 Feeling distracted when reading on screen

One of the main challenges that readers face in the digital age is distraction. When asking participants about their attitudes toward distraction when reading on screen, the majority of them (70%) strongly agree or agree that they felt distracted when reading electronically. This finding is in line with many research studies that reported that distraction when reading online is a common complaint among university students (Baron, 2015, 2017; Carr, 2010; Wolf, 2018).

When reading on a digital device that has a connection to the Internet, the notifications of Facebook, for instance, or even the notification sound of messenger and emails interrupt a reader's attempt to read deeply and focus on one single task. This has led today's readers to lament the fact that their deep reading becomes a struggle in a milieu that rewards multitasking and distraction. This claim is clearly stated by (Carr, 2010, p. 171):

The influx of competing messages that we receive whenever we go online not only overloads our working memory; it makes it much harder for our frontal lobes to concentrate our attention on any one thing. The process of memory consolidation can't even get started. And, thanks once again to the plasticity of our neuronal pathways, the more we use the Web, the

more we train our brain to be distracted—to process information very quickly and very efficiently but without sustained attention.

Durant and Horava (2015) have expressed similar concerns about the future of reading in the age of distraction. According to them, print reading encourages deep and immersive reading, whereas e-reading fosters tabular reading. In other words, reading on digital devices inherently provokes distraction which leads to a fragmentation of attention. They describe e-reading as superficial, ‘power browsing’ or skimming which is opposite to the linear and immersive reading that is done in print. They write:

Whereas deep print reading tends to foster sustained attention and in-depth reflection, e-reading fosters impatience and a desire for immediate gratification... e-reading is also much more prone to distraction, as it is often done on a device that also offers e-mail, various apps, or access to the Internet, which, in Carr’s words “seize our attention only to scatter it’. Thus screen-based reading is often much less conducive to memorization than print reading. (p.10)

From a neuroscientific perspective, the more we read on the screen rapidly and superficially, the more our brain adapts to this behaviour, and it becomes harder to engage in sustained and deep reading (Durant & Horava, 2015; Wolf, 2018; Wolf & Barzillai, 2009). Researchers acknowledge that although the digital environment enables readers to consume an enormous amount of information, this kind of information cannot be converted into conceptual knowledge. According to them, this trend of reading impairs the brain’s ability to memorise and absorb information, on the contrary, reading digitally invites the brain to interact with the information in a superficial way. Thus, what is acquired superficially at the expense of sustained attention and concentration will not last for a long time.

Numerous studies show that online texts which involve hyperlinks help readers to choose their reading path and extend their information, however, this advantage comes at a price when these hyperlinks encourage non-linear and fragmented reading. In other words, hyperlinks attract readers to jump from one link to another and hop from one site to another aiming at getting a sheer volume of information, however, this behaviour distracts them to focus on what they are reading. As Carr (2010) opined “hyperlinks are designed to grab our attention. Their value as navigational tools is inextricable from the distraction they cause” (p.87).

In fact, devoting full attention to a single activity becomes a struggle in the world of the Internet.

There is a growing body of research that demonstrates that the Internet encourages distraction that has a detrimental effect on learning. Carr (2010.p 108) acknowledged that:

Dozens of studies by psychologists, neurobiologists, educators, and Web designers point to the same conclusion: when we go online, we enter an environment that promotes cursory reading, hurried and distracted thinking, and superficial learning. It’s possible to think deeply while surfing the Net, just as it’s possible to think shallowly while reading a book, but that’s not the type of thinking the technology encourages and rewards.

Participants’ comments in this study confirmed the data of previous studies and revealed that distraction is an inherent problem in the digital age. Here are some selected comments:

‘Sometimes I am distracted by other apps on the phone and it hurts my eyes

‘Because reading on screen has a lot of distraction like social media apps and listening to music while reading can make your concentration [worsen]’

‘Easy to lose focus’

‘lack of concentration when reading on screen’

‘I can’t stay focused for a long time’

Similar studies reported the same consideration about the detrimental effect of distraction when it comes to reading on screen. Work by Baron et.al (2017) provided significant results about students’ perception that reading on screen inhibits concentration and fosters distraction of many sorts (e.g. checking Facebook or emails, sending tweets...etc).

To sum up, from prior studies that have consistently documented the negative consequences of reading on screen, and from the current findings of this study, it is obvious that the main cognitive issue of reading on screen is distraction. In fact, if students felt distracted when reading digitally, it is difficult for them to focus on what they are reading and spend more time accomplishing their reading tasks. The fact that may impact negatively on their learning outcomes. Thus, this research suggests that when students aim to reach focused and sustained reading, print would be the adequate medium to meet this requirement.

5.3.10.4 Reading Faster When Reading on Screen

The results showed that 50% of participants reported they read faster when reading on screen. This result is similar to prior research that proved digital reading tends to be fast reading (Baron, 2015; Delgado & Salmer, 2021; Trakhman et al., 2017). For instance, Singer et. al (2017) investigated the effect of the time factor when reading on the computer and in print. Results revealed that participants spent an average of 2,06 minutes when reading in print in contrast to 1,78 minutes digitally. Researchers concluded that college students would read significantly faster when texts were displayed on computers than when texts were displayed on paper. It is often reported that material displayed on computer screens is skimmed rather than read in-depth (Dyson & Haselgrove, 2000). This screen reading is generally characterised by quick and superficial reading (Baron, 2015; Liu, 2005). It was explained from empirical and theoretical

research that screen reading encourages shallow reading that fosters speed of processing information over accuracy. This claim is supported by a shallow hypothesis (Delgado & Salmer, 2021). Delgado et. al (2021) wrote:

This hypothesis considers that the daily, massive experience of reading on digital media promotes a superficial way of relating with textual information, which in turn is changing the way we process information. Although this hypothesis originally refers to the way we read on any type of medium, evidence suggests that such effect is more salient when reading on screen. (p.02)

Several empirical studies have reported that an increase in reading speed affects comprehension. Singer et. al (2017) and Delgado et.al (2021) concluded that when reading quickly on screen, readers missed the details that impact the overall understanding of the text. Singer et. al (2017) insisted that “this speed of processing would contribute to diminished comprehension performance in the digital condition” (p.02). in this regard, Baron (2015) invites readers to take time in reading to understand.

It is generally agreed that speed reading is detrimental to comprehension. Though current research suggests that speed reading could be useful to handle general comprehension and finding pertinent information, it encourages a superficial understanding that tends to fail in the details (Baron, 2015). Indeed current evidence supports the claim that students’ experience with a digital device that values speed and immediacy over quality decreases deep comprehension (Baron, 2015; Delgado et al., 2018).

For this reason, researchers emphasise the pivotal role that slow reading plays in improving comprehension skills. In his book, ‘Slow Reading’ Miedema (2008) acknowledges that slow reading is often a better choice for comprehension. He writes “slow reading is not about reading

as slow as possible at all times, but rather exercising the right to slow down at will... the voluntary aspect of slow reading allows for a deep and personal relationship between readers and their information (p.07). In other words, slow reading enables the reader to pay close attention to the text at hand to extract its full meaning of it. Miedema (2008) refers to slow reading close reading and deep reading that increase literacy skills and comprehension levels at different ages.

