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Research Article

Reading Digital Texts vs. Reading Printed Texts: Which One Is More Effective in Iranian EFL Context?

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Considering the development of technology in the current era, the present research aimed at investigating the effects of reading digital texts vs. reading printed texts on developing Iranian intermediate EFL learners' reading comprehension. To this end, the Oxford Quick Placement Test (OQPT) was administered to 93 language learners, and 60 of them whose level was intermediate were selected. Then, they were assigned to two groups: one CG and one EG. After grouping the participants, a reading pretest was administered to gauge the participants' reading comprehension before conducting the treatment. After that, ten digital texts in the format of PDF with their audio files were instructed to the EG. On the other hand, the same texts were taught to the CG in a printed format. After teaching all texts, a reading posttest was administered to both groups to measure the effects of the treatment on their reading comprehension. The gained data were analyzed using paired samples and independent samples *t*-tests. The findings illustrated that both digital and printed texts helped the participants to improve their reading comprehension, but digital texts were more effective than printed ones. In other words, the EG participants trained by the digital texts outflanked the CG participants taught through the printed texts. The implications of this study can inspire both English teachers and learners to use digital texts in their teaching and learning.

1. Introduction

For a variety of reasons, fluency in reading is a must for all EFL students. In the first place, EFL students learn English in a non-English-speaking setting. Reading would be the greatest way to compensate for the lack of information through their regular interactions. According to Anderson, Jeong, and Mullis (and many others), reading substantially impacts one's personal and intellectual growth, subsequent education, work performance, career advancement, and the capacity to change. The ability to read is a stepping stone to more excellent proficiency in other areas of language study [1]. It exposes students to a wide range of helpful sentence forms frequently. It also helps students to improve their vocabulary by studying the most often used and relevant terms in context. Students learn how to communicate thoughts via words and utilize punctuation and so on through reading. Reading also enhances writing abilities.

Readability has a "spread impact" on other aspects of language proficiency, such as grammar and syntax mastery, according to Elley [2].

When it comes to language learning (such as textbooks, writing, and rewriting), Mikulecky [3] said that reading is the foundation for all of these activities. Printed texts have always played an essential part in EFL classes since they make reading easier. An actual written text has a beginning and an end that can be traced back to the beginning and the end. A printed text is tangible objects with a beginning and an end. It is also hierarchical, intended for private reading, and provides a very linear and static reading experience to the reader. "The reader has little option except to follow the author's intended storyline or explanatory structure" in a printed text, unlike the online text, in which the navigation of the text may be fluid and reader-driven [4]. When reading printed materials, the reader can reorganize what they read by flipping between the pages, but its "properties are not flexible," and it is meant to be read sequentially [4, 5].

Nevertheless, today's learners' reading habits have been fundamentally altered by the recent surge of digital books. Web pages, text messages, and online posts like blogs are all examples of digital texts, as digital texts are stored on-screen reading software, computers, or portable devices. Their design is computer-generated and multifunctional (blending texts with audio, video, image, and hypertext). Using these elements, they are more interactive than printed text and encourage the reader to explore nonlinearly. Hypertext, in particular, makes a digital text interconnected with many other texts which offer the readers various directional choices fitting to their interes [6–8].

Students tend to prefer reading books in a variety of formats and on a variety of devices [9]. They often use digital texts for their studies, jobs, and research. Students may now quickly access digital sources for information, news, or just for fun by using a computer or handheld device of their choice. E-books are increasingly taking the place of paper textbooks in academic settings. As a result of the widespread use of digital reading devices, educational institutions all over the globe have begun to eliminate paper from the classroom [10]. Digital technology has provided numerous advantages, including speedy and easy availability of information and a wealth of networking opportunities [11, 12]. In the case of English as a second language (ESL), education and instruction access to a wide range of digital resources might be vital. Using digital resources may help students learn English as a second language (ESL). According to Krashen [13], instructors and students of English as a foreign language can get the most out of the Internet.

By contrasting the properties of printed and digital texts and the reading methods required to adopt them, four key distinctions between printed reading and online reading have been found. In contrast to print texts, Internet texts tend to be nonlinear or multilinear [14]. Digital messages follow a random and unexpected course instead of the predetermined and predictable paths of printed text. As a result, readers can see a smaller amount of text at once because of the limited area on the computer screen through which they see the text. As a result, Internet readers confront more difficulties understanding what they read than readers of traditional printed literature [15–17]. A fourth disadvantage of hyperlinks in digital texts is that they complicate navigation for readers mentally and physically on screens [18].

Since all Iranian schools and institutes use printed texts and books and simultaneously students have access to digital texts, this study aimed to compare the effects of these two modes (printed and digital texts) on Iranian EFL learners' reading comprehension.

