Children’s Reading Comprehension and Motivation on Screen Versus on Paper

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Abstract
The young generation, born into digital technologies and called Millennials or the Y-Generation, are raised in a world where everybody has a computer in their pockets (Hamari et al., 2014), and they are constantly engaged in digital activities. However, research on the impact of digital devices on learners’ educational performance and motivation is still an emerging field. This article aims to examine perceptions of the sixth-grade students in Turkey of their e-reading experiences on the basis of their personalized/gamified/PDF electronic reading practices in school and the influences of their perceptions on their reading comprehension and levels of motivation in English as a foreign language (EFL) classroom. The study follows a quasi-experimental approach with four treatment groups and a control group, involving 96 sixth-grade state school students in Turkey. The three treatment groups read in order from the personalized/gamified/PDF electronic reading for 5 weeks whereas the control group used printed guided reading program. The results indicate that EFL learners’ use of screen reading has the potential to increase reading motivation of the students. However, no significant difference was observed in their reading comprehension levels despite the use of different reading medium in control and experimental groups.

Keywords
gamification, screen reading, personalized reading, electronic story book reading, EFL learners

Introduction
The link between technology and learning has become more and more evident in recent times. Our learning is accelerated through the implementation of educational technologies in a wide range of contexts such as industry, charity, health, and education (Mullis et al., 2012). In addition, Tyner (2014) also mentions that the nature of reading changes in a fast pace when new technologies enter our lives and our learning environments. Mullis et al. (2012) contend that a technologically literate population is a hallmark of any country which is looking to achieve sustainable and successful development, and that reading has a vital role in this context because (a) it is essential to anyone who would like to acquire a skill; (b) it allows people to remain on top of the recent relationships; and (c) this guides the trajectories of life and ensures the involvement of the broader population in public engagement.

Teachers of this age, teaching technologically immersed groups of learners, inevitably look for a method to take their interest in reading. As the educators of the digital age, it is crucial to discover the possible benefits of technology enhanced learning and instruction.

Unwillingness to read in the target language is a common problem that language teachers have been facing recently (Arnold, 2009). As the attitude and confidence of young children while reading have been shown to predict the success of their later reading (McGeown et al., 2015), motivating students to read has become a necessity and a challenge which is frequently encountered by teachers of, especially, adolescent learners.

Reading comprehension is one of the most critical skills a foreign language learner, especially a Language Learner, needs to acquire (Grabe, 2009). Once learners improve their reading skills, they continue to make more progress in other language skills. As mentioned earlier, young children’s reading attitudes and confidence have been shown to predict their later reading success (McGeown et al., 2015). Early reading assists the development of the children’s language skills (Dickinson et al., 2012), which in turn supports wider educational attainment (Sullivan & Brown, 2013).

Through using online books provided through Razplus, which were adapted to a personalized electronic reading environment, the purpose of this study was to suggest that the implementation of personalized electronic reading lessons is effective in improving reading comprehension as it can

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provide English as a foreign language (EFL) learners with personalized versions of texts and reduce cognitive load.

Young children are increasingly reading from their digital devices, with the growing usage of digital technology in classrooms (Barzillai & Thomson, 2018). Therefore, it is useful to understand how children’s comprehension of reading varies when reading texts on screens compared with reading them in print. The fact that international tests (PIRLS2 and PISA3) are digitized (Backes & Cowan, 2018) has created a significant incentive for this research. Until now, a limited number of studies have examined the impact of the reading medium on reading comprehension of children (Halamish & Elbaz, 2019; Kerr & Symons, 2006). This research aims to bring a new perspective by broadening the studies conducted on the use of gamified electronic book reading and personalized electronic book reading to enhance the reading performance of sixth-year students within Turkish EFL setting. Moreover, this study aims to provide insights as to the feasibility of the implementation of personalized and gamified e-book reading strategies in state schools. Finally, the researcher hopes to provide a road map for the teachers, administrators, parents, and schools willing to employ personalized and gamified e-book reading strategies in their classrooms, schools, and houses. The main goal of this research is to discover if personalized electronic book reading and gamified e-book reading have positive effects on children’s reading comprehension skills and reading motivation in EFL classes.

The Influence of Personalized Electronic Book Reading

Personalized electronic book reading is tailored for or by a specific child. The main purpose of the personalized books is to support children in reading and experiencing fictional narratives. Personalized reading systems typically aim to teach children new concepts or provide them with a set of tailored reading experiences (Kucirkova, 2017). According to Kucirkova and Littleton (2016), personalized e-reading elements offer a variety of activities such as listening to the story, recording one’s voice, getting immediate feedback and help when students do not understand, highlighting text, use of hotspots, reading to the student, and story authorship. Kucirkova and Littleton (2016) also explain that the child’s name can be designated as the main protagonist or other story characters can bear the names of the child’s friends/relatives. Students might interact with the story elements in ways that are unique to them such as creating their avatars and use it as the protagonist of the book. With the help of personalized electronic reading elements, children can create meaningful and enjoyable stories.