5.3.10.5 Enjoying Reading on screen than on Hardcopy

When asked students which medium they felt enjoying reading. Findings showed no significant difference. In a recent study, Baron et.al (2017) participants' comments centered around the major themes that makes reading in print medium boring for both academic purposes and pleasure like the loss of materials when carrying it from one place to another, in addition to the lack of easy access as one participant opined "poor accessibility as compared to digital copies" (Baron et.al; 2017. p, 598). The comments of the participants of the current study shared the same ideas when it comes to the limitations of the print medium. Here are some selected comments about what students liked least about hardcopy:

Not being able to copy and paste the content

The inability to zoom out and in when the writing is small in print

It is not always available and affordable

I don't really like the messy aspect of it. Having too many papers and books lying around

On the other hand, regarding to screen reading benefits, Liu (2012) stated that " people prefer reading online over reading on paper when they read short documents (e.g. emails), when they do the casual reading (e.g. news and entertainment) or when they feel bored. some participants expressed their satisfaction and stressed the crucial role of digital reading in enhancing their learning.

5.3.10.6 The convenience of Screen Reading Medium

Results indicated that over 30% of participants agreed or strongly agreed that reading on screen is more convenient than hardcopy. Besides reading on screen is less expensive, the most prominent factor for choosing reading on screen over hardcopy is the greater convenience of accessing a wealth of information that is beneficial to students' learning in addition to the drawbacks of carrying heavy books. Features such as faster and immediate access to the targeted information are mentioned frequently by the students throughout the comments.

The results support the findings of previous studies, which agreed that reading on screen is more convenient than print reading. Mizrachi (2018) investigated the reasons why students preferred screen reading, and found that the convenience of electronic reading and the discomfort of carrying heavy books are mentioned repeatedly as important factors in students' answers. As one of the participants put it "I commute to campus and having physical copies of all materials is too much weight to carry around all day" (Mizrachi et. al 2018, p.08). Similar to findings by (Johnston et al., 2019), convenience also had an important part to play in students' reading decisions. Over 38% percent of participants agreed or strongly agreed that it is more convenient to read assigned courses electronically as one of the participants opines " it is more convenient and cheaper to read electronically" (Johnston et al., 2019, p. 11).

Furthermore, the convenience of digital reading can be noticed in enhancing university students' reading practices in the academic realm. Mirza et al. (2021) found that on screen reading with its valuable content (like Websites, e-books, e-mails, discussion boards, chat rooms, instant messages...etc) plays a significant role in increasing learning performance. They explained that today's students like the plethora of choices of digital reading and convenience. For instance, students frequently utilize social networking sites for academic purposes. Through

WhatsApp and Facebook applications, students may create a reading space by forming groups to share information, knowledge, and learning skills (Mirza et al., 2021).

Pardede (2019) in his turn highlighted the major features of digital text that include innumerable hypertexts that lead to additional information. He adds that this kind of reading has great importance in boosting EFL students' learning outcomes. Parade (2019.p, 81-82) writes:

Hypertext, in particular, makes a digital text interconnected with many other texts which offer the readers various directional choices fitting to their interests. So, a single text can provide different access routes and, therefore, different options for reading. In this context, the hyper-textual nature promotes a flexible pattern of discovery which fosters readers' greater cognitive effort for they must construct information frameworks based on the nature of the paths chosen. If teachers can develop truly interactive language-learning systems using hypertext to facilitate diverse learning needs and styles, it can be a valuable instructional tool for advancing learners' reading skills.

Another plausible explanation that led participants in the study to believe that on screen reading is more convenient is the outbreak of Covid 19. It is important to note that during the outbreak of Covid 19 that causes the closure of all Algerian universities, screen reading opens numerous opportunities for all students, and EFL ones in particular to carry on their learning through distance learning in this unexpected condition. For instance, Algerian universities impose on students to study online to avoid the spread of the pandemic. They use recent applications such as Zoom to organise and attend online conferences. In addition, teachers were compelled to deliver their lectures through Google Meet and MOODLE and assess their students online. Although recent studies (Asma & Asma, 2021) found that the limited expertise of

technology on the part of both teachers and students affect negatively on the course of e-learning in the Algerian context, online learning in general and digital reading in particular play a crucial role in enhancing students' learning performance, especially graduate students who are required to conduct research and attend educational webinars to improve their academic skills. This can be noticed through the open access to pertinent resources that the Algerian and even international libraries have offered to all students anywhere at any time. Therefore, the results of this study invite further research to investigate the effect of digital reading on students' academic performance during the pandemic of Covid19.

5.3.10.7 Preference for Having All Course Materials in Hardcopy

Even with the technological advancements that the 21st century is witnessing, over 73% of participants in this study agreed or strongly agreed that they preferred to have all course materials in hard copy. Findings of the current study echo previous studies revealing students' preferences for having their course materials in hardcopy (Johnston et al., 2019; Mizrachi, 2015). A plausible explanation for these findings may be students' feeling that it is easier for them to concentrate when reading in print as this platform discourages the nonlinearity of reading (Hillesund, 2010; Liu, 2005). To put in other words, the print medium supports static reading that lacks distractions and other disoriented factors such as hypertexts that may hamper students' attention. Having reading courses in a print format increases students' learning engagement and yields effective learning outcomes (Mizrach,2015). For instance, students can highlight and write in the margin, reread the materials as supported by Johnston et.al (2018, p.07), "Print materials provide an opportunity to write in the margins, underline, or highlight important information and allows [students] to easily refer back or refer across notes and readings". Students' quotes from this study confirm Jonstonet.al' claim. Here are some of them:

“You can write notes easily... within the copy, you are actually reading”

“I can highlight difficult words”

“Personally, when reading in hardcopy, I could concentrate more than when I read from screen. Second, I can check the book or the articles once I want to re-read it again or to remember information... actually, I feel more comfortable when reading from a book or hardcopy.”

Further, participants acknowledged that reading their course materials in hardcopy caused less eyestrain as one of them put it “I can concentrate better and it does not hurt my eyes”.

There is no doubt, from various research studies, that students’ level of comprehension is higher with printed materials since this platform is effective for better retention of information and focus. Here are some quotes, from what they liked most about hardcopy, that explain why students preferred to have their course materials in hardcopy:

“Remembering information easily”

“You remember well what you have read”

“I concentrate more”

“I can concentrate more, can rely on them, I can read whenever I go”

Participants in this study in their turn, as other previous studies have shown (Johnston et al., 2019), appreciated the tangible and tactile features of hardcopy materials that play a pivotal role in preferring hardcopy over screen format. Here are some selected comments:

I feel to feel the book in my hands, I can have it with me wherever I go

Touching and feeling the material

Touch, smell, concentration

I love the touch of paper, and smell, there is no distraction

Touch it

5.3.11 Students' Perceptions about Paper and Screen

To delve deeper into students' perceptions and take a more nuanced perspective, open-ended questions were conducted to provide a clear picture of students' preferences and perceptions of the paper and screen platforms.

The open-ended "like most/ least questions" further evidenced students' perceptions that the paper's superiority was stronger when it comes to reading comprehension and concentration. Based on the findings of the current study, the majority of participants strongly preferred paper medium due to its substantial characteristics. Common advantages of print platforms were that students appreciated the tactile sensation of print copies that was critical to their reading experience. Mizrachi et al (2018) acknowledged that paper is tangible and touchable which bolsters reading comprehension. Also consistent with prior research, the physical tangibility of paper is a viable option that gives the readers the freedom of holding the material and moving it as they like, this virtue may be a strong indication for favouring print over digital reading (Mangen et. al, 2019).

Additionally, print offered the features of note taking and highlighting that proved to be more beneficial than typing notes for memory recall (Sage et al., 2020). This result corresponds to past research (Baron et al., 2017a; Mizrachi et al., 2018) that showed that print was the most satisfying and preferred medium for students. This research suggests that being satisfied with a reading medium, paper, in this case, enjoying its physical and mental affordances, and feeling in control of the material in hand might have contributed to students' ability to engage with the material and optimize the learning opportunities. This view is supported by (Sage et al., 2020) who pinpointed that there are many moderators in the relationship between medium and learning and that students and educators should be cognizant of their choice of learning platform. While

past research indicated that the learning experience was equivalent in all versions (print, computer, and tablet), and students' perceptions were generally positive and consistent towards digital resources (Sage et al., 2019), this research suggests that students' preference for print remains strong, and paper benefits still exist.