2. Review of the Literature

There has been a dramatic rise in the use of new technology around the globe. There has been considerable benefit from the widespread usage of mobile devices for educational objectives, both within and outside the classroom [19]. Tablet computers, in particular, play a vital role in enhancing educational activities' effectiveness [20]. As a result, education and the use of technology in education have been two notions that have not been separated [21, 22]. Learners' reflective practice, preferred learning methods, and the restriction of merely written words and visuals in conventional books have all been improved by using technology [23–25]. Students should have access to these benefits.

Technology provides digital texts for the students. Digital text advocates claim that digital texts are better than paper texts. According to Noam [26], a book is an outdated technology that is costly, difficult to locate, ephemeral, perpetually out of print, slow to manufacture, write and read, and a strain on the eye. He believes that paper books will soon be relegated to historical artifacts. Additionally, others argue that digital texts consume no paper or ink, are more cost-effective since they can be accessed online, and hence are more economical than their print counterparts [27, 28]. Some students prefer reading on a computer screen because they find it more pleasurable, according to Al-Amir [29]. Using computers instead of paper for text presentation, James [30] points out the benefits of searching and upgrading and adds benefits of innovation to the text and the capacity to show the text and cost-effectiveness dynamically.

Cawkell claims that paper-based books are more authentic than computerized books (Cawkell, 1999, cited in Auman in 2002 [27]). According to Dorner (as described by Auman [27]), this is another indicator that the world has gone haywire. Digital reading has been critiqued in the same way as Mangen's research [31], which claims that it encourages superficial reading (e.g., scanning and skimming). Others believe that reading on a computer screen presents a host of usability issues that readers must contend with [32, 33]. Readers have several challenges while using e-readers, including lengthy lines, a considerable reading distance from the display, and difficulty moving the eye's attention from line to line. For Green and Maycock [34], the reason why some readers prefer to read lengthy texts on a computer screen is because of eye fatigue. A reader's cognitive load and disorientation may be exacerbated by the nonlinear structure of digital texts, leading to text fragmentation and a reduction in text coherence [35, 36]. A

computer's nervousness while utilizing or contemplating using a computer may also impede the processing of texts [37, 38].

According to Machovec [39], a computer screen or handheld reading device cannot match a printed page's readability, nor can it replicate the versatility and comfort of a conventional book. According to other studies, even in the digital age, students prefer traditional paper textbooks because they are simpler to browse, underline, or make marginal remarks [40, 41].

The information foraging theory (IFT) and hypertext theory are the two most widely accepted frameworks of online reading skills and material acquisition methodologies. Proposed by Pirolli (2007), IFT describes one's behavior while reading online in everyday causal reading or for specific reading tasks within the web ecosystem [42]. According to this hypothesis, humans are naturally rational, and their information-seeking systems adapt to the structure of the information environments they work in. User-friendly technology should be its primary goal.

The second theory alludes to "text constituted of blocks of words or pictures connected electronically by many pathways, chains, and trails in an open-ended and permanently incomplete textuality" by the name "hypertext" [43]. A crucial aspect of hypertext is its ability to generate conceptual and literal linkages among disjointed pieces of a single text or across entirely unrelated texts. Readers have much more freedom with hypertext than traditional texts, which are ordered in a predetermined sequence that they must adhere to. As a result of readers' additional input into the hypertext, they become more engaged and less controlled. As a result, individuals have the freedom to take their route through the text and are even regarded as "cocreators" of the hypertext [44].

Digital reading also necessitates the development of skills and tools for locating, accessing, manipulating, interpreting, and evaluating digital texts [45]. These abilities and tools establish the resource-based learning idea, which is at the foundation of digital literacy skills [45]. Using them, readers may search, analyze, modify, and converse while reading. Searching, digesting, altering, and communicating are all tools that help readers find information and exchange ideas [45].

Digital reading is economical in the long term; that is, readers can access many e-books (using digital devices) in the most updated formats at a low cost [46]. In addition, digital reading provides an interactive experience enriched with multimodal texts (i.e., written texts, sounds, and images) and diverse platforms for collaboration and the exchange of ideas [47, 48].

Due to the fact that web page readers are subjected to a variety of text formats in addition to the usual reading abilities associated with printed texts, they must be equipped with a variety of appropriate methods to conceive, comprehend, recover, and engage with these tools [45]. This is why a person who is adept at reading printed texts may struggle to read online texts if he is unfamiliar with digital reading instruments and has not acquired the necessary distinctive approaches.

Some experimental studies were done to inspect the effects of digital and printed texts on developing English learning. Hassaskhah et al. [49] explored how the medium of text presentation (paper vs. digital) influences reading comprehension and reading perceptions in college students. To do this, a group of 30 male and female English primary students who want to pursue their Master's (MA) degree took part in the study. A self-assessment checklist was used to measure their reading comprehension concerning the manner of text presentation, and their attitude toward either text type was assessed using the same checklist. Based on the outcome of the statistical analysis of variance (ANOVA), it was discovered that participants had a higher preference for paper-based materials and that they used the same conventional manner for all reading activities. Male participants outperformed their female counterparts in reading comprehension when the texts were printed on paper. As a result of the results, which provide further evidence for the role of mediating tools in the activity theory, it is suggested that the digitization of texts changes the character of external behavior and the nature of people's mental functioning.

