

***Keeping Tabs on Reading: Comparing Reading Comprehension Scores of E-Text Readers and Physical Text Readers in Senior High School***

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**Abstract**

Technology plays a powerful role in the field of education (South, 2017), and with digital integration inside the classroom, scholars debated in the use of these e-texts since issues regarding reading comprehension surfaced as researchers tried to tackle new forms of digital learning (Moran et al., 2008). This research aims to compare the pre-and post reading comprehension scores of e-text students and physical text students to find out if there was a significant difference in reading comprehension after the intervention. Alongside obtaining their perceptions towards the use of e-text, this study tackled test cognition levels to determine the development of thinking skills in the students. Pre-and post-reading comprehension exams were administered to two eleventh-grade classes, and were analyzed in order to determine whether the results could be significant. The researchers' two-tailed T-Test yielded a result of 0.0184 which was deemed significant. For the e-text users, their pre-and post-tests revealed a result of 0.2879 which was not significant. The researchers also tried to address the question of the lower thinking skills (LOTS) and higher thinking skills (HOTS) items in the test: for the physical text group, 65% of the lower cognition items exhibited more correct answers while the higher cognition items showed a 75% increase. The e-text group obtained only a 23% and 50% increase, respectively. This study may contribute to this growing field in Philippine education by providing insights on student reading comprehension skills, higher-order thinking capabilities, and student satisfaction about the use of tablets in reading.

Keywords: E-Learning, Digital Learning, Educational technology, Reading comprehension

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## **Introduction**

Technology played a powerful role in the field of education (South, 2017). Its ability to rethink the age-old processes of teacher-student relationships, teaching methodologies, and learning and collaboration created an exciting atmosphere, not only for students, but also for the stakeholders of education. However, in the same vein of most technological advancements, what possessed great potential for progress may also bear grim consequences that can further worsen the existing challenges the pedagogy currently faces, especially, in literacy (Biancarosa & Griffiths, 2012).

Thus, this inevitable call of digital learning and progress posed a challenge for teachers on how to integrate this digital tool into their methods to promote student learning and not to exacerbate the difficulties of the students. With the emergence of this concept of digital learning, varied researchers dedicated their attention into the different forms that digital learning can appear in (Moran, Ferdig, Pearson, Wardrop, & Blomeyer Jr., 2008).

One of these forms took the shape of E-Books or E-Texts. Back in 2010, there was a surge in E-Book sales, indicating that the public's appreciation of digital reading and browsing reached new levels (Doering, Pereira, & Kuechler, 2012). Even a good number of libraries are slowly transitioning into a digital environment where they used e-books and e-texts to promote motivation for reading (Doiron, 2011).

However, varied scholars continue to debate the issue of using e-texts versus traditional texts. Aside from problems with eye strains and other health issues (Waller, 2013), Reid (2016) posited that if children are not able to fully interact with e-texts, or were not exposed to these technologies early, they would not only have a hard time comprehending the text, but that, the gap which they faced between reading and understanding might be permanently closed. This suggested that if the student interacted with the e-text in a detrimental manner such as accessing distracting apps and programs, this will severely affect the way they comprehend the e-text. Thus, due to these and other disadvantages, many of seasoned faculty as well as other teachers advocated for traditional reading. Its ease of use as well as access not requiring electricity or the internet made it a core aspect of every reader.

Henceforth, a question is raised: does the use of e-texts versus traditional texts have an impact on a students' ability to comprehend texts?

To sum it up, the different technological advancements gave digital learning new roles in the field of education. It challenged teachers to integrate technology into their methodologies. However, an important query surfaced which was to figure out whether these different technologies can affect the students, especially, in their own literacy as readers.

There were limitations for this study. The first one is that teacher strategies and teaching styles were not considered as academic freedom is respected for these faculty members. Secondly, the small sample amount was since a good number of parents did not permit their children to join the research, and the researchers had to respect their choices. Thirdly, the change in one of the teachers assigned to one of the classes due to them leaving the school was also found as a limitation which was hard

to control for the researchers; however, they made sure to orient and inform the new teacher on the protocol and the research to assure consistency.

