The Influence of the Reading Medium on Learning Efficacy

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ABSTRACT	Published Online: January 26, 2024

This paper outlines the differences between electronic and printed reading comprehension for English as a Foreign Language (EFL) students. It explores which sources EFL students prefer and the reasons behind that; whether the reading mode influences the comprehension of the material being read; and which reading strategies are applied to each reading mode. We hypothesize that comprehension is easier and more successful when reading from printed sources. The method includes an experiment with students from the English Language Teaching (ELT) Program at the South East European University (SEEU) in North Macedonia. It aims to analyze and compare text comprehension and strategies used during digital reading (e-reading) and printed reading (p-reading). Findings clearly showed a preference for p-reading and more successful comprehension with this mode. No difference was found in the reading strategies application between e-reading and p-reading. The main conclusion is that there are no differences in the cognitive process underlying reading and understanding of electronic and print media, but comprehension and hence learning is more successful with printed sources. Eye fatigue and brain strain are the greatest disadvantages of electronic reading. Current and future English teachers, educational workers and policy makers should consider these conclusions when creating curricula for all educational levels and all ages.

KEYWORDS:
Strategies,
Comprehension,
Electronic,
Printed,
Education

1. INTRODUCTION

The increased use of technology in education, including English as a Foreign Language (EFL) teaching and learning, has led to higher availability and greater student exposure to electronic (e) reading compared to reading from printed sources (p) reading. In this paper, online reading, digital reading or e-reading refers to selected reading sources used in the EFL context; it does not apply to the general idea of reading or searching for information on the Internet.

Nowadays, young generations and students at different educational levels are more accustomed to e-reading in comparison to reading from printed sources (p- reading). One of the main reasons for that is the excessive use of social media and their accessibility through cell phones. Observing individuals of all ages staring at their electronic gadgets such as cell phones, tablets, computers and laptops has become the most usual sight. The trend of e-reading has especially gained on actuality during the pandemic period. There is hardly any

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course reader published today that is not accompanied by an electronic counterpart. Complete courses are organized in such a way that they can be totally delivered in online or hybrid mode with all the materials available online. These circumstances have contributed to considering e-reading as new and modern while p-reading as more traditional and out dated.

On the other hand, the challenges of online education during the lockdown period have raised dilemmas and debates among educational workers, experts, and especially parents about the effectiveness of using electronic versus printed sources for studying. Many of these discussions were related to the different aspects of online classes and mainly referred to the organizational and social components. Taking into consideration the importance of reading comprehension in the process of acquiring and learning foreign languages (Al Mahrooqi and Roscoe, Eds. 2014),[I] this paper focuses on the differences in text comprehension between e-reading and p-reading – an area about which the existing literature offers quite opposite views. What is more, acquiring good reading skills and reading comprehension are critical in development of academic literacy and learning in general (Seidenberg, 2013).[II] The purpose of the paper is to provide answers to the following research questions: What kind of sources (printed

or electronic) do EFL students prefer and why? Is there any difference in text comprehension between the two modes of reading? Do EFL students apply the same reading strategies when reading from electronic and printed sources? Conclusions based on findings are expected to contribute to discussions about the effectiveness of e-reading versus p-reading and offer recommendations for teachers, parents, and educational policy-makers leading to higher efficacy of learning.

II. LITERATURE REVIEW

Reading comprehension, or the ability to understand the text – text comprehension, is a complex process that consists of several stages. Kirby (2007)[III] mentions two types of processing involved in reading comprehension: bottom up processing, in which words are used to form phrases and phrases are used to form sentences and top down processing, in which higher level information such as the main idea of a text helps to identify some of its details. Theorists have proposed many models in order to describe the factors that influence text comprehension and they have analyzed the different components involved in this process. Elleman and Oslund (2019) [IV] identify four key points that are highlighted in most of the theories about reading comprehension: inference, knowledge, vocabulary and comprehension monitoring. They claim that all these elements have implications for instruction. The difference in the reading mode has not been considered among other relevant factors influencing reading comprehension. Similarly, other authors, (Solano et al 2004,[V] Morales and Espinoza, 2003, in Lopera, 2023),[VI] suggest that the same reading comprehension factors are present in both e reading and traditional reading and that the reading mode does not make a difference to a competent reader.