Regarding e-reading, Hussain et al. [50] sought to compare the impact of reading from a laptop/tablet screen versus reading printed texts. The effects of e-reading materials on students' understanding and ability to retain information are quantified, the impact of conventional printed document reading is examined, and the disparities between the impact of both forms of readings (printed and electronic) are measured. A pretest-posttest comparison group design was used for the trial, based on actual experimental research design. Students of bachlor degree constituted the population of the study. The honors degree was the study's population. One group was given e-reading materials, while the other was given paper materials to read after a pretest. Materials on educational research approaches were chosen as sources of information. A self-created exam was used to assess students' comprehension and retention abilities. Analysis of the data included mean, standard deviation, and the *t*-paired sample test. Students who read from printed materials retain and comprehend information better than those who read from screens, according to the study's findings (e-reading).

Kaman and Seyit Ertem [51] combined quantitative and qualitative research methods in a mixed approaches study. Pretests were administered to 75 fourth-graders at four different elementary schools, and the 30 pupils with the lowest pretest results were selected for the study. Students were randomly assigned to two groups: an EG and a CG. Each group had a total of 15 members. According to the quantitative findings, learners' reading perspectives were unaffected by the usage of digital texts, and the impacts on fluency and comprehension were short-lived. Students were ecstatic and enthusiastic, as seen by the high quality of their work.

Park and Lee [52] have studied the impact of e-books and printed books on EFL students' reading comprehension and grammatical skills. For this research, 97 elementary school pupils in South Korea learning English as a second language were surveyed. Each week for 11 weeks, these

students were taught English either by intensive reading on tablets ($n = 42$), novels ($n = 32$), or textbooks ($n = 23$) as a CG. According to the data, the tablet group showed the greatest improvement in literal-level reading comprehension compared to the other groups. In contrast, individuals who read printed books had better inferential reading comprehension and grammatical understanding than those who read on tablets. Digital texts were better for short and superficial learning, whereas print texts were better for more in-depth reading.

The studies reviewed above confirmed the positive effects of digital and printed texts on language learning. Although some researchers have demonstrated the effectiveness of digital and printed texts, a few experimental studies compare the impact of these two modes on the reading comprehension of Iranian EFL learners. Therefore, this study aimed to fill this gap and examine the effects of digital and printed texts on enhancing Iranian EFL learners' reading comprehension. Based on this purpose, one research question was posed.

RQ: Which type of text (reading digital texts or reading printed texts) is more effective for developing Iranian EFL learners' reading comprehension?

3. Methodology

3.1. Participants. Among the 93 EFL learners at Padideh Roz in Ahvaz, Iran, 60 participants were chosen for this research. The respondents were aged from 21 to 35 years old. For at least five years, they learned English as a foreign language. The Oxford Quick Placement Test (OQPT) at their university was used to establish their level of English ability as intermediate students. The respondents were placed into two groups, one for the EG and the other for the CG. Because the researchers could quickly locate male subjects, they were the only participants in this investigation.

3.2. Instruments. When comparing the respondents' proficiency levels, the OQPT was initially utilized to ensure that everyone was on the same page. This tool was used to gather data on the competency of the students. The OQPT had two sections: the first section (1–40) focuses on basic grammar and vocabulary. There are more difficult multiple-choice questions and a cloze exam in the second section (41–60). Based on the OQPT categorization chart, which includes 0–10 for beginners, 11–17 for breakthrough, 18–29 for elementary, 30–47 for intermediate, and 48–60 for advanced, the students' scores were average graded from high to low. The intermediate group consisted of individuals with scores ranging from 30 to 47.

Using the participants' textbook as a guide, the researcher created a reading pretest to collect information on the students. It was a reading comprehension exam with 20 objective items, all of which were read aloud. It included fill-in-the-blank questions, true or false questions, and multiple-choice questions. There were measurements taken to determine the reliability and validity of the test mentioned above. It was presented to three English specialists following the exam's construction to assess its face and content validity. As a result, three English instructors reviewed the exams and made minor adjustments to the questions' clarity, simplicity, and representativeness to ensure that the content validity index of the test items was accurate. As was expected, the experts made some adjustments. Following that, the exam was adjusted and then piloted on a comparable set of intermediate learners (15 participants) in another institution using the same coursebook and level as the original group (15 students). Following the application of validation and piloting, the required revisions and modifications were made to the test to accomplish item characteristics, such as item facility, item discrimination, and choice distribution, as desired. Finally, the test was completed and ready to be used. Using the KR-21 formula ($r = .86$), the dependability of the product was determined.