Overall, this study confirmed the hypothesis that EFL students preferred paper mediums when reading academic texts. It adds to existing literature that even though students' reading language differs, print remains the traditional means of learning.

All of the potential characteristics of print do not prevent students to acknowledge the advantages of digital resources. Undoubtedly, digital resources are increasingly permeating education and reading in particular. For example, e-books and digital applications play a pivotal role in sparking college students' interest to read more and expand their knowledge. Digital texts that are displayed on more advanced devices may aid learning and strengthen foreign language learners' proficiency by providing richer and more pertinent resources through hyperlinks and videos. These features of digital platforms may promote learners' autonomy and increase their potential to take charge of increasing their language proficiency, especially with the affordances of digital apps in terms of convenience and cheaper long-term costs. Furthermore, smartphone and tablet ownership are increasing among today's students. Consequently, this upsurge in digital device use may have educational merits. To put in other words, digital materials may be becoming more commonplace in university students' studying since they are being used more by them. And the integration of digital devices, such as mobile phones and tablet hold promise as a learning tool in the educational realm.

However, additional research must be undertaken to clarify the complexities of digital resources that impede learning like distraction and the widespread of information that may confuse students about what information is worth taking.

5.4 Discussion of the interview

5.4.1 Reading Benefits

The findings from the teachers' interviews showed that all teachers questioned shared the same view when it comes to the benefits of reading. The four teachers stressed the significance of reading in boosting EFL learners' language proficiency. Reading is valued as an essential skill for learners of English. Reading researchers agreed that reading is the primary source of language acquisition (Barnett, 1989; S. Krashen, 2003). "For Krashen (1981), comprehensible input is vital for language acquisition, and reading is an inimitable source of such an input" (as cited in Barnett, 1989. p,19). Indeed, a wide range of research studies confirms this argument. For instance, Pardede (2019) points out that reading develops EFL learners' vocabulary by exposing them to different types of texts that include a range of useful sentences and words. He added that EFL learners study in an environment where English is not spoken so that reading would be the means to overcome the lack of input and the significant skill to learn the target language.

Furthermore, reading is regarded as the gateway to academic success. In his study of ESL students' reading performance in the US, Mokhtari and Sheorey (1994) found that students who read widely scored better and acquired a high level of language proficiency than those who did not.

Moreover, reading also has been approved as the most significant language skill that develops students' writing skills and other areas of language learning. This view is supported by Krashen

(2003) who writes “reading is a powerful means of developing literacy, of developing reading comprehension ability, writing style, vocabulary, grammar and spelling” (p.22).

From the findings of the interviews, it is important to note that reading plays a critical role in helping EFL students to master many areas of language learning. One of these vital areas is to acquire a good writing style, especially for graduate students who are required to write theses. Therefore, EFL teachers should give importance to reading and look for effective reading instructions to boost their students’ reading habits and motivate them to read extensively in the target language.

5.4.2 Reading Motivation

Numerous research studies have demonstrated the beneficial effects of motivation on students’ reading skills development. Cambria and Guthrie (2010) argue that there are two sides to reading: one side refers to the skills that include phonemic awareness, phonics, word recognition, vocabulary, and simple comprehension, and the other side is the motivation to read.

The results of the interview revealed that EFL teachers at Mascara University were aware of the importance of motivation in learning. They believed that the selection of appropriate reading material that appeals to students’ interests was the key factor to increase their motivation to read. This view is demonstrated by numerous research studies. Grabe and Stroller (2002) point out that choosing topics of students’ interest can be a worthwhile endeavour. It is generally agreed that students are more likely to put forth the effort necessary to read and learn if the material and the learning activities interest them. Furthermore, reading researchers note that students’ interest in what they read enhances their comprehension (Grabe, 2009; Wigfield, 1997). Wigfield (1997) explains that “students’ interest in the material they are reading relates quite clearly to the use of effective learning strategies, their level of attention, and their comprehension of reading

materials” (p.63). This conclusion is confirmed in L2 context by Grabe (2009) who demonstrated that reading motivation is of central importance to L2 learners that contributes to vocabulary growth. He emphasised that “students with higher reading motivation performed significantly better on a number of reading-comprehension measures” (p.182).

The arguments and findings mentioned point to the fact that teachers may play a crucial role in increasing students’ reading motivation by incorporating a variety of interesting topics that embrace students’ interests. Research says that teacher affects positively in increasing their students’ reading motivation (Cambria & Guthrie, 2010). In this regard, Cambria and Guthrie write “motivation may be stimulated by home and may be influenced by peers, but the teacher is the main factor influencing a student’s development of reading motivation” (p.16).

The findings of this study indicated that EFL teachers gave much importance to effective reading instructions that can improve their students’ reading motivation thereby their language learning will be improved as well.

Despite the findings of this study spotlight on the significance of reading motivation in the EFL context, there are many questions and issues that remain to be addressed. Empirical studies are needed to look for effective reading approaches to motivate EFL students to read. Furthermore, researchers are invited to scrutinize the problems that hinder EFL learners’ reading in English. Indeed, much research should be done in EFL context to look for reading strategies to handle the challenges of reading obstacles.

5.4.3 Reading Challenges

Reading is perhaps the most daunting language skill to master for EFL learners. Through the data obtained from the teachers’ interviews, vocabulary knowledge was the main obstacle that hindered EFL students’ reading comprehension.

The teachers questioned pointed out that the limited command of vocabulary on the part of their students was the major challenge that impeded their reading comprehension. This finding is supported by reading specialists. For instance, McNamara (2007) raises the concern that readers' inability to identify unfamiliar words lowers their reading pace which consequently impacts negatively their reading performance. She explained that when readers encounter unknown technical terms when reading expository texts, the reading task becomes a difficult challenge.

Furthermore, in second and foreign language reading, the process of reading becomes more complicated (Barnett, 1989; Grabe, 2009). Reading researchers refer to this complexity as the lack of vocabulary knowledge. Yorio (1971) surveyed 30 second language learners, whose native language was Spanish, about the problems they face when reading in English. The results of the questionnaire showed that students indicated that vocabulary constituted their main obstacle in reading comprehension. Yorio (1971) writes, "foreign students consider vocabulary their most serious handicap in reading English; because of the nature of the reading process, words are the smallest physical meaningful units of the message and they play a more important role and constitute more of a problem than we are sometimes willing to concede" (p.107).

In a similar vein, Grabe (2009) recognises the complexity of the reading process in a second and foreign language, arguing that readers' limited vocabulary knowledge hindered their reading performance. Grabe notes that reading comprehension depends on word recognition, and if the reader fails to decode the meaning of the word, he would not be able to accomplish the reading goals.

As results indicated that the main challenge that impeded EFL students' reading comprehension was a lack of vocabulary knowledge. The fact that makes reading in a foreign language more complex. Nevertheless, the limited command of vocabulary that students

experience in reading a foreign language, in this case, English, can be handled if they receive effective and efficient reading instructions. Yorio (1971, p.114) provides some useful notions to consider when teaching or selecting reading materials. Here are some of them:

- 1- Being a complex skill, reading should be approached carefully and taught progressively.
- 2- From the very beginning, overall comprehension should be emphasised and consistently tested.
- 3- Passages or readers should be chosen with extreme care, taking grammatical and vocabulary into consideration.
- 4- Little by little, as the student becomes more skillful, speed in reading should be emphasised and special exercises given to that effect.
- 5- Always remember that reading is not an easy, smooth process and what the teacher, usually a native speaker, finds trivial and uncomplicated, is often hard and complex for foreign learners.