## **Review of Related Literature**

In the study conducted by Biranvand and Khasseh (2014), students exposed to e-books reported an increase in their academic progress and performance. In the same study, the researchers further tested the students' perceptions on the variety provided by electronic materials, and they positively responded. Similarly, Reid's (2016) study found out that not only did the use of e-books or e-texts increase student engagement with the text, it also increased their reading comprehension assessments. Majority of the students yielded improved scores as compared to their pre-intervention results. As such, the researcher was able to suggest that the use of these electronic texts can be an opportunity for literacy development. Both Bickel (2017) and Reid (2016) cited better acquisition of reading strategies among the students when they were using e-books. As Bickel (2017) stated, the different features available on the devices can be used by the student to aid their reading. For example, when one double-taps on a certain passage or word, the device highlights the selected line which can increase student attention to detail on the text.

From a perspective, three factors contributed to a so-called increase in reading comprehension scores: increased student engagement in reading, higher variety of materials, and additional reading strategies employable by students.

However, other studies yielded different results. A study done by Jeong (2010) resulted in lower quiz scores when the students used of e-texts as compared to those when they were working with traditional texts. While the students worked with the physical texts, they obtained a mean score of 86.33, and they used the electronic texts, it yielded up to a mean of 82.94. To explain this, Jeong (2010) mentioned that these results may have been influenced by the screen's resolution size of the e-texts as well as the students' extensive handlings of a physical book. Then again, with Waller's (2013) idea of eye fatigue, this could also be a factor of lowered scores. Jeong's (2010) study brought up the data of eye fatigue, and the study found out that students experienced heavier eye fatigue when they made use of e-texts (3.04 Hz) as compared to those who dealt with physical texts (1.63 Hz). In most cases, eye fatigues are known to cause overall tiredness to the body (which may reduce capacity to fully understand texts) as well as general nervousness or even anxiety. In Bickel's (2017) study, she also found out that there was no significant difference between the scores of the e-text group and the traditional text group. One of the explanations she offered was that the devices used could have given distractions to the students, affecting their ability to comprehend the given texts.

Overall, it can also be viewed that e-texts can provided less benefits, or that they had no significant difference in terms of effects on reading comprehension due to three factors: device technicalities and distractions, students' being more used to physical books, and eye fatigue.

Given these views, the researchers tried to bring in two perspectives: that e-texts can provide significant advantages to a student's reading comprehension, and that e-texts have no bearing or significance in improving student comprehension. The studies

presented here have all dealt with either collegiate learners or elementary learners. Furthermore, the research being done into digital learning in the Philippine context is quite a new field, and as such, there is a need to contextualize these kinds of researches to get a clearer picture of how technology affects Filipino students.

This study may provide new insights as to how reading teachers can utilize the use of e-books and traditional texts in their Senior High School classrooms based on the preliminary results of how selected senior high school Filipino students' reading comprehension of a text.

## **Gaps and Opportunities for Research**

### *Exclusivity in the use of E-Text and Physical Text*

Most of the studies cited herein worked on the methodology of allowing both their sample groups to make use of both e-texts and physical texts. What this means is that all their participants experienced reading the given texts through a gadget and a book before they were assessed. As stated in Bickel's (2017) study, she stated in her suggested researches that it would be advisable for future studies to have two groups (one control and one experimental) which would exclusively use either e-texts or physical texts. Even in the studies conducted by Jeong (2010) and Reid (2016), they made their participants make use of both forms of text. While this is a valid way of conducting experiments, this might shy away from being able to make more concrete and robust conclusions since there might be a difficulty in attributing the reading comprehension scores to either the presence of e-texts or physical texts.