The third instrument employed in the present study was a reading posttest created by the researchers and was a modified version of the pretest. It was provided to the respondents to examine the impact of phonological awareness on their ability to increase their reading comprehension. The posttest included all of the same features as the pretest, including the amount of time it took and the number of items it contained. The only variation was that the questions and alternatives sequence was modified to prevent the respondents from being reminded of their answers before the exam.

3.3. Data Collection Procedure. In the first step, 60 intermediate EFL learners were chosen for the study's target population and were divided randomly into two groups: one EG and one CG. After grouping the sample for the study, they were pretested on reading comprehension, and then, the treatment was practiced. Ten digital texts in PDF format with their audio files were taught to the EG. In each session, one digital text in PDF format with its audio file was sent online to the EG. The teacher explained the meanings and the main points of the text in a voice format and sent it to the EG. Then, the students were required to read and practice the PDF file. On the other hand, the same texts were taught to the CG in a printed format. The researcher attended the class, gave the printed text to the students, and started teaching it. The teacher made students familiar with the topic by providing related background knowledge. After that, he translated the text, explained the key points, and involved the students by asking questions. After teaching the text, the students were required to answer some questions related to the text; they were also required to practice and read the text at home. Ten texts were taught to the CG according to the mentioned procedure. After teaching all texts, the researcher administered the reading posttest to determine the possible effects of the digital and printed texts on the participants' reading improvement.

3.4. Data Analysis. The information gathered via the previously mentioned instruments was evaluated and interpreted following the study's goals. Statistical methods such as the paired samples t-test and the two independent samples

t-test were utilized to determine the effects of the digital texts on the participants' reading comprehension, and the comprehensive findings were presented in various tables.

4. Results

In the following tables, two independent samples *t*-tests and one paired samples *t*-test were used to analyze the reading pretest and posttest data.

Both groups' means and standard deviations on the reading pretests are shown in the table (Table 1). As indicated, the mean score of the CG is 15.50, and the mean score of the EG is 15.96. Looking at their means carefully, one can understand that both groups had almost the same reading comprehension knowledge before receiving the treatment.

In the table (Table 2), an independent samples *t*-test was applied to see if the differences between the mean scores of both groups on the pretest are significant or not. As the sig value (0.34) is higher than 0.05, the differences between the groups are not significant. Based on the results of the independent samples *t*-test, we say that both groups performed similarly on their reading pretest.

After administering the reading posttests to both groups, their scores were compared in the table (Table 3), and the results indicate that the CG's mean score is 17.16, and the EG's mean score is 18.23. Based on their mean scores, it seems that the EG gained higher scores on their reading posttest. To figure out the differences between the reading posttests of both groups, an independent samples *t*-test was used in the following table.

Table 4 shows that the sig value is 0.00; therefore, we can conclude that there is a significant difference between the performances of both groups on the reading posttest in favor of the EG. Indeed, the EG participants performed better than the CG participants on the reading posttest.

In Table 5, a paired samples *t*-test is run for comparing the reading pretest and posttest of the CG. The results show that the difference between the reading pretest and posttest of the CG is significant as Sig (0.00) is higher than 0.05. Likewise, the second paired samples *t*-test shows that the differences between the reading pretest and posttest of the EG are significant.

5. Discussion and Conclusion

After collecting the data, the researchers analyzed them to discover the possible effects of digital and printed texts on the reading comprehension of Iranian intermediate EFL learners. The findings indicated that both the digital and printed texts helped the participants develop their reading skills, but the digital texts were more effective. The results statistically showed that the EG did better than the CG on the posttest.

The previous related studies support these outcomes of the present study. For example, our research supports Akbar et al. [53], who carried out a survey examining the effects of reading digital texts on Iranian EFL learners' reading fluency. Their results showed that reading digital texts positively affected reading comprehension and reading fluency. Also, our study is supported by Schneps et al. [54], who compared reading on printed materials with reading on electronic tools in terms of levels of reading fluency and reading comprehension of learners who had reading disabilities. Based on their research findings, reading on the devices meaningfully affected reading fluency and comprehension. Moreover, the results of this study are in line with the results of Kaman and Seyit Ertem [51], who disclosed that the use of digital texts had positive effects on promoting fluency and decreasing reading errors.

Our research results follow Fard and Nabifar's [55] research, which indicated that the learners who read from the computer screen significantly outflanked those who read printed pages in a traditional classroom. Additionally, Bhatti's [56] research in Pakistan indicated that using digital texts was more effective than printed texts. In addition, Huang [57] advocated our study, who suggested that the online reading group outflanked the paper-based group on overall reading comprehension. Our study is supported by the online collaborative learning (OCL) theory proposed by Harasim [58] focusing on the Internet facilities to provide learning settings that develop collaboration and knowledge construction.

On the other hand, the results of our study are different from the results of Hassaskhah et al. [49], who inspected the effects of paper vs. digital texts on reading comprehension and reading attitudes. They discovered that participants in their study preferred paper-based books and that the same conventional approach was used to all reading tasks without any differentiation. Similarly, our study is incompatible with Hussain et al. [50], who measured the impacts of e-reading and printed document reading. According to their findings, participants who read from printed materials retained more information and had a better knowledge of the text than those who read from a computer screen did (e-reading).