However, personalized electronic books might have some limitations. Interactive elements that are used in personalized electronic books such as hotspots and games might interfere with children’s understanding of the story and might result in cognitive overload (Bus et al., 2014). Kucirkova (2017) does not advise the use of only personalized electronic books for children.

The Influence of Gamified Electronic Reading

Gamified e-books offer young readers the experience of exploring the world of literature. And educators have been benefiting from the power of gamification to encourage engagement. Khan Academy, which is a free-to-use learning tool that features lectures on topics from mathematics to music and uses the badge system to demonstrate mastery of subjects, can be given as an example. Teachers also implement award schemes to reward successful accomplishments in the classroom. The textbook publishers also exploit the benefits of gamification. For example, the “Connect” program of McGraw-Hill publishing provides online activities to accompany textbooks; these activities also feature a score and a leader board so that the students can compare the points they received with the scores of their peers or their own personal best. Morford et al. (2014) claimed that gameplay elements such as the direct impact of a player on the outcomes of the game, specific end goals, rules of play, and the development of strategies to complete the tasks help to stimulate students in three ways. First, gaming components can be motivating on a social basis by providing incentives for team participants to cooperate or to compete with other teams. Subsequently, academic games are emotionally rewarding when students receive prizes and input, as they get absorbed in the activities of the game. Eventually, to achieve these properties, the game needs to be challenging enough to include students without overwhelming them.

Motivation is another issue teachers need to tackle in the 21st century. Baker and Wigfield (1999) identified subfactors of reading motivation as recognition, competition, self-efficacy, curiosity, and social and general reading motivation. Moody et al. (2010) indicate that interactive features raise the interest and excitement of children in reading therefore stimulating the participation of children in reading books. It is possible to state that more and more children have started to read online as it offers a fun and interactive reading environment. Research by Jones and Brown (2011) shows that engagement in reading refers to the level of interest and the amount of time spent by children, while reading books is also associated with the growth of literacy skills. In addition, another study also indicates that reading engagement is correlated with reading motivation and reading interventions can predict future reading achievement and progress (Justice et al., 2003). It can be concluded that if students are encouraged to read in the early years by their families and teachers, as they are more motivated in those years, it will highly contribute to their future reading achievement.
Research Questions

This research aims to answer the following questions:

Research Question 1 (RQ1): Is there a statistically significant difference between the reading motivation levels of sixth-grade EFL learners who are exposed to gamified e-book reading, personalized e-book reading, PDF e-book reading, and of the ones engaged in printed book reading?

Research Question 2 (RQ2): Is there a statistically significant difference between the reading comprehension abilities of sixth-grade EFL learners who are exposed to gamified e-book reading, personalized e-book reading, PDF e-book reading, and of the ones engaged in printed book reading?

Method

This study is part of a doctoral dissertation. The main purpose of this study was to determine the influences of electronic book reading on reading comprehension skills and reading motivation levels of sixth-grade EFL students at a state school in Istanbul, Turkey. In this quasi-experimental study, data were gathered through pre- and post-tests of reading comprehension and a 4-point Likert-type reading motivation scale. Random sampling was not used in this design due to feasibility reasons. The groups that were present were matched for certain features and participants were randomly assigned to the groups. However, it still did not guarantee that these groups were equivalent.

Design

The effects of four e-book treatments were examined within four experimental conditions.

All groups were given 2 hr of training before they started the study. They read a fictional story which was selected to practice specific skills such as: (a) asking and answering questions about key details in a text; (b) retelling a story; (c) describing characters, settings, and major events in a story using key details; and (d) using illustrations and details in a story to describe its characters, settings, and events.

Gamified Reading Group (n = 24)

They used an online reading program called Raz-Kids, which was presented for 5 weeks in 90-min sessions each. All 24 students in the group were required to log in to the program during each session. Each child had their own username and password, and the software was set to their level of reading. The timer was set at 90 min for students to listen, read, and take quizzes on the books appropriate for their level. During these lessons, the other features of the program were not allowed to be controlled and, students were given training in class to develop reading fluency and comprehension skills before the experiment for guided reading.

Personalized E-Book Reading Group (n = 24)

They had a 5-week long personalized reading program. It was provided individually for 90-min sessions each week. All 24 students were required to log in to the program during each session. Every child had their own login name and password, and the program was adjusted to their level of reading. The timer was set at 90 min, during which students read and took quizzes on level-appropriate books. During these sessions, they were not allowed to access the features of the play. However, before the research for guided reading, students were given instruction on how to develop reading fluency and comprehension skills.