Thus, this study will have two groups where one class (the control group) will exclusively use physical texts during the research's duration. By doing this, the researcher will be able to see how the scores garnered by the students in the assessment would be attributed to the given forms of the text, whether electronic or physical. On this end, this research would not test whether there was a significant increase in the students' reading comprehension after being exposed to both electronic and physical texts (which were one of the focuses of previous studies), but it would look more into a comparison of scores between students who exclusively use e-texts and students who exclusively make use of physical texts.

This may open discussions regarding testing score and whether exclusive use of e-texts or physical texts has an impact on student reading comprehension skills.

### *Focus on item analysis towards understanding of levels of cognition*

Researches done in this field of e-text versus physical texts placed various focus on reading comprehension and vocabulary development. Examples of this trend of growing focus on reading comprehension was found in Jeong's (2010), Reid's (2016), and Bickel's (2017) studies. However, more than just assessing reading comprehension, it was interesting to note that there were studies which paved a connection between technology use and acquisition of Higher Order Thinking Skills (HOTS).

This study was done by Hopson, Simms, and Knezek (2001) where they studied students who were immersed in a technology-dominated classroom and students in a traditional classroom. From their results, they posited that, while the change is minimal, there is still a significant increase in the HOTS scores attained by the technology-immersed students in the areas of synthesis, analysis, and evaluation.

Thus, it was interesting to focus on the issue of e-texts and physical texts not just on scores, but also in the possible acquisition of HOTS within Senior High Students. Comprehension exams such as the ones in informal reading inventories (IRI) and standardized tests often possessed different purposes when it comes to items. Some items were designed to only test knowledge levels while others challenge students' ability to think higher. For example, in the IRI developed by Burns and Roe (2011), the items found in their IRI were often categorized such as ones designed for making inferences, detailing cause and effects, and something as basic as sequencing events.

One way to interpret on this is through this scenario: if the physical text group obtained more items belonging to the lower-order thinking skills (LOTS) while they garnered lower results in the HOTS items, then, it would be possible to have constructed the idea that those who made use of physical texts would more likely be better at LOTS, but they might have a harder time developing their HOTS.

Overall, this study will be capitalizing on two possible research gaps where a group will solely use either e-text or physical text instead of being exposed to both; and the focus on item analysis on the development of LOTS and HOTS in students.

## **Methodology**

### *Research Questions*

The study aimed to answer the following questions:

- a. Was there a significant difference between the pre-and post reading comprehension scores of the “e-text group” and the “physical text group?”
- b. What are the perceptions of Senior High Students when it comes to reading e-texts versus physical texts?
- c. How does the use of either e-text or physical text affect student development of lower order thinking skills and higher order thinking skills?

### *Procedures*

Two HUMSS Reading and Writing classes were used for this study. In each class, there were thirty students. One class made use of physical texts as their reading material throughout the entire duration of the experiment. This was the control group. The experimental group was made up of the second HUMSS class which only used e-texts during the intervention.

At the beginning of the intervention, a pre-test was administered to the experiment and control groups. This test was taken from Fan's (2009) study where he pilot-tested this material before implementing it in his own experiment. After the duration of the experiment, the researcher administered the post-test to the students and the scores were collated and averaged. A T-Test was also employed to effectively analyze the data.

To answer the second research question, this study made use of Jeong's (2010) Feedback Questionnaire to obtain selected students' perceptions regarding the use of tablets versus books through a structured interview. The selected students were given consent forms to make sure that they are willing to be interviewed. If below eighteen (18) years of age, the students were required to present the consent form to their parents. Ethical considerations in using human samples in a research study were observed.

The third research question was answered via item analysis on the students' exam results. Since each item has been assigned a specific category as either a LOTS or a HOTS, then, the researcher gathered how many student in each group were able to get more LOTS items than HOTS items, and vice versa. For example, if the physical text group had a higher average in terms of getting the correct answers on the HOTS items as compared to the e-text group, then, it was possible to draw conclusions on how the use of physical texts can better develop HOTS in students against exclusive e-text users.