It is a predicament that learners are willing to confront in their everyday lives and educational settings while reading digital texts on tablets. It is also feasible to see that tablet computers and digital texts have diverse impacts on student's performance. Using digital reading tools, Larson [25] showed that it was possible to improve new literacy skills while increasing interactions between readers and their reading. Furthermore, the technological instruments and their capabilities need the manual transfer of these reading texts from one location to another. When Larson said that this condition had increased the interactions between readers and reading materials, he made a significant addition to the area of literature.

Unlike the printed texts that are static, digital texts are not constant. The shapes, sizes, locations, and colors of the digital texts, for example, can be changed. These characteristics can be beneficial since the readers can, for instance, adapt the font size to their needs. In addition, digital texts are portable and sharable, making learning easier. These features can be the possible reasons why the EG outflanked the CG on the reading posttest.

The digital texts provided more opportunities for the students to read at any time and place since they had the texts on their mobile devices. Moreover, the students had more interactions with a teacher through digital texts. This is why the EG performed better than the CG. Our research is

Table 1: Descriptive statistics of the reading pretests.

	Groups	N	Mean	Std. deviation	Std. error mean
Scores	CG	30	15.50	1.96	0.35
	EG	30	15.96	1.92	0.35

Table 2: Inferential statistics of the reading pretests.

		Levene's test for equality of variances		T-test for equality of means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference
Scores	Equal variances assumed	0.09	0.76	−0.93	58	0.35	−0.46	0.50
	Equal variances not assumed			−0.93	57.97	0.35	−0.46	0.50

Table 3: Descriptive statistics of the reading posttests.

	Groups	N	Mean	Std. deviation	Std. error mean
Scores	CG	30	17.16	1.26	0.23
	EG	30	18.23	1.19	0.218

Table 4: Inferential statistics of the reading posttests.

		Levene's test for equality of variances		T-test for equality of means				
		F	Sig.	T	df	Sig. (2-tailed)	Mean difference	Std. error difference
Scores	Equal variances assumed	0.05	0.81	−3.36	58	0.00	−1.06	0.31
	Equal variances not assumed			−3.36	57.82	0.00	−1.06	0.31

supported by the sociocultural theory that focuses on students' interactions and considers learning as socially situated and aided by cultural tools [59].

This research investigated the effects of digital and printed texts on Iranian intermediate EFL learners' reading comprehension. The findings revealed that both modes of digital and printed texts developed EFL learners' reading comprehension, but the digital texts were more effective for improving reading comprehension. According to the obtained results, it can be concluded that incorporating digital materials into EFL classes can motivate students to learn better. Since educational situations are unavoidably affected by technological tools, it becomes vital to apply them in a planned and suitable manner. We offer that teachers also use reading activities with digital texts to develop the reading enhancement of EFL learners.

Due to the development and presence of technology in all aspects of our lives, digital texts are unavoidable in learning and teaching. The most effective approach is to use them as a supplement or a replacement for tools that instructors have previously implemented. The development of digital materials and the enormous influx of digital learning devices in recent years have changed how today's learners read and construct, communicate, and share information and knowledge. Digital materials can only be optimized if instructors understand the nature of digital reading, the characteristics, and the reading strategies that must be used to engage with digital materials. So, they can assist their students to enhance their digital reading proficiency.

6. Implications and Limitations of the Study

Some implications can be drawn from the findings of this study. The results of this study can inspire teachers to use more digital texts in their classes. Digital texts allow for convenience in reading because they are downloadable, make the content accessible offline, and available across multiple electronic instruments. Digital texts may also include interactive materials, such as video tutorials, but not included in printed instructional texts. Common examples include media content such as videos, interactive case studies, highlighting and annotating devices, and audio translations. Some digital texts, in addition, have interactive features that allow students and instructors to exchange highlight notes and ask questions to one another while reading the book. The inclusion of supplemental materials and collaborative learning capabilities in digital texts provides instructors with a chance to incorporate just-in-time learning experiences into their instructional processes. The findings of this study can allow teachers to add more interactive learning elements to their arsenal of educational devices. Students can be assigned online activities and assessments that are far more engaging and motivational than an average reading assignment.

This research can help students improve their reading comprehension by using digital texts. With movability being a benefit, learners can be more likely to bring digital texts and textbooks to classes because they are noticeably more mobile than their conventional printed counterparts. Learners can take notes by copying and pasting content from

Table 5: Paired samples *t*-test: comparing the reading pretest and posttest of each group.