PDF Guided Reading Program (n = 24)

It was provided individually for 90 min in each session, for a duration of 5 weeks. During each session, each of the 24 students opened a folder and read the book from the screen. The timer was set to 90 min, during which students read and took quizzes on the books designated for their level. They were not allowed to access any other page other than the pdf file during these sessions.

Printed Guided Reading Program (n = 24)

It was provided individually for 90 min in each session and lasted 5 weeks. During each session, the teacher handed out the printed book and questions to each one of the 24 students. The timer was set to 90 min, during which guided reading activities were conducted and students took quizzes on the books designated for their level.

Participants

The study was conducted with sixth-year primary school students (N = 96) of an EFL classroom, in a state school in Turkey, during the 2019–2020 academic year. The EFL program which the participants of the present study are exposed to is a four-skill integrated curriculum for three lesson hours each week with a Turkish EFL teacher. In addition to that, they were exposed to a communicative skills (CS) curriculum for two lesson hours per week with a native English speaker teacher. The experiment was carried out as an in-class activity and 90 min (two lesson hours) was allocated for each book every week. The participants’ ages varied between 11 and 12. For the purposes of the study, a state school which had at least four sixth-grade classes with 24 students in each classroom was selected. Each class had a Turkish EFL teacher and the researcher, who is an experienced EFL teacher, was also present during the sessions.
The assessment primarily utilized to assess the progress of the students is summative assessment, even though the teachers themselves may sometimes apply formative evaluations. As for participants of the study, the students are young learners who study at Istanbul, Turkey, at a public secondary school. At the time of the study, their common level of English proficiency was A1+, although each differs greatly in their learning profiles, the talent they have for acquiring a foreign language, and their areas of interest.

**Intervention Material**

Five books from Raz-kids was chosen: (a) *Brainstorm Bear*, (b) *Different*, (c) *My Bones*, (d) *If I Were in Charge*, and (e) *John’s Stop Sign*. Children performed the activities individually on a desktop computer, with a headset and an attached mouse. All assessments were given in printed form and the researcher entered the responses on an excel file.

**Data Collection Instruments and Procedures**

**English Proficiency Test**

For this study, the Cambridge Movers Sample Test was used at the time of the analysis to assess the students’ current level of English. The evaluation was performed by both the researcher and another experienced teacher working at the same school, teaching the same students. After both scorers completed evaluating all the proficiency tests separately, they worked together to compare, explain, and negotiate their scores to ensure interrater reliability.

**Reading Comprehension Tests**

Reading comprehension tests were used to assess the students’ level of comprehension after reading each story. Reading comprehension tests were developed to compare reading comprehension of the students on the content of the 5 weeks of the electronic reading course by field experts. The reading comprehension tests created included elements such as vocabulary, story elements, problem and solution, analyzing details, identifying main idea and details, and overall reading comprehension scores. The level of each book was associated with other common leveling programs like Developmental Reading Assessment, Lexile, and Reading Recovery.

**Reading Motivation Questionnaire**

A 4-point Likert-type reading motivation questionnaire which was developed by Baker and Wigfield (1999) to investigate the impact of the gamified reading courses before and after the experiment was utilized in this study. Reading motivation questionnaire was used to assess the students’ reading motivation before (pre-test) and after the treatment (post-test) to determine whether there was a significant change in the learners’ reading motivation. The questionnaire was administered by the researcher in the classroom. Before the children answered the survey, they were told that they should answer questions about their reading, and that the questions had no correct or incorrect answers. Children were asked to respond to each item on a scale of 1 to 4, with choice of answers ranging from (1) very different from me to (4) a lot like me. They were given some time to read the questions on their own. They completed the Motivation for Reading Questionnaire (MRQ) approximately in 7 min (Table 1). Reading motivation scores has subfactors such as recognition, competition, self-efficacy, social, curiosity, and general reading motivation. The data obtained from the pilot study were analyzed descriptively via SPSS 22 to determine internal consistency reliability and Cronbach’s alpha coefficient indicated the questionnaire, to reach excellent reliability, $\alpha = .91$.

**Procedure**

The researcher conducted Cambridge Movers English Proficiency test to assess the student’s English proficiency levels. To ensure that the test was level-appropriate for the participants, a sample test was piloted in another class of sixth graders, which had 24 students. After completion of the piloting process and analyzing the results, the sample test was administered simultaneously to all four participant groups, and the analysis lasted about 65 min. The intervention and assessments took place in class; a quiet, not distracting environment was ensured. Intervention started the following week, and each week students read one fictional storybook. Children worked alone through an e-book during the intervention. After reading each book, students answered 10 reading comprehension questions. During the sessions, classroom teacher and researcher were always present in the classroom. When the 5-week long intervention ended, students took “Reading Motivation Questionnaire” post-test.