### *Measurement Outcomes*

Fan's (2009) Reading Comprehension Exam. This exam was administered before and after the intervention to test the students' comprehension abilities. It was a fifty-item (50) test with assigned texts which the students read, and then, they answered the given questions. This exam was administered for an hour. The researcher marked the tests, and scores were tabulated. Once the pre-and post-tests are accomplished, the researcher obtained the average of the scores for comparison.

Simple T-Test. Once the pre-and post-test averages were obtained, the data were submitted for a T-Test. If the result is less than the level of significance ( $0.05 > x$ ), then, the researchers may be able to state that there is a significant difference in the scores obtained by the students in the pre and post-tests.

Jeong's (2010) Feedback Questionnaire. This feedback questionnaire was used in an interview with selected students to gather their perceptions on the use of tablets versus physical texts. This allowed for a more qualitative data which was used to make connections and analyses between student perceptions and scores obtained in the Reading Comprehension Exams.

Analysis of Means. After the item analysis and counting of frequencies of correct LOTS and HOTS items, the researchers obtained the mean scores from the post administration of the materials. Afterwards, the researchers compared these means to deduce which usage of text form yielded higher results in LOTS and HOTS. The different means were tabulated and compared for analysis and interpretation as well as possible conclusions.

## Results & Discussion

*Research Question 1: Was there a significant difference between the pre-and post reading comprehension scores of the e-text and the physical text groups?*

**Table 1.0. Results of the Pre-and Post Test of the Physical Text Group**

Physical Text Students	Pre-Test (35 items)	Post Test (35 items)
S1	15	27
S2	26	31
S3	16	29
S4	9	30
S5	18	26
S6	29	22
S7	16	26
S8	9	18
S9	29	18
S10	14	31
<b>Mean</b>	<b>18.1</b>	<b>25.8</b>

Table 1.0: Pre-and post-test results of the physical text students' reading comprehension after the intervention.

In order to answer the first research question, the researchers focused first on the pre-and post-test results of the Physical Text Group (PTG). To determine whether the results were significant, the researchers performed a two-tailed T-test.

Upon performing the T-test, the researchers obtained the p-value of 0.0368 with a Level of Significance of 0.05. As such, upon comparison with the values, the p-value is less than the Level of Significance which may have allowed the researchers to determine that the results of the pre and post-test in the PTG was statistically significant since there may be too little a percentage to determine that the results happened by chance.

On the other hand, upon testing the E-Text Group (ETG), the findings were different.

**Table 1.1. Results of the Pre-and Post-Test of the ETG**

E-Text Group	Pre-Test (35 items)	Post Test (35 items)
S1	30	27
S2	21	4
S3	30	29
S4	27	30
S5	25	29
S6	28	28
S7	27	22
S8	22	26
S9	31	28
S10	31	27
<b>Mean</b>	<b>27.2</b>	<b>25</b>

Table 1.1: Pre-and post-test results of the e-text students' reading comprehension after the intervention.

Upon performing the T-test, the researchers obtained the p-value of 0.2879 with a Level of Significance of 0.05. As such, upon comparison with the values, the p-value is more than the Level of Significance which may have enabled the researchers to determine that the results of the pre and post-test in the PTG was statistically insignificant.

Thus, in the first research question, the researchers may be able to posit that there was a remarkable improvement in the scores garnered by the students in the PTG group as seen by the increase of the group mean from 18.1 to 25.8. This is supported by Ross et al's (2017) study wherein they cited numerous researches which showed that students who made use of physical texts garnered higher scores in comprehension exams due to a so-called easier recalling of information when it is written on print. They also discussed how some studies found out that unlike e-texts where students tended to read in F-patterns or just skimming and scanning, students were more likely to engage with the printed text, resulting in higher comprehension.