		Paired differences					*t*	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference				
					Lower	Upper			
Pair 1	CG pre/post	−1.66	1.93	0.35	−2.38	−.94	−4.71	29	0.00
Pair 2	EG pre/post	−2.26	2.08	0.38	−3.04	−1.48	−5.95	29	0.00

digital textbooks, making it easier for them to take notes. Furthermore, when course information is placed into a tool, participants are relieved of the burden of lugging hefty textbooks in their backpacks. It makes their life simpler since they can carry all of their math, language arts, social studies, science, and other textbooks on a single tablet. The portability of the digital materials permits students to read and study their lessons whenever and wherever they like. Many students want to use digital books since they can share the content. Unlike printed books, it is desirable to simultaneously share these digital books with different readers. Thus, it is crucial to note that these digital books have enabled students to collaborate with their teachers in real time. Digital texts or books can be accessed from anywhere, on any device. Multiple textbooks can fit within a single phone or tablet. Even better, online textbooks are never out of stock when students need them. Digital materials enable students to collaborate outside of the class and help them share knowledge, ideas, and learning opportunities with those students that cannot visit personally.

The results of this investigation can be effective for the curriculum designers who make courses for EFL students with different levels of abilities. In designing courses for language students, it is offered that curriculum designers integrate digital texts and activities to allow the students to enjoy their learning. In doing so, the curriculum developers should bear in mind to include digital materials that are attractive and portable. The findings of this research may help the curriculum designers to enrich the instructional environments by utilizing the facilities provided by the technology.

This study has some drawbacks; one of them is that it included only 50 participants; therefore, the result cannot be generalized to many EFL learners. Furthermore, this study was conducted during ten sessions; in fact, the duration of the treatment was short. The participants in this study were intermediate students, so the results may not be generalizable to other levels. The study participants were between 21 and 35 years old; the generalization of the results to different age ranges should be made with great care. Only quantitative data were collected in this study; gathering qualitative data was neglected.

Future studies are advised to include more training sessions to examine the effects of digital and printed texts on EFL learners' reading comprehension. Future studies will need to determine whether the intervention is equally effective in other demographics and locations. The second advice for the prospective study is to involve more people to obtain more diverse and reliable results. Furthermore, both female and male students are encouraged to participate in research on the same subject. Future research can investigate the impacts of digital and printed texts on different ages and levels to get more reliable results.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

[1] N. J. Anderson, *The Role of Metacognition in Second/foreign Language Teaching and Learning. ERIC Digest*, ERIC Clearinghouse on Languages and Linguistics, Washington, DC, USA, 2003.

[2] W. B. Elley, "Acquiring literacy in a second language: the effect of book-based programs," *Language Learning*, vol. 41, no. 3, pp. 375–411, 1991.

[3] B. Mikulecky, "Teaching reading in a second language," 2008, http://www.longmanhomeusa.com/content/FINAL-LO%20RES-Mikulecky%20Reading%20%20Monograph%20.pdf%3e.

[4] J. Coiro, "Reading comprehension on the Internet: expanding our understanding of reading comprehension to encompass new literacies," *The Reading Teacher*, vol. 56, pp. 458–464, 2003.

[5] M. H. Alkawaz, M. T. Veeran, and R. Bachok, "Digital image forgery detection based on expectation maximization algorithm," in *Proceedings of the 2020 16th IEEE International Colloquium on Signal Processing & its Applications (CSPA)*, pp. 102–105, IEEE, Langkawi, Malaysia, February 2020.

[6] S. Dissaneevate, T. Wongsirichot, P. Siriwat et al., "A mobile computer-aided diagnosis of neonatal hyperbilirubinemia using digital image processing and machine learning techniques," *International Journal of Innovative Research and Scientific Studies*, vol. 5, no. 1, pp. 10–17, 2022.

[7] C. D. W. Jayawardena, A. Ahmad, and A. A. Jaharadak, "Synthesis of digital transformation beyond technology perspective: digital strategy, leadership & culture," *Journal of Critical Reviews*, vol. 7, no. 10, pp. 349–357, 2020.

[8] P. Pardede, "Print vs digital reading comprehension in EFL: a literature review," *JET (Journal of English Teaching)*, vol. 5, no. 2, pp. 77–90, 2019.

[9] J. B. Levy, "Reading in the digital age: a review of "words on screen"," 2017, https://ssrn.com/abstract=3063497.