Available literature is not consistent with regard to the effectiveness of the two modes of reading. Siagian and Maryanti (2018) [VII] point out the advantage of reading from printed sources because of the use of more senses or at least two (visual and tactile), compared to the e-reading, in which only the eyes are the active sensory perception. Their contention is based on findings about brain organization and neuroanatomy according to which learning is more successful when more sensory organs are activated in the process. From medical perspective, the so called visual fatigue (Benedetto et al., 2017) [VIII] or digital eye strain is a big disadvantage of e-reading. It results from a prolonged use of electronic devices and includes symptoms such as dry eyes, itching, blurred vision and headache. Stiff neck, fatigue and backache are also associated with eye strain resulting from e-reading. (Kaur et al., 2022). [IX]

Some researchers imply higher effectiveness of digital texts over printed texts in the EFL context (Sidabuttar et al., 2022).[X] A few studies with two groups of readers have shown that online reading groups outperform the paper based group on overall reading comprehension. This has led to the conclusion that using digital texts is more effective than printed text in EFL learning. Yet, other authors (Delgado et al., 2018,) [XI] point out that the way in which the medium or mode of reading affects reading comprehension is still unclear. A review of meta-analyses and narrative literature research synthesis that had been conducted for the purpose of their study has not clearly indicated any difference between the two reading modes. The lack of introducing moderating factors such as the time frame or the specific characteristics of participants has been identified as a potential reason for the inconsistency in research findings. In this regard, considering age as an important factor, it would be expected from young learners to prefer e-reading because they have been exposed to it and used to it since very young age in comparison to older generations.

In foreign language learning, reading is a very essential skill as it has multiple positive effects on vocabulary knowledge, spelling and writing. Reading and writing relationship is especially important because of the fact that writing is considered to be the skill that students at all proficiency levels struggle most with (Nunan, 1999, [XII] Hyland, 2003).[XIII] Eisterhold, (in Kroll, 1990: 88) [IV] points out that reading paragraphs function as main and basic models from which "writing skill can be learned, or at least inferred". For these reasons, reading strategies receive quite a great focus in EFL teaching and learning.

Reading strategies are specific mental operations used consciously by the readers in order to understand what they read or as Rraku [XV] (2013:1) suggests – they refer to the "conscious reading behavior". Carrel (1998) [XVI], selects skimming, scanning, predicting, guessing, making inferences, confirming or disconfirming, identifying main idea and rereading as the most common ones. The existing literature on differences between e-reading and p-reading is focused on measuring student performance in both media rather than on the direct influence of digital and printed texts on the cognitive processes involved in reading, including the reading strategies. In fact, Wylie et al., (2018) [XVII] claim that researchers, educators, and policy makers have many data about different aspects of reading available in the literature, but none of them provide information related to the role of cognitive processes in reading digital texts. This paper aims to examine if there is a difference in text comprehension when reading online and from printed source; which mode is preferred by EFL students and why; and if the same reading strategies are applied with both modes of reading.

III. RESULTS

Students of the Master Program in English Language Teaching (ELT) at the South East European University (SEEU) in North Macedonia participated in the experiment intended to measure the reading comprehension with electronic and printed source. They belonged to the same age group (approximately 23 to 25 years); their English proficiency level was also similar and ranged from B2 to C1.

The group consisted of 24 students out of whom 8 were males and the rest 16 were females. A few of them had some teaching experience and all of them had completed the teaching practicum during their undergraduate studies so they could understand the purpose of the study and cooperated well.

Two different texts were used for measuring reading comprehension. Both reading passages were selected from the same standardized course reader for teaching English for Specific Purpose to Information Technology students (Glenndining and Mc Ewan, 2002)[XVIII]. They were supposed to be with similar level of difficulty. The idea was to choose material that would be more challenging than texts from general English course books and matching participants' rather advanced proficiency level. There were a few questions following each text, serving as indicators for text comprehension.

A short questionnaire was the other instrument applied. Its purpose was to collect information about the reading strategies applied during each reading mode and participants' preferences. The questionnaire contained the following items:

- Which reading strategies did you use while reading the A) Printed B) Online text? Choose all that you used, in order of application to this reading task by putting a number next to them, beginning with number 1 being mostly used: scanning, skimming; guessing the meaning from context, using a dictionary, translation, visualizing, connecting and other? (The answers were supposed to be given twice, once for the hard copy, once for reading online).

- Write a short reflection on your preference regarding each mode of reading with explanation. Focus on whether you preferred one mode more than the other and if yes why. Please also reflect on the reading strategies you used with both types of texts and text comprehension.