**Results**

For the purposes of this study, quantitative data collection instruments were used. The quantitative data were collected via Reading Comprehension scores and Reading Motivation questionnaire pre- and post-test scores of the students. The data gathered from each instrument were tabulated and analyzed statistically using SPSS (Statistical Package for Social Sciences) 22.0 version for Windows. In the analysis of quantitative data, the Kruskal–Wallis test, Mann–Whitney $U$ test, and Wilcoxon test were used in dependent groups. The Wilcoxon test is a non-parametric alternative to dependent $t$-test, which is a parametric test. As the participants in the study were limited in number, non-parametric tests were used in this study. The distribution of descriptive features by groups
were compared with chi-square analysis. Kruskal–Wallis test was used “to compare quantitative continuous data between groups” (Creswell, 2012). After the Kruskal–Wallis test, the Mann–Whitney U test was used as a complement to determine the differences. A significant difference was observed between the groups. The significance level was determined as \( p < .05 \) for the interpretation of the data obtained from the research. The change between repeated measurements in the group was analyzed with the Wilcoxon test.

### Findings About the Effects of Different Reading Environments on Reading Motivation Levels

A comparative analysis was conducted and the between-group statistics were tabulated to discover whether there was a difference between the reading motivation scores of the groups due to the different reading environments: printed book reading, gamified e-book reading, personalized e-book reading, and PDF e-book reading. In Table 2, the examination of reading motivation measurement invariance at groups can be analyzed.

Post self-efficacy scores of the students differ significantly between the groups, \( \chi^2(3) = 44,681, p = .000 < .05 \). It was observed that post-treatment self-efficacy scores of the participants who were given personalized e-book treatment (\( M = 3,604 \)) were higher than the self-efficacy scores of the ones who were exposed to PDF e-books (\( M = 2,865 \)). And post-treatment self-efficacy scores of the participants who were given gamified e-book treatment (\( M = 3,604 \)) were higher than the self-efficacy scores of the ones who were exposed to printed books (\( M = 2,573 \)). Data analysis also showed that post-treatment self-efficacy scores of the participants who were given gamified e-book treatment (\( M = 3,469 \)) were higher than the self-efficacy scores of the ones who were exposed to PDF e-books (\( M = 2,865 \)). And post-treatment self-efficacy scores of the participants who were given gamified e-book treatment (\( M = 3,604 \)) were higher than the self-efficacy scores of the ones who were exposed to printed books (\( M = 2,573 \)).
Table 2. Examination of Reading Motivation Measurement Invariance at Groups.

| Groups                      | Personalized e-book reading group (n = 24) | PDF e-book reading group (n = 24) | Gamified e-book reading group (n = 24) | Printed book reading group (n = 24) | KW     | p       | D       |
|-----------------------------|-------------------------------------------|----------------------------------|--------------------------------------|-----------------------------------|--------|---------|--------|
|                             | \(M\) | SD     | \(M\) | SD     | \(M\) | SD     | 10,746 | .115   | 1 > 2 |
| Pre self-efficacy           | 2.806 | .722   | 2.733 | .674   | 2.821 | .730   | 2.719  | .632   | 1 > 4 |
| Post self-efficacy          | 3.604 | .337   | 2.865 | .707   | 3.469 | .356   | 2.873  | .463   | 3 > 2 |
|                             |        |        |       |        |       |        |        |        | 3 > 4 |
| Pre competition             | 2.915 | .672   | 2.979 | .847   | 2.940 | .657   | 2.900  | .000   | 10,877 | .123  |
| Post competition            | 3.115 | .672   | 2.979 | .847   | 3.854 | .232   | 2.177  | .239   | 50,130 | .000  |
|                             |        |        |       |        |       |        |        |        | 3 > 1 |
|                             |        |        |       |        |       |        |        |        | 1 > 4 |
|                             |        |        |       |        |       |        |        |        | 3 > 2 |
|                             |        |        |       |        |       |        |        |        | 3 > 4 |
| Pre curiosity               | 2.417 | .793   | 2.325 | .542   | 2.375 | .711   | 2.367  | .229   | 10,435 | .321  |
| Post curiosity              | 2.948 | .532   | 2.146 | .483   | 2.927 | .334   | 2.146  | .194   | 55,390 | .000  |
|                             |        |        |       |        |       |        |        |        | 1 > 2 |
|                             |        |        |       |        |       |        |        |        | 1 > 4 |
|                             |        |        |       |        |       |        |        |        | 3 > 2 |
|                             |        |        |       |        |       |        |        |        | 3 > 4 |
| Pre compliance              | 3.013 | .412   | 3.063 | .428   | 3.021 | .420   | 3.027  | .423   | 10,882 | .112  |
| Post compliance             | 3.552 | .321   | 3.104 | .776   | 3.021 | .737   | 2.438  | .111   | 33,268 | .000  |
|                             |        |        |       |        |       |        |        |        | 1 > 3 |
|                             |        |        |       |        |       |        |        |        | 1 > 4 |
|                             |        |        |       |        |       |        |        |        | 2 > 4 |
|                             |        |        |       |        |       |        |        |        | 3 > 4 |
| Pre social                 | 2.760 | .732   | 2.727 | .597   | 2.769 | .631   | 2.750  | .000   | 10,118 | .018  |
| Post social                | 3.052 | .383   | 3.019 | .548   | 3.094 | .482   | 2.813  | .111   | 13,891 | .003  |
|                             |        |        |       |        |       |        |        |        | 1 > 4 |
|                             |        |        |       |        |       |        |        |        | 2 > 4 |
|                             |        |        |       |        |       |        |        |        | 3 > 4 |
| Pre recognition            | 3.061 | .510   | 3.069 | .491   | 3.069 | .411   | 3.072  | .353   | 10,024 | .115  |
| Post recognition           | 3.361 | .510   | 3.069 | .491   | 3.569 | .411   | 2.472  | .353   | 44,024 | .000  |
|                             |        |        |       |        |       |        |        |        | 1 > 2 |
|                             |        |        |       |        |       |        |        |        | 1 > 4 |
|                             |        |        |       |        |       |        |        |        | 3 > 2 |
|                             |        |        |       |        |       |        |        |        | 2 > 4 |
|                             |        |        |       |        |       |        |        |        | 3 > 4 |
| Pre general reading motivation | 2.568 | .270   | 2.590 | .470   | 2.312 | .242   | 2.435  | .132   | 10,152 | .232  |
| Post general reading motiva| 3.268 | .270   | 2.890 | .470   | 3.312 | .242   | 2.435  | .132   | 51,152 | .000  |