[10] R. Giebelhausen, "The paperless music classroom," *General Music Today*, vol. 29, no. 2, pp. 45–49, 2015.
[11] S. Ghory and H. Ghafory, "The impact of modern technology in the teaching and learning process," *International Journal of Innovative Research and Scientific Studies*, vol. 4, no. 3, pp. 168–173, 2021.
[12] Y. K. Usluel, "Social network usage," in *Social Networking and Education, Lecture Notes in Social Networks,*, vol. 5, pp. 213–222, Springer International Publishing, New York, NY, USA, 2016.
[13] S. D. Krashen, *Explorations in Language Acquisition and use: The Taipei Lectures*, Pearson Education, London, UK, 2003.
[14] H. Y. Chen, "Online reading comprehension strategies among general and special education elementary and middle school students," Doctoral Dissertation, Michigan State University, East Lansing, MI, USA, 2009.
[15] J. Coiro, "Predicting reading comprehension on the internet," *Journal of Literacy Research*, vol. 43, no. 4, pp. 352–392, 2011.
[16] A. Gunasinghe, J. A. Hamid, A. Khatibi, and S. M. F. Azam, "The viability of UTAUT-3 in understanding the lecturer's acceptance and use of virtual learning environments," *International Journal of Technology Enhanced Learning*, vol. 12, no. 4, pp. 458–481, 2020.
[17] A. Gunasinghe, J. Hamid, A. Khatibi, and S. Azam, "Does the Lecturer's innovativeness drive VLE adoption in higher education institutes? (a study based on extended UTAUT)," *Journal of Information Technology Management*, vol. 10, no. 3, pp. 20–42, 2018.
[18] J. Coiro, M. Knobel, C. Lankshear, and D. J. Leu, *Handbook of Research on New Literacies*, Routledge, Oxfordshire, England, 2008.
[19] D. A. Wagner, N. M. Castillo, K. M. Murphy, M. Crofton, and F. T. Zahra, "Mobiles for literacy in developing countries: an effectiveness framework," *Prospects*, vol. 44, no. 1, pp. 119–132, 2014.
[20] O. C. Gungoren, M. Bektas, E. Ozturk, and M. B. Horzum, "Tablet computer acceptance scale-validity and reliability study," *Egitim ve Bilim*, vol. 39, no. 176, pp. 69–79, 2014.
[21] V. Komis, M. Ergazaki, and V. Zogza, "Comparing computer-supported dynamic modeling and "paper & pencil" concept mapping technique in students' collaborative activity," *Computers & Education*, vol. 49, no. 4, pp. 991–1017, 2007.
[22] M. McCannon and T. B. Crews, "Assessing the technology needs of elementary school teachers," *Journal of Technology and Teacher Education*, vol. 8, no. 2, pp. 111–121, 2000.
[23] B. Boeglin-Quintana and L. Donovan, "Storytime using iPods: using technology to reach all learners," *TechTrends*, vol. 57, no. 6, pp. 49–56, 2013.
[24] E. Susilawati, I. Khaira, and I. Pratama, "Antecedents to student loyalty in Indonesian higher education institutions: the mediating role of technology innovation," *Educational Sciences: Theory and Practice*, vol. 21, no. 3, pp. 40–56, 2021.
[25] L. C. Larson, "Digital readers: the next chapter in e-book reading and response," *The Reading Teacher*, vol. 64, no. 1, pp. 15–22, 2010.
[26] E. M. Noam, "Will books become the dumb medium?" *Educom Review*, vol. 33, no. 2, 1999.
[27] S. Auman, "High school students' decisions to read print or electronic text: learning outcomes and preferences," Master's thesis, University of North Carolina, Chapel Hill, NC, USA, 2002.
[28] K. Fartash, S. M. M. Davoudi, T. A. Baklashova et al., "The impact of technology acquisition & exploitation on organizational innovation and organizational performance in knowledge-intensive organizations," *Eurasia Journal of Mathematics, Science and Technology Education*, vol. 14, no. 4, pp. 1497–1507, 2018.
[29] S. S. Al- Amir, *Computer-Based Testing vs. Paper-Based Testing: Establishing the Comparability of Reading Tests through the Evolution of a New Comparability Model in a Saudi EFL Context*, University of Essex, Colchester, England, 2009.
[30] F. F. James, "The electronic book and PDA: looking beyond the physical codex," 2008, http://www.scinet.cc/articles.
[31] A. Mangen, "Hypertext fiction reading: haptics and immersion," *Journal of Research in Reading*, vol. 31, no. 4, pp. 404–419, 2008.
[32] A. G. Bus and S. B. Neuman, *Multimedia Literacy Development*, Routledge, Oxfordshire, England, 2009.
[33] P. Van Den Broek, P. Kendeou, and M. J. White, "Cognitive processes during reading: implications for the use of multimedia to foster reading comprehension," in *Multimedia and Literacy Development*, G. Bus and S. Neuman, Eds., pp. 57–74, Routledge, Oxfordshire, England, 2009.
[34] T. Green and L. Maycock, "Computer- based IELTS," *Research Notes*, vol. 18, pp. 3–9, 2004.
[35] Y. Ozuru, K. Dempsey, and D. S. McNamara, "Prior knowledge, reading skill, and text cohesion in the comprehension of science texts," *Learning and Instruction*, vol. 19, no. 3, pp. 228–242, 2009.
[36] R. Ackerman, Y. Eshet, A. Caspi, S. Eden, and N. Geri, Eds., "The subjective feeling of comprehension and remembering accompanying text learning on-creen," *Learning in the Technological Era IV*The Open University of Israel, Raanana, Israel, 2009.
[37] D. J. Ayersman and W. Michael Reed, "Effects of learning styles, programming, and gender on computer anxiety," *Journal of Research on Computing in Education*, vol. 28, no. 2, pp. 148–161, 1995.
[38] S. M. M. Davoudi, K. Fartash, V. G. Zakirova et al., "Testing the mediating role of open innovation on the relationship between intellectual property rights and organizational performance: a case of science and technology park," *Eurasia Journal of Mathematics, Science and Technology Education*, vol. 14, no. 4, pp. 1359–1369, 2018.
[39] G. S. Machovec, "Books on the world wide web: issues and trends," *Information Intelligence*, vol. 16, no. 6-7, pp. 1–6, 1996.
[40] L. Foderato, "A digital age, students still cling to paper textbook," 2010, http://www.nytimes.com/2010/10/20/nyregion/%2020%20textbooks.html.
[41] J. A. Hamid, S. M. Ferdous Azam, and S. M. Shukri, "Influence of food safety concerns and perceived value among working adult population in Malaysia," *Systematic Reviews in Pharmacy*, vol. 11, no. 1, pp. 799–807, 2020.
[42] P. Pirolli, *Information Foraging Theory: Adaptive Interaction with Information*, Oxford University Press, Oxford, UK, 2007.
[43] L. Hawkes, C. Murphy, and J. Law, *The Theory and Criticism of Virtual Texts: An Annotated Bibliography*, Greenwood Publishing Group, Westport, CT, USA, 2001.
[44] R. Land and S. Bayne, *Digital Difference: Perspectives on Online Learning*, Springer Science and Business Media, Berlin, Germany, 2011.
[45] E. Cheek and E. Ortlieb, *Theoretical Models of Learning and Literacy Development*, Emerald Group Publishing, Bingley, UK, 2014.
[46] K. Sage, H. Augustine, H. Shand, K. Bakner, and S. Rayne, "Reading from print, computer, and tablet: equivalent