To sum up, data from the teachers' interviews revealed that limited vocabulary knowledge is one of many other challenges that stand in the way of EFL students to achieve reading proficiency. Since vocabulary knowledge is perceived as determining factor of reading proficiency, EFL teachers should focus on teaching vocabulary in a meaningful context to improve their students' reading reservoir. It is important to note that there is scant research examining the reading challenges that EFL learners face. Therefore, it is salient to conduct more studies to determine these challenges and suggest remedies in this context.

5.4.4 The Impact of Digital Age on EFL students' Reading Habits

Data from the teachers' interviews show that teachers value the substantial effect of the digital age on EFL students' reading habits. As technology permeates the educational realm, it becomes

a permanent vehicle for EFL students to enhance their reading skills. Availability of information, and easy access to authentic materials are the affordances that the digital age offers for EFL learners to improve their learning and reading performance.

The finding of this study is demonstrating that teachers did express their positive attitudes towards the role of the digital age in EFL students' reading performance. This finding is consistent with other previous studies. For instance, Anderson (2003) points out that the Internet is considered the primary input for EFL and ESL students, and online reading contributes to their language learning proficiency and knowledge. Liu (2009) highlights that the digital age makes a tangible shift in students' reading behaviours. According to the findings of his study, students from different disciplines are increasingly using electronic libraries to achieve their reading goals. He argues that the proliferation of electronic texts contributes to the transformation of students' reading behaviours from paper-reading to screen reading.

The finding of the teachers' interviews is in agreement with the students' questionnaire that revealed that students spend much time reading on their screens due to the affordances of electronic media. This finding is congruent with other prior research. Hazaea and Alzubi (2016) investigated the effectiveness of using Mobile on Saudi EFL students' reading practices, their findings show that mobile phones with their tremendous applications play a critical role in enhancing students' reading comprehension.

5.4.5 Medium's appropriateness

There is no doubt that the reading experience has been affected by the digital age and on screen reading is becoming increasingly prevalent in students' life. In the age of google, users can access a wide range of electronic information to achieve their reading goals. However, the question that needs an answer is: is digital reading the same as print reading? In other words, do

students get the most out of the reading material in the digital environment as they do in the traditional environment?

In answering this question, the teachers' answers in the interview showed mixed results about the appropriateness of the reading medium for EFL students' reading comprehension. In fact, this pivotal issue prompts researchers to provide plausible explanations for the discrepancy between screen and paper medium when it comes to reading comprehension. Despite the digital reading contributes to enhance students' reading skills through the ubiquity of information, students should be aware of the detrimental effect of screen medium (Halamish & Elbaz, 2019). Halamish and Elbaz (2019) conducted an experimental study to investigate the effect of screen and paper medium on elementary children's reading comprehension, their findings showed that children comprehend better on paper than on screen.

Durant and Horava (2015) in their turn raise the concern of the impact of screen reading on cognitive skills. They acknowledge that the reading medium matters and readers should be cognizant of the challenges of digital reading. According to them, screen reading impairs many activities of the brain such as memorization, reflection, and engaging in the reading material. They write,

Numerous studies, ranging from scientific eye-tracking research to usage analysis to surveys of readers, show that people reading in digital format are far more likely to engage in a form of superficial "power browsing" or skimming than they are to read in-depth. (p.9)

They share the same view with Wolf and Barzillai (2009) when they emphasise the pivotal role of paper medium in enhancing deep reading. Durant and Horava (2015) say, "deep print reading tends to foster sustained attention and in-depth reflection, e-reading fosters impatience and a desire for immediate gratification" (p.10).

The current study points to the importance to conduct more empirical studies to develop useful interventions to help students overcome the detrimental effect of screen reading on comprehension and other cognitive skills.

5.4.6 Reading Instructions in the Digital Age

Technology can be conceptualized as affording tools that teachers can deploy in their quest to create young readers who possess the higher levels of literacy skills and background knowledge demanded by today's information-based society

(Biancarosa & Griffiths, 2012, p. 139)

The last part of the interview served to investigate teachers' perceptions of integrating technology into reading classes. The perceptions indicated that adopting new reading instructions through technology may encourage students to improve their reading performance. In addition, teachers believed that technology offers real promise for motivating students to be skilled readers in the twenty-first century.

Teachers' perceptions in this study concerning the pivotal role of technology in reading instruction are supported by much research. Biancarosa and Griffiths (2012) highlighted the importance of technology in improving students' literacy outcomes. They stressed the great advantages of e-reading that serves as a tool for acquiring the vocabulary and background knowledge to become a skilled reader. They added that technology enables teachers to share useful information with their students and assess their learning outcomes effectively.

Furthermore, the field of research has yielded important findings on the role of technology in enhancing students' reading skills. In Burgess's (2009) study investigating the impact of Web

CT such as discussion boards and chat on reading and writing performances, it was found that students' reading engagement and critical thinking were improved.

The findings of the current study revealed that teachers pointed out that despite today's students having more experience with the use of digital devices and possessing adequate skills to interact with digital texts, teacher guidance and supervision are still needed in their learning process. This belief reflects their mindset wherein technological advances are a teaching tool that complements the traditional method (in this case the use of paper reading) not to substitute teachers. This view is confirmed by Biancarosa and Griffiths' (2012) saying when they state that 'although e-reading technology can be used to deliver rich and meaningful content, it may not support learning unless thoughtful human beings are guiding its use" (p.154).

The aforementioned views explained why teachers in the current study called to adopt a blended approach that mixes both paper reading and digital reading to devise innovative approaches. According to them, these approaches may contribute to effective reading outcomes. However, adopting new instructions in the digital age requires teachers to receive adequate training in using educational technology effectively (Biancarosa & Griffiths, 2012).

Results of this study showed teachers' positive attitudes towards the incorporation of technology in their reading classes without overlooking the traditional methods as Hsu and Wang (2010) illustrated " we do not suggest that a different teaching approach is better than the traditional methods, but the adoption of diverse innovative pedagogies is necessary for a successful media-or technology- saturated classroom" (p.84).

To sum up, there is no doubt from teachers' perspectives that technological advances hold promises as a strong influence on students' reading skills, however, evidence of technology effectiveness in EFL reading context is relatively limited. Therefore, based on the findings of this

study, continued research in EFL context about the impact of technology in the educational realm in general and reading area, in particular, is needed so that EFL teachers feel confident about which intervention will be useful for their students to meet the demands of the twenty-first century workforces.

5.5 Conclusion

The findings reveal that EFL students' reading comprehension has been affected by the reading medium. Paper medium seems to be superior when approaching the informational text. The major characteristics of print reading like physical and mental experience do play a critical role in bolstering students' learning outcomes. These results are in line with the questionnaire findings that sought to solicit insights into students' reading medium preferences. The questionnaire data shown in this study contribute to exploring students' strong preferences for paper medium to understand better and concentrate when reading academic text. Furthermore, the interpretation of the interview data indicated that Algerian EFL students' reading practices, like other students, have been altered by the digital age, and much attention should be devoted to this change so that students would be able to be proficient readers in the 21st century.

As a result of the data generated by the experiment, questionnaire, and interview, there was a clear indication that paper still dominates the educational field when it comes to impactful learning.

GENERAL CONCLUSION

General Conclusion

Introduction

This study has sought to investigate the effect of reading mediums on students' reading comprehension. In particular, this study examined the effect of paper medium and computer screen on Algerian EFL graduates' reading comprehension when approaching academic texts at Mascara univeristy. It also aimed to explore EFL students' preference for the reading medium that might help them to attain better comprehension for the texts at hand. Furthermore, this study aimed to further our understanding of EFL teachers' perspectives on EFL students' reading behaviours in this digital environment based on the effectiveness of the reading medium in enhancing reading performance.