Note. KW = Kruskal–Wallis.
*p < .05 Kruskal–Wallis H Test.

Post competition scores of the students differ significantly between the groups, \(\chi^2(3) =50,130, p = .000 < .05\). Analysis of the data showed that post competition scores of participants who were exposed to gamified e-book reading \((M = 3,854)\) were higher than the post competition scores of participants who had the personalized e-book reading treatment \((M = 3,115)\). Comparing the post competition scores of participants who were exposed to gamified e-book reading \((M = 3,854)\) with the scores of the ones who had PDF e-book treatment \((M = 2,979)\) showed the former to be the higher one. Post competition scores of participants who were exposed to gamified e-book reading \((M = 3,854)\) were also higher than the scores of the participants who were given printed book treatment \((M = 2,177)\). The comparison of the post competition scores of participants who were given personalized e-book reading treatment \((M = 3,115)\) to the scores of participants who were given printed book treatment \((M = 2,177)\) indicated that the former is higher. And finally post competition scores of participants who were exposed to PDF e-book reading \((M = 2,979)\) were also higher than the scores of the participants who were given printed book treatment \((M = 2,177)\).
Table 3. Descriptive Statistics of the Groups’ Reading Comprehension.

| Groups                        | Personalized e-book reading group (n = 24) | PDF e-book reading group (n = 24) | Gamified e-book reading group (n = 24) | Printed book reading group (n = 24) | KW   | p     | D     |
|-------------------------------|-------------------------------------------|-----------------------------------|---------------------------------------|-----------------------------------|------|-------|-------|
| First-week story elements     | 0.830 .381                                | 0.710 .464                        | 0.710 .464                            | 0.710 .464                        | 1,445 .695 |      | 3 > 1 |
| Fifth-week story elements     | 0.580 .504                                | 0.790 .415                        | 0.960 .204                            | 0.790 .415                        | 9,832 .020 | 3 > 1 | 1 > 2 |
| First-week main idea and details | 0.880 .338                            | 0.960 .204                        | 0.790 .415                            | 0.710 .464                        | 5,938 .115 | 3 > 2 | 4 > 3 |
| Fifth-week main idea and details | 0.830 .381                            | 0.830 .381                        | 0.880 .338                            | 0.670 .482                        | 3,831 .280 |      |      |
| First-week problem and solution | 0.920 .282                        | 0.500 .511                        | 0.830 .381                            | 0.920 .282                        | 17,000 .001 | 3 > 2 | 4 > 3 |
| Fifth-week problem and solution | 0.750 .442                        | 0.580 .504                        | 0.830 .381                            | 0.830 .381                        | 5,278 .153 | 4 > 1 | 2 > 1 |
| First-week analyze character  | 0.620 .495                                | 0.830 .381                        | 0.670 .482                            | 0.710 .464                        | 2,794 .424 | 4 > 2 | 3 > 3 |
| Fifth-week analyze character  | 0.960 .204                                | 0.790 .415                        | 0.880 .338                            | 0.880 .338                        | 3,016 .389 |      |      |
| First-week vocabulary         | 0.620 .495                                | 0.750 .442                        | 0.670 .482                            | 0.960 .204                        | 8,356 .039 |      |      |
| Fifth-week vocabulary         | 0.580 .504                                | 1.000 .000                        | 0.460 .509                            | 0.960 .204                        | 27,708 .000 | 4 > 3 |      |

Note. KW = Kruskal-Wallis.