However, the opposite may be seen in the ETG results. The presented decrease of the group mean from 27.2 to 25 may have given the notion of a dwindling performance from the ETG students. However, upon looking at it statistically, the decrease may not be called as significant since its T-test exceeds 0.05.

But, looking at the result from another perspective, the reduction in student scores may be attributed to what Jeong (2010) and Ross et al (2017) mentioned about screen factors and eye fatigue. In their studies, they discussed how these factors play into reducing student comprehension since it negatively impacts their consistency in retrieving information since as Ross et al (2017) cited, they just tended to skim and scan when using e-texts.

Thus, to answer the first research question, the improvements manifested by the students in the PTG are statistically significant; however, the reductions in the students' scores in the ETG group are not statistically significant.

***Research Question 2: What were the perceptions of Senior High Students when it comes to reading e-texts versus physical texts?***

To answer this question, the researchers decided to analyze the student interviews via a thematic analysis which focuses on three major themes: (a) satisfaction, (b) usefulness, and (c) behavioral.

For Satisfaction, it is defined as the e-text's capability as a learning tool alongside its colors and functions. According to the interviews, the respondents agreed that the portability of e-texts was one of the greatest reasons why they are satisfied with it. They claimed that since they could bring their gadgets almost everywhere, it was a good tool for them if they wanted to read something. There is also a notion that using e-texts may be able to help save paper as well as the added flexibility coming from the variety of functions that an e-text can have.

However, when it came to the theme of Usefulness, which is defined as perceptions regarding the e-text's font sizes, ease of use, interface, and clarity of the reading



screen, the students' response became more varied and divided. While some respondents believed that reading through e-texts may be better due to the ability to zoom in and out or to smoothly scroll up and down, most the responses boiled down to the notion that information is harder to comprehend due to smaller font sizes (which would have to require them to zoom in or out) and a more difficult time to cross-reference information in the text. Thus, what they preferred was a physical text or book as a main tool in their hands, and when they plan to cross-reference information, that is when they would turn to technology. Thus, while the students agreed that scrolling through and zooming in the e-text is convenient, they still preferred to use physical texts as it is easier for them to cross-reference information.

Lastly, for Behavioral which pertains to the possibility of the respondent's willingness to increase use of e-texts in the future, the general answer was that it mainly depends on the situation. While the respondents stated that they would most likely use electronic texts in the future due to its ability to its portability and ease of use, the participants made a note that their choice for using it would be influenced by the subject in school (whether or not it requires e-texts), but they would still also keep using physical texts due to familiarity and the ability to easily compare ideas.

Thus, to answer the second research question, the perceptions of students regarding the usage of e-text was that they will most likely use e-texts in the future as a learning assisted tool, but their usage of such a tool would depend on the academic subject at hand since their familiarity with physical texts allowed them to have an easier time in comparing and cross-referencing data.

**Research Question 3:** *How does the use of either physical text or e-text affect student development of lower and higher order thinking skills?*

To answer this question, the researchers considered the Frequency of Correct Responses (FCR) of the students in each item, and then, they cross-analyzed it with the revised Bloom's Taxonomy of Anderson and Krathwohl to determine whether or not there was a change in the cognitive attainment of each student.

**Table 2.0. FCR Results of the Cognition Levels for PTG**

Physical Text	Total Items	Number of Items with Increased Responses	Number of Items with Correct Responses	Number of Items with Decreased Responses	Number of Items with Correct Responses	Number of Items with Retained Responses	Number of Items with Correct Responses
Remembering	15	10		5		0	
Understanding	16	10		3		3	
Analysis	4	3		1		0	

Table 2.0: The FCR of the cognition level of the items which showed changes in value of the number of correct responses for each item. This is for the Physical Text Group.

For the items which were categorized under the Remembering level, 66% of the items obtained an increased correct response frequency. A possible interpretation for this could be that the students who were immersed in an academic environment of purely

physical texts exhibited an increase in their competency in reading comprehension when it came to remembering or enumerating details from the text. This is like the Understanding level which presented 63% of the items obtaining an increase in correct responses.