In the first phase of the experiment, participants were divided into two groups. At the same time, identical text was given to both groups in a different form and comprehension questions measured reading comprehension. One group received the text in a hard copy, while participants from the other group were reading it from a digital device: their phone or laptop. The comprehension questions following the texts, could have been answered either by writing on paper or by typing on a computer/phone. With these options, the intention was to focus on the cognitive processes involved in reading comprehension and minimize factors such as writing or typing speed. Participants were instructed to provide full answers based on the information read in the text and to take as much time as they needed. It was not revealed to them that the reading comprehension would be measured by the time of completion and that those providing correct answers sooner would be considered as more successful. This was done in

order to eliminate the influence of the time frame as a moderating factor.

In the next phase, both groups received another text with similar difficulty. This time the reading mode was different. The moderating factors mentioned in the literature (Delgado et al., 2018)[XI], including participants' age, proficiency level, time constraints to finish the activity, as well as text difficulty, had been taken care of. Thus, text understanding would not be particularly difficult for any participant, but the time needed for the activity was supposed to vary, depending on their comprehension. It was measured by the period of time needed for answering the questions correctly. More successful were students that could give the right answer sooner.

The next step was to collect information about the reading strategies applied to the different reading mode. The following table illustrates strategy selection by students.

Table 1. Reading Strategy Use

Reading Strategies	Number of Selections with Printed Text (out of 24)	Number of Selections with Electronic Text (out of 24)
Skimming	23	22
Scanning	20	22
Guessing the Meaning from Context	24	24
Using a Dictionary	0	0
Translation	0	0
Visualizing	2	2
Connecting	11	11
Other	Re-Reading - 10 Making associations - 4	Re-Reading – 14 Making associations - 4

The reflective activity was not completed by all participants. Fifteen (15) out of twenty-four (24) wrote the reflections. Thirteen (13) were evidently in favor of the printed version of the type of text that they had received. Two (2) participants did not find significant differences between the reading modes. Extracts from some reflections are given below:

"If the text was about some 'lighter' topic such as cosmetics or recipe, I wouldn't mind reading it from a screen. But this required deeper involvement and the paper was more useful for that" – student 1

"It was a bit difficult to find the lines in the electronic version. Lines could have been marked with numbers and when you read back you know where to place the eyes" – student 2

"I'm used to studying from books but generally I don't see any difference. It is all a matter of will and concentration"… student 3

IV. DISCUSSION

In both cases and with both texts, participants that were reading from a printed source performed better. They completed the reading comprehension activity sooner. What is more, those that used a printed source first and electronic second, had difficulties in concentrating on the text for the second time when they were reading it on a computer. This was not the case with the group that had a printed text for the second time. The assumption is that the lack of concentration was resulting either from eye fatigue (the experiment was conducted in late evening), perception or maybe even bias that comprehending a text in an electronic form would be more difficult. Despite the fact that the experiment was conducted with proficient English speakers, dealing with texts that were genre and field specific implied that participants needed certain cognitive efforts to comprehend them.

With both options, guessing the meaning from context was the most used reading strategy, selected by all participants. Skimming and scanning were high on the list, while translation and using a dictionary were not mentioned at all. It was interesting that the same strategies were selected for both modes by individual students. Connecting and visualizing were marked quite a few times, while making associations and re-reading were mentioned as other strategies used.

Participants mainly mentioned practical things as advantages of p-reading: underlying, marking, going back and forth, easier concentration when looking for specific details, the proximity of the text and the questions. Eye fatigue and brain strain to remember details visually in order to refer to them when reading for details were among the disadvantages of e-reading. Inferring meaning from context was the most commonly used strategy in both cases.

V. CONCLUSION

The study showed that participants preferred p-reading over e-reading in the EFL context. Text comprehension was more successful when the text was read from a printed source. It was concluded that the main advantages of p-reading included greater comfort while reading, having less eyes strain, having the ability to go over the text more easily and taking notes or marking the reading passage. Eye fatigue during the e-reading, especially the need to scroll up and down the text when looking for particular information, were pointed out to be its greatest disadvantage. Next, it was concluded that there was no significant difference in the usage of reading strategies in the two modes. Guessing the meaning from the context was the most widely used reading strategy with both reading modes. This conclusion confirmed the previous findings from the literature about the same cognitive processes underlying the reading process, no matter of the reading medium. In this way, the difference between p-reading and e-reading showed to be only of a technical matter. However, p-reading facilitated reading comprehension, while e-reading burdened it due to the characteristics mentioned previously. Based on this, it is recommended to use hard copies for reading in every learning context, whenever it is possible.