learning in the digital age," *Education and Information Technologies*, vol. 24, no. 4, pp. 2477–2502, 2019.

[47] S. KazazoĞLu, "Is printed-text the best choice? A mixed-method case study on reading comprehension," *Dil ve Dilbilimi Çalışmaları Dergisi*, vol. 16, no. 1, pp. 458–473, 2020.

[48] Y. H. Lin, M. R. A. Chen, and H. L. Hsu, "Fostering low english proficiency learners' reading in a freshman EFL reading class: effect of using electronic and print textbooks on Taiwanese University students' reading comprehension," *International Journal of English Linguistics*, vol. 11, no. 1, pp. 54–67, 2021.

[49] J. Hassaskhah, B. Barekat, and N. Farhang Asa, "Reading performance of Iranian EFL learners in paper and digital texts," *The Journal of Teaching Language Skills (JTLS)*, vol. 6, no. 1, pp. 1–21, 2014.

[50] S. Hussain, M. Minaz, N. Ahmad, and N. Idris, "Reading on students' comprehension and retention power," in *Proceedings of the International Conference on Computational and Social Sciences*, Johor Bahru, Malaysia, August 2015.

[51] S. Kaman and I. Seyit Ertem, "The effect of digital texts on primary students' comprehension, fluency, and attitude," *European Journal of Educational Research*, vol. 76, pp. 147–164, 2018.

[52] J. Park and J. Lee, "Effects of E-books and printed books on EFL learners' reading comprehension and grammatical knowledge," *English Teaching*, vol. 76, no. 3, pp. 35–61, 2021.

[53] R. S. Akbar, H. A. Taqi, A. A. Dashti, and T. M. Sadeq, "Does e-reading enhance reading fluency?" *English Language Teaching*, vol. 8, no. 5, pp. 195–207, 2015.

[54] M. H. Schneps, J. M. Thomson, G. Sonnert, M. Pomplun, C. Chen, and A. Heffner-Wong, "Shorter lines facilitate reading in those who struggle," *PLoS One*, vol. 8, no. 8, Article ID e71161, 2013.

[55] H. E. Fard and N. Nabifar, "The effect of computer assisted language learning on reading comprehension in Iranian EFL context," *Journal of Academic and Applied Studies*, vol. 5, pp. 1–8, 2011.

[56] T. M. Bhatti, "Teaching reading through computer assisted language learning," *The Electronic Journal for English as a Second Language*, vol. 17, no. 2, pp. 1–11, 2013.

[57] H. C. Huang, "Online versus paper-based instruction: comparing two strategy training modules for improving reading comprehension," *RELC Journal*, vol. 45, no. 2, Article ID 165180, 2014.

[58] L. Harasim, *Learning Theory and Online Technologies*, Routledge, Oxfordshire, England, 2012.

[59] M. Cole and J. V. Wertsch, "Beyond the individual-social antinomy in discussions of piaget and vygotsky," *Human Development*, vol. 39, no. 5, pp. 250–256, 1996.