With this, it may be possible to suggest that the students' competency in understanding and explaining concepts were also increased. Lastly, the physical text group also exhibited an increase in correct responses in 75% of the items in the Analysis level of cognition. This could mean that the ability of students in the PTG to analyze parts of a whole were also increased in the intervention.

**Table 2.1. FCR Results of the Cognition Levels for ETG**

<b>TECH</b>	<b>Total Items</b>	<b>Number of Items with Increased Correct Responses</b>	<b>Number of Items with Decreased Correct Responses</b>	<b>Number of Items with Retained Correct Responses</b>
Remembering	15	2	10	3
Understanding	16	5	8	3
Analysis	4	2	1	1

Table 2.1: The FCR of the cognition level of the items which showed the movement of the values of correct responses for each item. This is for the E-text group.

As presented, most the Remembering level items (65% of the items) had a decrease in correct responses. The same bore a similar case for Understanding, yielding a result of 50% of its items having a reduced number of correct responses after the intervention. However, the Analysis items had 50% of its composition see an increase in its correct responses.

In total, for the PTG, out of 35 items, 66% of its composition obtained an increased number of correct responses. Connecting this with the first research question, the significant difference in the improvement of the students' cognition levels paved signs to the effects of a physical text-centered environment wherein, since according to the second research question, their familiarity with physical texts may have been maximized. The same may not be applicable to the ETG since 54% of its items had a reduced number of correct responses.

It may be plausible to assume that the lack of familiarity as well as factors of eye fatigue or strain as cited in Jeong's (2010) study may have led to this reduction in performance. Furthermore, while the results of the t-test of the ETG may not have been significant, the issues raised by the students in the interviews such as their perception towards the e-text being more on portability rather than academic function could have attributed to this result with the level of cognition.

As stated in Edward's (2016) study, technology's function was not to start these thinking skills, but to build upon them. Additionally, she posited that the concern with technology and students is on how the students would focus on using technology

to “get things done”, not to “do it efficiently”. This statement may support the researchers’ findings wherein the students would tend to focus more on the satisfaction of portability rather than academic functionality.

Thus, to answer the third research question: the PTG may have exhibited increased levels of cognition due to the concept of familiarity with physical texts which could have allowed them to foster these cognition levels after the intervention.

On other hand, for the ETG, it may be plausible to assume that reduction in cognition levels for most the items was due to their perception of technology as a portable object to “get things done”.

Although, the researchers would like to point out that, as cited in Edward’s (2016) study, the teacher’s ability to cultivate these thinking skills in the students was still paramount to the development of appropriate cognition levels.

## **Conclusions**

To conclude, the researchers may have found that the PTG demonstrated more improvement in terms of reading comprehension scores and cognition levels after the intervention, as evidenced by the pre and post-test results. While the ETG may have shown a reduction in performance as well as in cognition, it should be noted that the T-test results for this group was deemed to be not significant.

The interviews may have given light to the notion that while students find technology as a satisfying portable tool to “get things done”, the idea of familiarity and being able to cross-reference information easily gave the students enough to reason to still believe in the use of physical texts over e-texts, especially when the subject does not call for the use of such electronic devices.

All in all, the development of reading comprehension skills as well as LOTS and HOTS could still be dependent on the teacher. A teacher who is comfortable with electronic texts may still perform better at developing the necessary skills in his or her students as compared to a teacher who used physical texts but cannot make an academically-stimulating environment.

For future researches, this study may be able to pave new understandings when it comes to the Philippine context of digital learning, specifically, in students’ literacy development. The researchers suggest that future studies focus on educational technology and the higher order thinking skills of evaluation and synthesis. They may also choose to tackle affective levels of learning to see whether technology can affect the perspective or feelings of a student towards in learning. It may also be beneficial to compare how technology and teaching strategies connect to help students in developing the necessary skills for reading and cognition.

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