The small number of participants, text selection and English proficiency were some of the limitations of this study. It would be useful to replicate the experiment with another group of students with lower proficien**cy** and a topic from General English and compare the results. School age learners would be another interesting sample taking into consideration their obsession with electronic devices and, as pointed by some researchers, less and less time devoted to p-reading nowadays (Twenge, Martin and Spitzberg, 2018)[XIX]. More specific data about the brain activity during e-reading and p-reading might be gathered in cooperation with neurologists through Electroencephalograms. Such measurements would definitely show if there is a difference in the brain activity with regard to the reading mode and provide deeper understanding of the cognitive processes that underlie reading comprehension**.**

VI. DISCLOSURE

I certify that there are no financial, nor any other conflicts of interest related to the authorship of this manuscript.

REFERENCES

1. Al Mahrooqi, R., Roscoe, A. 2014. Eds. Focusing on EFL Reading: Theory and Practice. Cambridge Scholar Publishing.
2. Seidenberg, M. (2013). The Science of Reading and its Educational Implications. Language Learning and Development. Routledge, London.
3. Kirby, R.J. 2007. Reading Comprehension: Its Nature and development. Canadian Language and Literacy Research Network. Retrieved from, Reading_Comprehension_Its_Nature_and_Development.pdf
4. Elleman, A.M., Oslund, E.L. 2018. Reading Comprehension Research: Implications for Practice and Policy. Policy Insights into Behavioral and Brain Sciences. 6/1. Retrieved from https://journals.sagepub.com/doi/epub/10.1177/2372732218816339
5. Solano, P. ET. al. 2004. Self-regulation of learning from texts. Galician-Portuguese Journal of Psicoloxiae Educación, 11/9. Retrieved from, http://webdocente.altascapacidades.es/Aprendizaje%20Autorregulado RGP_11-8.pdf. DOI:10.26891/JIK.v11i2.2017.52-59
6. Lopera, G.A.C. 2023. Reading, Writing and Reading Comprehension: Coexistence between Printed and Digital Media. European Journal of Education and Pedagogy. 4/2. DOI: http://dx.doi.org/10.24018/ejedu.2023.4.2.597

7. Siagian, F., E.; Maryanti, E. 2018. E-Reading Vs Traditional Reading: Can Internet, Social Media and Gadgets Bridge the Gap between Reading and Learning among Medical Students? Journal of Medical Sciences. 11(2)/52 DOI:10.26891/JIK.v11i2.2017.52-59

8. Benedetto, S., Drai-Zerbib, V., Pedrotti, M., Tissier, G., Baccino, T. 2013. E-Readers and Visual Fatigue. *PLoS ONE* 8/12. Retrieved from, E-readers and visual fatigue - PubMed (nih.gov)

9. Kaur et all. 2022. Digital Eye Strain- A Comprehensive Review. Ophthalmology and Therapy. 11/5. 1655–1680.

10. Sidabutar et all. 2022. Reading Digital Texts vs. Reading Printed Texts: Which One Is More Effective in Iranian EFL Context? *Hindawi* Education Research International. https://doi.org/10.1155/2022/7188266. Retrieved from ,https://www.hindawi.com/journals/edri/2022/7188266/

11. Delgado, P., Vargas, C., Akerman, R., Salmeron, R. 2018. Don't throw away your printed books: A meta-analysis on the effects of reading media on reading comprehension. Educational Research Rev*iew,* 25. Retrieved from, https://www.sciencedirect.com/science/article/pii/S1747938X18300101?via%3Dihub

12. Nunan, D. (1999). Second Language Teaching and Learning. Heinle and Heinle Publishers.

13. Hyland, K. 2003. *Second Language Writing*. Cambridge University Press

14. Kroll, B. 1990. Ed. *Second Language Writing*. Cambridge University press

15. Rraku, V. 2013. The effect of reading strategies on the improvement of the reading skills of students. Social and Natural Sciences Jo*urnal*. 7/2 DOI: 10.12955/snsj.v7i2.418

16. Carrell, P. L. 1998. Can Reading Strategies be Successfully Taught? Australian Review of Applied Linguistics. 21, 1-20. https://doi.org/10.1075/aral.21.1.01car

17. Wylie, J., Thomson, J., Ackerman, R. Lepannen, P.H.T. 2018. Cognitive Processes and Digital Reading. Learning to Read in a Digital World. Amsterdam: John Benjamins. Retrieved from, (PDF) Chapter 3. Cognitive processes and digital reading (researchgate.net)

18. Glendinning, E.H., McEwan, J. 2002. Oxford English for Information Technology. Oxford University Press.

19. Twenge, J., M.; Martin, G., N. 2019. Trends in U.S. Adolescents'Media Use 1976-2016. Psychology of Popular Media Culture. 8/4 http://dx.doi.org/10.1037/ppm0000203