Post curiosity scores of the students showed a significant difference between the groups, $\chi^2(3) = 55,390, p = .000 < .05$. Post curiosity scores of the gamified e-book reading group ($M = 2,948$) were observed to be higher than those of the PDF e-book reading group ($M = 2,146$). And it was also seen that post curiosity scores of the personalized e-book reading group ($M = 2,948$) were higher than those of printed book reading group ($M = 2,146$). The comparison of the post curiosity scores of gamified e-book reading group ($M = 2,927$) with PDF e-book reading group’s post curiosity scores ($M = 2,146$) showed the former to be higher than the latter. And finally gamified e-book reading participants’ post curiosity scores ($M = 2,927$) were also seen to be higher than printed book reading group’s post curiosity scores ($M = 2,146$).

Post compliance scores of the students differ significantly among the groups, $\chi^2(3) = 33,268, p = .000 < .05$. Personalized e-book reading participants’ post compliance scores ($M = 3,552$) were seen to be higher than gamified e-book reading participants’ post compliance scores ($M = 3,021$). The scores of participants who were immersed in personalized e-book reading ($M = 3,552$) were also showed to be higher when compared with the post curiosity scores of the participants who were exposed to printed book reading ($M = 2,438$). Post compliance scores of both PDF e-book reading group ($M = 3,104$) and gamified e-book reading group ($M = 3,021$) were observed to be higher than printed book reading group’s post curiosity scores ($M = 2,438$).

Post social scores of the students differ significantly between the groups, $\chi^2(3) = 13,891, p = .003 < .05$. Post social scores of personalized e-book reading participants ($M = 3,052$) were seen to be higher than those of printed book reading participants ($M = 2,813$). It was also observed that post social scores of both the PDF e-book reading participants ($M = 3,219$) and gamified e-book reading participants ($M = 3,094$) were higher than printed book reading participants’ post social scores ($M = 2,813$).

Post recognition scores of the students differ significantly between the groups, $\chi^2(3) = 44,024, p = .000 < .05$. Post recognition scores of gamified e-book reading students ($M = 3,361$) were observed to be higher than those of the PDF e-book reading students ($M = 3,069$). And post recognition scores of the personalized e-book reading group ($M = 3,361$) were higher compared with the scores of the printed book reading group ($M = 2,472$). Gamified e-book reading group’s post recognition scores ($M = 3,569$) were also higher than PDF e-book reading group’s post recognition scores ($M = 3,069$). Analysis also showed that post recognition scores of both the PDF e-book reading participants ($M = 3,069$) and gamified e-book reading participants ($M = 3,569$) were higher than printed book reading participants’ post recognition scores ($M = 2,472$).

Finally, post general reading motivation scores of the students also differ significantly between the groups, $\chi^2(3) = 51,152, p = .000 < .05$. Post general reading motivation scores of participants who were given personalized e-book reading treatment ($M = 3,268$) were observed to be higher than those who were given PDF e-book reading treatment ($M = 2,890$). And post general reading motivation scores of participants exposed to personalized e-book reading ($M = 3,268$)
were seen to be higher than the post general reading motivation scores of participants who were exposed to printed book reading ($M = 2.435$). Data analysis also indicated that gamified e-book reading participants’ post general reading motivation scores ($M = 3.312$) were higher than PDF e-book reading participants’ post general reading motivation scores ($M = 2.890$). And finally, post general reading motivation scores of both PDF e-book reading participants ($M = 2.890$) and gamified e-book reading ones ($M = 3.312$) were seen to be higher when compared with the scores of printed book reading participants ($M = 2.435$).

**Findings About the Effects of Different Reading Environments on Reading Comprehension**

This part shows the reading comprehension performance of the groups in the experiment. A comparative analysis was carried out and the between-group statistics were interpreted to discover whether there was a difference between the reading comprehension scores of the groups due to the different reading environments: printed book reading, gamified e-book reading, personalized e-book reading, and PDF e-book reading. In Table 3, the descriptive statistics of the groups’ reading comprehension can be found.