This chapter will present the summary of the key findings of this study that provide critical insights in EFL context. It also addresses the potential limitations of this research that would help further investigations to fill gap in literature. Furthermore, in this chapter, the researcher proposes possible suggestions and provides recommendations for future research.

To reach the aforementioned objectives, two main research questions have been asked:

- 1- What is the effect of the reading medium on Algerian EFL students' reading comprehension at Mascara University?**
- 2- Which reading medium do Algerian EFL students prefer when reading academic texts?**

In the following section, the researcher attempts to summarise the key findings that answer the research questions.

Summary of Key Findings

In this section, a summary of the major findings is presented so as to address the two research questions and provide evidence to draw final conclusion.

Research Question 1**What is the effect of the reading medium on Algerian EFL students' Reading Comprehension?**

In answering this research question, we are mainly interested in the effect of paper and computer screen on students' reading comprehension when reading academic texts. The researcher conducted an experimental study that adopted between- subjects design to reach the overarching purpose of this research.

Through a synthesis of related studies, the researcher hypothesised that paper medium has a great advantage in comprehending academic texts compared to screen medium. The results of the current study supported this hypothesis and confirmed prior research studies that have shown that paper's medium role is crucial when it comes to reading comprehension.

The results of the current study indicated that participants who read informational texts on paper scored better than those who read on computer screen. This argues that when reading materials that require higher level processing to uncover the meaning of the complex vocabulary, paper would be the suitable platform to attain effective reading comprehension.

On the other hand, results indicated that when students read narrative texts in both conditions, i.e. paper and computer screen, no significant difference has been recorded. This finding revealed that text genre was another factor that moderated medium effects.

Research Question 2

Which reading medium do Algerian EFL students prefer when reading academic texts?

The majority of students in this study reported that they prefer to read their academic materials in print format. They believe that they learn better and concentrate more on materials presented in print. This perception among students is consistent with the results of the current experimental study that indicates the superiority of paper medium when it comes to reading informational texts that require more attention and deep reading. The findings of this research reveal that despite the ubiquity of information in electronic format in the digital age, students' preference for paper remains strong.

There are a number of important reasons that explain the overwhelming preference for the print medium. Students in this study are more likely to prefer print reading due to its emotional and physical experiences. Undoubtedly, smelling, touching, and flipping the papers with fingers, in addition to holding the materials at hand give the reader a sense of ownership that maintains his engagement with the content. These experiences help students not only to feel and manipulate the material but also enhance the students' cognitive expertise such as memory and concentration. As mentioned previously, reading a print document helps students to build a good spatial representation of the whole text. To put in other words, readers of long texts on paper can see the entire passage with its different angles and from top to bottom on one single page. Constructing this cognitive map of the text helps the reader to localise and remember more information which in turn leads to impactful learning.

The data from the participants' questionnaire indicate that the participants' preference toward printed text was derived from the easy employment of effective learning strategies like

highlighting and annotating. It is important to note that highlighting and notetaking are enormously useful and play a pivotal role in learning. Students in this study reported that they frequently highlight and write notes in the margins on their printed texts because these practices while reading improve their understanding and retention of information when needed. This finding suggests that employing highlighting and annotation during reading from print is useful of deeper understanding of the text. It is worth mentioning that highlighting and annotating printed documents suggest that the participants of this study have a sense of awareness about the impacts of format on their own learning and that factor does contribute to medium preferences and reading behaviours.

On the Contrary, reading on screen has many limitations that should be acknowledged. First, reading on screen encourages scrolling. It has been proved that scrolling up and down impedes the reader's concentration and hinders the continuity of the reading process. Thus, prior research revealed that scrolling while reading on screen has a detrimental effect on readers' cognitive skills like concentration and comprehension. Second, staring at screen for a long time can strain the eyes. This inherent problem was frequently mentioned by the participants. They complained that reading on screen causes eyesight problems due to the emission of light from their digital screens. They added that reading digitally leads to other problems like headache and neckache. These shortcomings are detrimental to the reading act.

Another area that shows the screen limitation is distraction. Through students' responses to the open-ended questions, they stated that distraction is the major obstacle when reading electronically. There is no doubt that reading on screen devices that have an internet connection will disrupt the students' focus on the reading task. In fact, receiving notifications or checking e-mails while reading academic texts that require deep reading and thorough understanding will

impede the concentration of students and distract them from accomplishing the reading assignments. For these reasons, specialists in neuroscience stated that doing many tasks at a time and switching from one activity to another affect negatively on the plasticity of the brain to focus deeply on one task. Moreover, empirical studies revealed that when students read online are confronted with limitless opportunities that trigger their attention. As a result, they feel frustrated to continue their reading process that is why distraction becomes the real menace while reading digitally.

Notwithstanding these limitations, online environment offers EFL students a wide range of opportunities that cannot be ignored to increase their language proficiency. Undoubtedly, the Internet puts at students' disposal viable sources to learn the target language and enhance their reading habits; for instance, Google is a useful engine of research that supplies readers with the pertinent information that are necessary to their studies and academic careers. Besides, students in this study stated that screen reading is convenient for them in many aspects. First, students can hold with them an electronic library that includes thousands of electronic documents that enable them to have an access to them wherever and whenever they go.

In addition, this study showed an interesting finding. Participants in this study pinpointed that they reread their academic staffs onscreen rather than on paper. This finding comes to surprise since previous studies showed that students practise the act of rereading in print than on screen. It is important to note that this study was conducted during the lockdown of COVID 19. As other countries across the globe, Algerian universities closed their doors to limit the outbreak of this pandemic. Consequently, Algerian EFL students as other students in disparate disciplines found themselves obliged to stay at home and learn online. This emergent circumstance imposed on students to read extensively on their screens other than to use the university library. Thus, it is

conceivable that students would reread their materials on their electronic devices to conduct their research and write their theses. Furthermore, EFL students' practice of the rereading onscreen was due to the nature of reading in a foreign language that requires the use of online dictionaries and other online applications that were created during the pandemic to facilitate the process of e-learning.

The findings of this study revealed that despite the increase of EFL students' on-screen reading behaviours in the digital environment and during the lockdown of COVID 19, their preference for the print medium is still prevailing in the academic reading realm. This indicates that paper is unlikely to disappear in this digital age. These findings from the participants' responses indicated that students are aware of the effect of the medium on their comprehension when it comes to careful and deep reading for their academic materials. They believe that to attain effective learning outcomes, paper medium will be advantageous over screen regardless of the affordances of digital reading.

To further our understanding and clarify the discrepancies of both paper and screen mediums, the research explored EFL teachers' perspectives at Mascara university in this respect to put this topic in a big picture and provide clear insights about the effect of the reading medium in this digital environment. Since teachers play a pivotal role in learning and teaching process and have a profound impact on motivation students to read, their views seem precious in this regard.

From their interview, Algerian EFL teachers acknowledged that reading is the cornerstone of learning English that contributes to the increase of EFL students' language proficiency. Thus, any factor that affects the reading process should be given a careful attention. They shed light on the role of this abundant world of information in shaping EFL students' reading profiles and argue that the reading purpose is the main factor that determines the effect of one format over the

other. According to them, when reading for academic purposes or intensive reading, print medium will be more beneficial for their students. On the other hand, if students are reading for pleasure, screen medium will be feasible. Their views imply for the combination of the two mediums if their students seek to reach effective reading performance. They believe that the reading instructions should be a mixture of all reading mediums so as to enable EFL students to face the demand of the twenty first century.

Limitations

Notwithstanding the aims of this research have been achieved, there were some unavoidable limitations. First, the current research has been conducted with a small sample of participants, only 30 students. Therefore, the result cannot represent all the Algerian EFL students and cannot be generalized beyond the participants in the present study. While the researcher does not claim generalizability, the results of this study provide emerging patterns in the EFL students' reading patterns in the digital age and denote behaviours that should be explored in future research.

Second, although potentially interesting for EFL students, the topics of the experimental texts were not school topics in the sense of being included in subjects studied at university or related to graduate students' thesis. In future investigations, it would be interesting to explore whether the texts included in the syllabus or text content- more or less academic- may interact with the reading medium in affecting text processing and comprehension.

Third, neither gender nor social background variables were considered in the current study. Both variables might affect the EFL students' choice of the reading medium. It is important that future investigations examine the effect that social background and gender have on the language learners' printed text and screen reading.

Discovering limitations can serve as an important way to identify new gaps in the literature and therefore propose the need for further research. The section which follows took the limitations described into consideration and linked these to recommendations for further research.

Recommendations for Future Research

In fact, research concerning the effect of the screen reading on EFL students' reading patterns is still in its infancy in comparison to the print-based reading research. Reflecting upon what was found in the current study, several recommendations are provided as follows:

- 1- It is recommended that assessing larger samples might help reach insightful data about the effect of the reading medium on reading comprehension. For instances, when dealing with larger samples, the researcher might include students with individual differences and with different backgrounds that might uncover additional supporting evidence.
- 2- Future research studies should study participants with different grade levels and settings to see if the results of the current study can be replicated. Thus, studies with different samples and contexts can extend and enrich our understanding of the effect of the reading medium on students' reading performance.
- 3- In future research, it would be interesting to explore whether the reading purpose such as reading for pleasure and text length may affect the choice of the reading medium and on the reading strategies EFL students deploy during the act of reading.
- 4- When examining the effect of the reading medium on comprehension, it is important to reveal the participants' thoughts while reading. Therefore, designing think- aloud protocol would be an effective technique to report what students think and what reading strategies they deploy to comprehend the text. There is no doubt that using think-aloud protocol may provide clear insights about the effect of screen and paper mediums on reading performance.

- 5- Furthermore, research with other research designs is recommended. The present research adopted the quantitative approach with a little emphasis on qualitative measures. This type of research cannot properly investigate students' perspectives towards the effect of print and screen reading on their comprehension. Thus, studies using different research designs will provide different insights. For instance, qualitative research may be useful in investigating the impact of the digital age on EFL students' reading behaviours and how the digital era contributes in shaping the reading profiles of today's students. Meanwhile, longitudinal studies will be able to explore the significant changes in EFL students' reading patterns overtime and denote the various factors that enhance or inhibit their reading performances.
- 6- In order to better prepare EFL graduate students to be able to read academic texts effectively in the digital environment, teachers are in need of careful and intensive training. This would imply the need for organising more workshops to enable EFL teachers acquire the needed mechanism so that they can provide their students with the useful toolkits that meet their reading needs.
- 7- More studies are needed to provide practitioners with useful information and helpful interventions to sustain students' deep reading in the age of distraction. In fact, both teachers and students are in need of effective reading strategies to maximize their reading outcomes in this online environment.

Conclusion

It is indisputable that the digital age is profoundly affecting the students' reading experience. Screen reading becomes the prevailing behaviours of today's students. Students spend more time reading on their digital devices than they did in the print environment either for learning or entertainment. The tangible shift from paper to screen alters university students' reading

behaviours and sparks a new wave of literature to investigate whether this transformation in reading patterns has an impact on reading performance. Previous studies have reached mixed results concerning the effect of paper and screen mediums on reading comprehension in academic context. Nevertheless, the present study confirmed the assumption reported in the literature that claimed the benefits of reading academic texts on paper to attain better reading outcomes. One of the clarifications that the current research has made to the literature is that the reading medium really matters when it comes to reading comprehension even if the message is conveyed in a foreign language. The findings of this study provide clear insights that Algerian EFL students scored better when reading informational texts in print than on computer screen. Further, students' responses in the questionnaire explained the reasons behind the preference for paper medium over screen. It was concluded from their comments and explanations that paper is the viable means to uncover the meaning resides in the words' text, and most importantly, this medium generally supports a level of mental focus and contributes to better reading comprehension. Based on the results of this research, practitioners and teachers alike should give a space for print reading if they want to strengthen their students' deep reading skills in the age of distraction.

Although the current findings support the print medium and students praise its features, it is necessary to acknowledge the benefits of digital reading in students' lives. Thus, it is essential to see print and screen mediums as complementary mediums, serving different reading purposes and learning needs, that enable students to acquire the necessary reading skills to face the demands of the twenty first century.

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Appendices

Reading Comprehension Tests

Appendix A

Pride and Prejudice

Elizabeth Bennet, the second of a family of five daughters, has recently made the acquaintance of Mr Darcy, a wealthy gentleman with a large estate. He does not make a favourable impression on Elizabeth, who finds him proud and condescending, and her family are his inferiors in terms of class, money and social manners. One day, Mr Darcy arrives at the Bennet family's house.



Elizabeth was suddenly roused by the sound of door-bell and, to her utter amazement, she saw Mr Darcy walk into the room. In a hurried manner he immediately began an inquiry after her health: she answered him with cold civility. He sat down for a few moments and then, getting up, walked about the room. Elizabeth was surprised, but said not a word. After a silence of several minutes, he came towards her in an agitated manner; and thus began:

“ In vain I have struggled. It will not do. My feelings will not be repressed. You must allow me to tell you how ardently I admire and love you.”

Elizabeth's astonishment was beyond expression. She stared, coloured, doubted and was silent. This he considered sufficient encouragement; and the avowal of all that he felt, and had long felt for her, immediately followed. In spite of her deeply-rooted dislike, Elizabeth could not be insensible to the compliment of such a man's affection; and though her intention did not vary for an instant, she tried to compose herself to answer him with patience. He concluded with representing to her the strength of that attachment which, in spite of all his endeavours, he had found impossible to conquer; and with expressing his hope that it would now be rewarded by her acceptance of his hand.

As he said this, she could easily see that he had no doubt of a favourable answer. He spoke of apprehension and anxiety, but his countenance expressed real security. Such a circumstance could only exasperate farther, and, when he ceased, the colour rose into her cheeks, and she said: 'In such cases as this, it is, I believe, the established mode to express a sense of obligation for the sentiments avowed, however unequally they may be returned. It is natural that obligation should be felt, and if I could feel gratitude, I would now thank you. But I cannot- I have never desired your good opinion, and you have certainly bestowed it most unwillingly. I am sorry to have occasioned pain to anyone. It has been most unconsciously done, however, and I hope will be of short duration.'

Mr Darcy, who was leaning against the mantelpiece with his eyes fixed on her face, seemed to catch her words with no less resentment than surprise. His complexion became pale with anger, and the disturbance of his mind was visible in every feature. He was struggling for the

appearance of composure, and would not open his lips till he believed himself to have attained it.

At length, with a voice of forced calmness, he said:

‘And this is all the reply which I am to have the honour of expecting! I might, perhaps, wish to be informed why, with so little endeavour at civility, I am thus rejected. But it is of small importance.’

Questions

1. Read the extract from the classic novel *Pride and Prejudice*, written by the English author Jane Austen . Choose the best title for the extract, a, b, c, or, d.

- a. A happy engagement
- b. A marriage proposal
- c. An angry confrontation
- d. A declaration of mutual love

2. Decide whether the statements about the extract are true (T) or false (F).

- 1 Elizabeth was not expecting Mr Darcy’s visit.
- 2 Elizabeth encouraged Mr Darcy to start the conversation.
- 3 Mr Darcy declared his love for Elizabeth.
- 4 Elizabeth had suspected that Mr Darcy was in love with her.
- 5 Elizabeth felt flattered by Mr Darcy’s words to her.