The problem and solution scores of the students in the first week differed significantly between the groups, $\chi^2(3) = 17.00, p = .00 < .05$. Personalized e-book reading participants’ problem and solution first-week scores ($M = 0.92$) were higher than pdf e-book reading group’s problem and solution scores ($M = 0.50$). And gamified e-book reading group’s first-week problem solution scores ($M = 0.83$) were seen to be higher than those of pdf e-book reading group ($M = 0.50$). Also, printed e-book reading group’s first-week problem solution scores ($M = 0.92$) were observed to be higher compared with pdf e-book reading group’s problem solution scores ($M = 0.50$).

Vocabulary scores of students in the first week differed significantly between the groups, $\chi^2(3) = 8.35, p = .03 < .05$. Printed book reading group’s vocabulary first-week scores ($M = 0.96$) were seen to be higher than personalized e-book reading group’s vocabulary first-week scores ($M = 0.62$). Printed book reading group’s vocabulary first-week scores ($M = 0.96$) were higher than pdf e-book reading group’s vocabulary first-week scores ($M = 0.75$). And printed book reading group’s vocabulary first-week scores ($M = 0.96$) were higher than gamified e-book reading group’s vocabulary first-week scores ($M = 0.67$).

The story elements scores of the students in Week 5 differed significantly between the groups, $\chi^2(3) = 9.83, p = .02 < .05$. It was observed that story elements scores of gamified e-book reading participants in Week 5 ($M = 0.96$) were higher than personalized e-book reading group’s story elements scores in Week 5 ($M = 0.58$).

Vocabulary scores of Week 5 also differed significantly among the groups, $\chi^2(3) = 27.70, p = .00 < .05$. Vocabulary scores of both the PDF e-book reading group ($M = 1.00$) and printed book reading group ($M = 0.96$) in Week 5 were higher compared with the vocabulary scores of personalized e-book reading group ($M = 0.58$). Also, both PDF e-book reading group’s ($M = 1.00$) and the printed book group’s vocabulary scores in Week 5 ($M = 0.96$) were seen to be higher than gamified e-book reading group’s vocabulary scores in Week 5 ($M = 0.46$).

According to the results of Kruskal–Wallis $H$ test conducted to determine whether subfactors of reading comprehension such as story elements, analyzing characters, main idea, and details, problem, and solution, there was not a statistically significant difference in terms of the group variable ($p > .05$).

When post general reading comprehension scores were compared with a Wilcoxon test for paired groups, no statistically significant difference between arithmetic averages was found ($p > .05$).

**Discussion**

The aim of this study was to understand the implications of different forms of reading (gamified e-book reading, personalized e-book reading, pdf e-book reading, and printed book reading) on the reading comprehension and motivation levels of sixth-grade EFL students.

**Discussion of the findings of RQ1**: Is there a statistically significant difference between the reading motivation levels of sixth-grade EFL learners who are exposed to gamified e-book reading, personalized e-book reading, PDF e-book reading (experimental group), and of the ones engaged in printed book reading (control group)?

The aim of the first research question was to test the impact of e-book reading lessons on sixth-grade EFL learners’ reading comprehension skills and reading time. The quantitative findings showed a substantial difference between the gain scores of the pre-test and post-test reading motivation survey. Namely, the implementation of both personalized e-book reading and gamified e-book reading lessons has had a very positive effect on the reading motivation of the students who participated in the study. The participants spent less time reading in both personalized e-book reading and gamified e-book reading lessons compared with PDF e-book reading and printed book reading classes. Jones and Brown (2011) state that electronic storybooks has become popular and they are good motivators for personal reading.

Judgments on self-efficacy appear to work out pretty well for student engagement and learning from digital texts, and there is some evidence to support self-judgment of students (Farah & Maybury, 2009; Mansor et al., 2013). Self-efficacy
expectations are another important factor in evaluating the level and achievement of the computer use by individuals (Deryakulu et al., 2008). Liman Kaban et al. (2019) claim that self-efficacy can be increased when students determine their individual learning goals, select their learning aids and actively use them for their learning. In the study conducted, the results correlate with findings of previous as it was found that self-efficacy scores of students who used personalized, gamified, and PDF e-book reading were higher than the printed book control group’s self-efficacy scores.

The researcher in this study also aimed to link motivation levels to reading performance of learners. As other researchers in educational technology argue, it was hypothesized that motivation will affect reading performance in the planning stage (Hull et al., 2013; Kneer & Glock, 2013). And, in this study, the hypothesis was not confirmed. It was inferred that this could be due to the poor performance and skill level of the students. The potential effects of gamified setting on results was not clearly observed as the majority of students displayed poor performance in reading performance with poor variability (floor effect). Consequently, it can be stated that learners could be encouraged to perform more fluent and enjoyable reading activities in their own levels both inside and outside the classroom. Besides, they could be instructed strategies required for developing their reading and L2 skills autonomously. However, it should be kept in mind that some young learners might not be familiar with reading EFL texts online and they might find it hard to engage themselves in reading in the first place. Therefore, piloting and collecting student feedback regarding online EFL experience might be of practical use before adopting such an implementation in EFL classroom. In addition, reliable and constant internet connection should be established and provided throughout the lessons in the school.