3. Match the words from the extract (some are in a different form) 1-5 to those which have a similar meaning a – e.

1. astonishment ◀ a composure
 2 agitation b anxiety
 3 apprehension c disturbance
 4 exasperation d amazement
 5 calmness e anger

1	2	3	4	5

4. Answer the questions with E (Elizabeth), D (Mr Darcy) or B (both Elizabeth and Mr Darcy).

- 1 Who found the other person's words surprising?
- 2 Who had a mixed reaction to the others' words?
- 3 Who felt annoyed by the other person?
- 4 Whose skin changed colour?
- 5 Who felt sure of receiving a particular answer?

5. What do you think? Choose the sentence that best matches your opinion, 1,2,3,or 4, and say why.

- 1 Mr Darcy's proposal was insulting to Elizabeth.
- 2 Elizabeth reacted too rudely to Mr Darcy.
- 3 Elizabeth should have accepted Mr Darcy's proposal
- 4 Mr Darcy was right to express his feelings honestly.

The sentence that best matches my opinion is:

Why?.....

Appendix B

BANKER TO THE POOR

Seen by many as a visionary genius, Muhammad Yunus is to poverty as Bill Gates is to computer software. Only that Yunus's business exponentially flourishes in his native Bangladesh, a country with a population of 145 million, most of whom live in abject poverty, and where



illiteracy is rampant. And it is the poorest among the poor in this country whom Yunus has selected as the focus for his experiment: its women.

It was while on a field trip to a destitute rural community in southern Bangladesh that Yunus conceived his revolutionary idea. Interviewing a local woman who made bamboo stools, he learned that, lacking any savings or capital, she had to borrow the equivalent of 15p to buy bamboo for each stool. But after she had repaid the exorbitant interest rates demanded by the loan sharks, she only made 1p profit on each stool. Yunus found 41 other workers in a similar predicament and lent them the cash in his pocket as an experiment to help them break out of the vicious circle of poverty. His trust was rewarded; they paid him back and their businesses flourished.

Yunus went on to develop his innovative system of 'microcredits', ie making small loans available to needy entrepreneurs at affordable interest rates. What was original and utterly subversive about his plan was that he decided to lend lots of small amounts to the poor with no

collateral, and on the basis of trust, not legal contracts. Within six years he had persuaded the institutional banks to lend him the money he needed and also to offer 50-50 parity between the sexes. What he found was that not only were the women repaying the money more reliably than the men, but the small amounts of money going through the women brought much more benefit to the family, as it was they who had trained themselves to manage scarce resources, and were thus able to bring that efficiency to bear on the loans.

Yunus formally founded Grameen- which means ‘village’ in Bengali- as a bank in 1983 and, ever since, it has lent money to individuals, 97 per cent of whom are women, and all of whom are below the poverty line. Loans are often very small-as little as £20- and recipients work in small groups, on the strict understanding that should one member of the group default, the others will be liable to repay their debt. The bank demands repayment very quickly, but in tiny instalments. Borrowers are typically hardworking, motivated, reliable and themselves

altruistic, often creating collective, grass roots enterprises that benefit the whole community. Yunus has found that they will cling tenaciously to the one chance the bank offers them, fully aware that defaulters can never apply for another loan.

Today, Grameen operates in 70,000 villages, and has 2,200 branches and 6.6 million borrowers. To the bafflement of commercial bankers its microcredit system works, as Yunus likes to say, ‘like clockwork’. The loan-default rate, the envy of any mainstream bank, is less than 1.5 per cent. Grameen has consistently reported annual profits most years, all of which are ploughed back into the scheme, which never stops growing. The model of microcredits has been imitated in more than 80 countries, reaching 100 million people worldwide.

Yunus, whilst not opposing welfare schemes per se, rejects charity as long-term strategy for addressing the global imbalances between rich and poor. What he believes is that people are better off with a loan than with a **handout**: 'Give a man a fish, and you feed him for a day,' the old adage runs: 'Teach him to Fish, and you feed him for a lifetime.'

Questions

1. Read the article. How does the writer describe Muhammad Yunus?

1. An impossible dreamer
2. A hard-headed businessman
3. A visionary philanthropist
4. A successful billionaire

2. Read the article again. Choose the best alternative, a or b, to complete the sentences.

1 Yunus developed Grameen

- a) To improve the lives of the poor.
- b) As a way of making money.

2 The rural workers Yunus met were trapped in poverty because

- a) They could not afford to take out loans.
- b) They had to pay back the loan sharks.

3 The women do not default on their loans from Grameen because

- a) They would not have other chances to borrow from Grameen
- b) They are hardworking and motivated.

4 Grameen

- a) Does not make a profit.
- b) Uses its profits to develop the business.

5 Yunus believes loans are better than handouts because

- a) They encourage people to develop skills.
- b) He does not support welfare schemes.

3. Match the adjectives 1-5 to the nouns a-e

1. abject a. crank
2. exorbitant b. resources
3. innovative c. interest rates
4. scarce d. poverty
5. well-meaning e. system

1	2	3	4	5

4. Match the highlighted words and phrases in the article to the definitions 1- 7

1. a difficult or unpleasant situation that is not easy to get out of.....
2. an amount of money or goods given to people who need them ...
3. existing, happening or spreading in an uncontrolled way.....
4. fail to pay money that you owe ...
5. property that you agree to give to a bank if you fail to pay back money that you have borrowed.....
6. someone who lends money to people and charges them a very high rate of interest
7. with no money or possessions

5. What do you think? Which is the best way to help people in developing countries?

Choose the phrase, 1,2,3, or,4 which best matches your opinion and say why.

1. Give financial aid to the most destitute
2. Improve the education system
3. Develop the overall national economy
4. Provide loans for small businesses

The phrase that best matches my opinion is:

Why?:.....
.....
.....

Appendix C

STEM CELLS

1

Fast-forward to the end of the 21st century: surgeons create new organs to order, regrow crippled spines and hearts, and reverse the damage of Parkinson's disease or diabetes with ease.

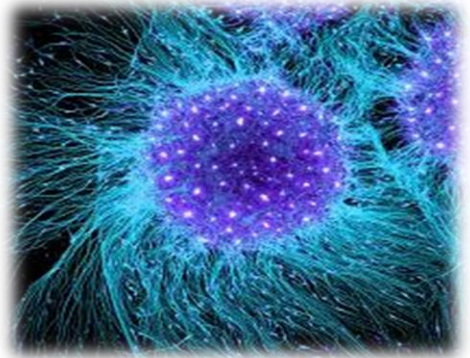
Immune rejection and waiting lists for replacement organs are

consigned to history. Stem cells may have the potential to fulfil this promise and much more, but there are still many technical, ethical and political obstacles to overcome before real therapies are possible.

2

There are two types of stem cell: those found in adult cells and embryonic stem cells (ESCs). Currently, stem cells of both types are being tested to treat many conditions, including: Alzheimer's disease, blood disorders, blindness, deafness, diabetes, heart disease, kidney failure, liver damage, multiple sclerosis, osteoporosis, Parkinson's disease, spinal cord injuries, strokes and cancer. Doctors have been transplanting adult blood stem cells, in the form of bone marrow transplants, for many decades, but stem cells from human embryos were only isolated and cultured in 1998. Though research has progressed rapidly since then, we still have much to understand; not only what gives stem cells their unique properties, but also how exactly they are able to differentiate into the 300 or so different types of human cell in the human body.