**Discussion of the findings of RQ2:** Is there a statistically significant difference between the reading comprehension abilities of sixth-grade EFL learners who are exposed to gamified e-book reading, personalized e-book reading, PDF e-book reading (experimental group), and of the ones engaged in printed book reading (control group)?

The current study also aimed at comparing the comprehension levels of students when reading digital text (PDF e-book reading, personalized e-book reading, and gamified e-book reading) and print text. The participating students were primary school sixth-grade EFL students. The three classes each read five fiction stories digitally and another class read in print. The data collected and analyzed were used to investigate the impacts of the type of text on comprehension scores. Results showed students scored were not higher on the assessments whether they read print text or when they read digital text. In other words, there was no statistically significant difference in scores between the groups. The findings correlate with some other studies which also found no difference between the effects of different reading medium on comprehension scores (Hermena et al., 2017; Margolin et al., 2013; Rockinson-Szapkiw et al., 2013).

On the contrary, findings of the reading comprehension test indicated that both gamified e-book reading and personalized e-book reading participants made the highest gains and significantly outperformed those in the other two groups (i.e., PDF e-book reading and printed book reading) in vocabulary questions. Students reading printed versions of books may have received the same vocabulary support provided by their teacher, but none of the students used their teacher’s consultation for the 17 vocabulary support required (Greenlee-Moore & Smith, 1996). They concluded that e-books provide students with anonymity to receive assistance as opposed to printed versions of books that require publicly asking the teacher. If students ask the teacher for assistance, which requires time away from the text, the text away may lead to a reduction in comprehension. E-books have immense ability to reinforce the definition of the word for children by being incorporated in a computerized dictionary (Segers et al., 2004; Verhallen et al., 2006). Moreover, if students are nervous about asking for support, they will prefer to continue reading even though they do not comprehend any of the vocabulary. A student may continue to read without understanding, because it is safer than suffering from public failure (Greenlee-Moore & Smith, 1996). Once students have the chance to use e-book applications and websites, they can download and start reading books within minutes, at their reading rate.

**Limitations, Conclusion, and Future Research**

The present study is likely to offer several practical implications for researchers, practitioners, and material/course designers. Initially, the findings revealed that electronic reading lessons could significantly improve the learners’ reading comprehension skills and develop their language acquisition (LA). In addition, the gathered results elucidated both the perceptions of the sixth-grade Turkish EFL learners exposed to electronic reading and the reflections of their teachers on its implementation. Learners and teachers stressed the importance of the implementation in gaining better reading and language skills and achieving LA through reading. They also pointed out that less teacher intervention and more peer collaboration in reading tasks led to a more positive experience and more engagement. Therefore, it would be worth integrating electronic reading lessons into EFL curricula to assist with the development of language and reading skills as well as the achievement of LA through L2 reading.

The results offer scientific evidence that personalized e-books and gamified e-books are not only an alternative to printed book reading, but they also act as unique resources that are far more effective than printed books. Therefore, well-designed digital books should be incorporated as a standard practice in the school curriculum and home setting. It was also found that all these changes (personalizing/
gamifying) in digital books contribute strongly to the early text comprehension of children, which is a prerequisite to more advanced reading skills (Kucirkova, 2018; Silva & Cain, 2015).

Shortly, the results of the present study demonstrated that the use of screen reading lessons for teaching and learning reading could be considered as an efficient means of instruction to promote the growth of reading comprehension skills and improve the reading performance and motivation of LA in EFL classrooms.

The choice of sixth-grade students for this study was due to the fact that sixth graders are at an intersection in their reading skill growth. Many students at this age have usually learned to properly decipher words to the point of practical fluency. At this grade point, students are now learning to read critically and to read for pleasure (Abbott et al., 2010; Burns et al., 2011). The present study pose some suggestions for further studies. Furthermore, the number of participants \((N = 96)\) in the study was not very high, and also their reading ability levels were low. For future research, it may also be advised to use a wider sample of different ability levels. Because of the nature of this research, the number of participants was limited. It is recommended that this type of research be carried out on a larger scale to improve the generalizability. It would be necessary to continue studying successful uses of e-Books in the classroom environment, as the findings of the statistical study showed a higher upward trend in growing student reading comprehension than students reading conventional books.

Another limitation is that this research was carried out for a duration 5 weeks, with 10 lessons being introduced in each. Hence, the researcher did not apply a retention test. A retention test could be carried out after a longer period for future studies to be able to gauge the effects of the implementation on the retention of the participants. Finally, the present study participants only used readers from a single online source, Razplus (www.raz-plus.com). Other sources of books can be combined into screen reading lessons to give the students a broader variety of genre choices.

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