3



Embryonic stem cells (ESCs) come from fertilized human embryos just a few days old. In the embryo, these cells go on to form all the tissues of the developing body. They have generated so much interest because they are virtually immortal in the laboratory and are pluripotent, ie they have the potential to turn into many different types of cells, from bones to brain cells. So far, most existing ESCs come from human embryos left over from infertility treatment; however, in some countries women are now donating eggs specifically for stem cell research. The cells could potentially be cultured in the lab as an unlimited source of repair tissue for many ailments, and could be studied to provide vital clues about how the tissues of the body, and certain congenital diseases, develop. They might also be used to test new drugs in the lab instead of on people or animals.

4

The so-called adult stem cells are found in a number of organs in the bodies of both adults and children, including bone marrow, blood, the cornea and retina, intestine, liver, muscles, nervous system and the brain, pancreas and skin. These stem cells are less flexible than ESCs and are typically only able to form cells of tissue in which they reside; they also suffer from the disadvantage of not being immortal in the laboratory. However, they sidestep the ethical **quandary** of destroying embryos, and it may be possible to stimulate the adult stem cells we already possess to repair damaged tissues within our bodies.

5

The most significant **hurdle** still to be surmounted in stem cell technology is immune rejection. As with any tissue transplant (from a donor other than identical twin), the body will recognize ESCs as foreign and mount an attack which could destroy them. Therapeutic cloning is a clever technique that **circumvents** this problem. Custom-made ESCs, formed from a patient's own DNA

and a donor egg, contain the DNA of the recipient and would not be treated as foreign by the immune system. However, the cloned embryo could in theory be implanted into a womb where it might develop into a cloned human baby. This would be reproductive cloning and is the same method that was used to produce Dolly the sheep, the world's first successfully cloned animal.

6

Producing **viable** clones of many species is a lengthy and difficult problem and, despite **questionable** claims of success, has yet to be proven in human. In any case, reproductive cloning has been banned in many European countries for ethical reasons and because of suspected health risks to the clone. Opponents argue that all embryos, whether created in the lab or not, have the potential to go on to become a **fully-fledged** human, and therefore it is morally wrong to experiment on them. Other countries have taken the line that the medical benefits outweigh these concerns, and therapeutic cloning has been allowed, although subject to strict regulation. In the United States, disagreement between the religious groups who want a total ban on cloning and an equally vociferous pro-therapeutic cloning lobby has currently stalled legislation on stem cell technology.

Questions

1 Read the text and say where you think it comes from, 1, 2, 3 or 4.

- 1 A research paper
- 2 A scientific journal
- 3 A medical report
- 4 A popular magazine

2 Match the words 1-8 in column A to their definitions a-h in column B.

A

- 1 cell 5 immune
 2 clone 6 organ
 3 DNA 7 tissue
 4 embryo 8 transplant

1	2	3	4	5	6	7	8

B

- A. a part of your body that does a specific job, such as your heart or brain
 B. the smallest part of a living structure that can operate as an independent unit
 C. a medical operation in which a new organ is put into someone's body. The organ is taken from the body of another person, especially someone who has just died, who is called a donor
 D .an animal or human before it is born, when it is beginning to develop and grow
 E .the substance that animal and plant cells are made of
 F .an exact copy of an animal or plant created in a laboratory from the animal's or plant's DNA
 G .safe from a disease, because you cannot be infected by it
 H .deoxyribonucleic acid: a chemical substance that contains genetic information and is found in all living cells and some viruses.

3 Choose the best titles a-f for the paragraphs 1-6

- A the cloning connection Paragraph number

B adult stem cells	Paragraph number
C miracle technology?	Paragraph number
D ethical minefield	Paragraph number
E ESCs	Paragraph number
F what are stem cells?	Paragraph number

4 .Match the words or phrases highlighted in the text to the synonyms 1-7

- 1 able to survive
- 2 complete
- 3 dilemma
- 4 gets round
- 5 obsolete
- 6 obstacle
- 7 uncertain

5 .What do you think? Choose the sentence,1,2 or3, that best matches your opinion and say why.

- 1 Scientists should be free to develop ESC technology
- 2 ESC technology should be banned.
- 3 ESC should be allowed, but subject to regulation

The sentence that best matches my opinion is

Why:

.....

3. I prefer reading academic texts on

Paper Screen no preferences

4. I prefer reading shorter texts (less than 5 pages) on:

Paper screen

5. I prefer reading longer texts (more than 5 pages) on:

Paper screen

6. When I have electronic texts, I prefer reading them on:

Computer desktop laptop mobile phone tablet

7. When I find important texts on the net, I prefer to:

Read them electronically print them out

Section Three : Frequency of highlighting and annotating when reading print and electronic documents

1. I highlight and annotate (write in the margin or take notes) academic texts in print

Very often often sometimes rarely never

2. I highlight and annotate academic texts on screen

Very often often sometime rarely never

Section Four: Reading Practices in print and screen

1. I reread academic texts when they are in hardcopy

Very often often sometimes rarely never

2. I reread academic texts when they are in electronic format

Very often often sometimes rarely
never

3. I multitask (do two tasks or more at the same time) when I read in print

Very often often sometimes rarely never

4. I multitask when I read on screen

Very often often sometimes rarely never

Section Five: Learning engagement on both medium

*** Please circle your answer on the 5-point Likert Scale**

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. I remember more information when I read in hardcopy	5	4	3	2	1
2. I enjoy reading onscreen than in hardcopy	5	4	3	2	1
3. I read faster onscreen than with hardcopy	5	4	3	2	1
4. I concentrate well when I read in hardcopy	5	4	3	2	1
5. I feel easily distracted when I read on screen	5	4	3	2	1
6. I prefer to read hardcopy when I need to understand the material deeply	5	4	3	2	1
7. Reading onscreen is more convenient than in hardcopy	5	4	3	2	1
8. I prefer to have all my course materials in print (books; handouts... etc)	5	4	3	2	1

Section Six: Like and Dislike about paper and screen medium

1. What is the one thing you like most about reading in hardcopy?

.....
.....

2. What is the one thing you like least about reading in hardcopy?

.....
.....

3. What is the one thing you like most about reading on a digital screen?

.....
.....

4. What is the one thing you like least about reading on a digital screen?

.....
.....

Thank you

Appendix E

Teachers' Interview

SEMI-STRUCTURED INTERVIEW

Date:.....

Interviewer:

Interviewee:

INTRODUCTION

The research topic is about the effect of reading medium (paper or screen) on EFL (English as a Foreign Language) Algerian graduate students' reading comprehension in the academic context at Mascara University. The study also aims to explore students' preference for paper or screen when approaching academic texts.

This research requires me to get in-depth understanding about that topic, therefore I contacted you as teachers at Mascara university to benefit from your knowledge and experience in such issue.

Bear in mind that your responses will be confidential and anonymous.

QUESTIONS

1. What is your position at the university? Part-time teacher Full-time teacher
2. For how many years have you taught at English department?
3. What are the benefits of reading that your EFL students experience?
4. How do you motivate your students to read?
5. What reading challenges do your EFL students experience?

6. In your experience, what impact has the digital age had on EFL graduates' reading behaviour? Can you give me any examples of that?
7. Do you prefer to give your students hardcopy handouts to read or send them electronically? Why?
8. What are the important reasons that lead students to read their academic texts in print?
9. What are the important reasons that lead students to read their academic texts on screen?
10. Which reading medium (paper or screen) do you think is suitable for your students to achieve a deep learning outcome? Why?
11. Today's students are digital natives, who have grown up in a digital environment and have more experience with the Internet and digital devices. Do you think that integrating technology while teaching reading will enhance their reading comprehension? How?
12. Do you think there is an important question I didn't ask?

Your participation in answering these questions is much appreciated, thank you.