**The Effectiveness of Electronic Books in the Primary Classroom**

**Author:** Bethany Hendrickson
**Faculty Mentor**: Jeanne Tunks Ph.D. and Janet Ray, Ph.D., Department of Teacher Education and Administration, College of Education
**College and Department Affiliation:** Department of Teacher Education and Administration, College of Education

**Bio:**

Bethany Hendrickson is currently a student teacher in the DFW area. She will be graduating in May, 2014, and is looking forward to her future in the field of education. Bethany is a mother of two girls, and she is the former president of Writer Resource, Inc., a company she co-owned. Before returning to school, she worked for seven years as a preschool teacher at a local Mother's Day Out. Bethany has a passion for serving students with special needs. She hopes to pursue her Master's degree in the next few years.

**Abstract:**

Public schools have multiple levels of supports to help young readers; however, there are some students who show little or no progress after receiving all available tiers of reading supports. Software companies such as Raz-Kids™ have created online reading resources, including electronic books, to enhance reading instruction for students. Minimal research has been completed about the benefits of using electronic books in the primary grades. An action research study was conducted on the benefits of using electronic books in a second grade classroom, especially for students who did not benefit from traditional reading supports. For this study, the Raz-Kids™ software was mounted on four personal computers in the classroom, wherein data were collected over a seven-week period. The research conducted in this study revealed that using electronic books in the classroom increased student motivation. All students participated, and each student in the class made improvements in multiple areas: fluency, comprehension, and expression.

**Introduction**

Today's students are inundated with technology from the day they are born. In many cases, students are more comfortable using technology than their teachers. It can be difficult for teachers and administrators to sift through the myriad of electronic resources available for students and to ensure that the resources add value to the classroom. A great deal of research has been conducted on the use of technology in the classroom for middle school and high school students; however, not enough research has been done on technology's use in primary grades. One of the main focuses in the elementary grades is reading. It has been demonstrated that when a child struggles with reading, it can have a negative impact on his or her subjects because reading is the backbone of learning. The question remains: Why is technology not being used in every classroom to improve reading outcomes for young students?

Money, knowledge of available software (good or bad), and its rapid changes make choosing the use of technology for school a daunting task. While not every school has access to the same technologies, a multitude of platforms are available. Some schools have iPads or Kindles; others might only have PCs. There are educational software applications for all of these platforms, and many more. After taking these things into consideration, the Raz-Kids™ program was chosen as the platform for this action research project. Technology is the way of the future, and using programs such as Raz-Kids™ to strengthen reading skills in our youngest students will give them the skills they need to read and interact with the contents they may encounter in all learning settings.

Raz-Kids™ is a software program developed to make reading easier for students by providing an online library of leveled (books increasing in difficulty in regard to story elements, sentence structure, and language use), serial (books in a series), nursery rhyme, poetry, and song

e-Books. The leveled readers are offered in both English and Spanish. Students reading an e-Book on the site are able to click on select vocabulary words to hear the pronunciation, listen to an e-Book while following along, and record themselves reading an e-Book for self-monitoring.

**Background**

The idea of using technology in the classroom is not new; however, the idea of using it as a primary vehicle to improve reading outcomes for primary students is a relatively recent concept. Most of the literature found on the subject of using technology for the improvement of reading skills has focused on older students, possibly because of their improved computer skills or their heightened cognitive skills (Johnson, Perry, & Shamir, 2010).  Commonly, the word text is envisioned as a message that has been written in a book, newspaper, journal, or magazine, even though it currently pertains to a wide array of mediums (Larson, 2010). The International Reading Association in 2009 suggested that integrating information and communication technologies into the literacy curriculum was of the utmost importance (Larson, 2010). Many students have been exposed to multiple facets of technology at home long before entering the classroom, posing the question: Should there be a pedagogical shift to a more technological curriculum (Walsh, Asha, & Sprainger, 2007)?

The use of electronic books (e-Books) is one way to incorporate technology into the reading curriculum. Before introducing e-Books into the primary classroom, teachers and administrators must consider its potential effects. Some educators doubt the benefits of using technology to foster literacy skills (Van Wyk & Louw, 2008). Students will still need to decode words as they do with traditional texts; however, they will also have to learn to navigate the features of whichever platform they are using (Serafini & Youngs, 2013). E-Books should be considered in the classroom because of the added features, such as animations, videos, sounds,

and narrations; however, H. R. Schugar, Smith, and Schugar (2013) believe teachers should be cautious about the e-Books they choose to use with students. The additional features have the potential to be either beneficial or harmful. Some e-Books have a lot of extra content; however, that content could become distracting to students and actually have a negative impact on reading comprehension. The additional features included in some e-Books can make repetitive book reads more enjoyable, motivating students and helping to increase language and comprehension skills (Boeglin-Quintana & Donovan, 2013).

Since there is little data regarding the subject of using e-Books in the elementary classroom, there is not a common consensus on which students will benefit the most from this technology. Rhodes and Milby (2007) believe it is important to give young children multiple opportunities to respond to literature. They also believe that the use of e-Books gives students the same benefits as listening to and following along with an audio book, but the e-Books have the additional advantage of offering technological supports. The authors suggest that e-Books are especially helpful for students with disabilities because they offer multimedia effects that support student understanding and scaffold student learning, giving the students the chance to master skills they may not be able to master on their own. Their research shows that students with disabilities receive a boost in self-esteem when given access to text-to-speech technology, such as e-Books. Teachers can easily create e-Books for their students with disabilities and open up a whole new world for them by supporting vocabulary acquisition, increasing comprehension, and modeling fluency. Van Wyk and Louw (2008) state that technology does not eliminate difficulties for students; however, it allows them to strengthen skills, such as reading, and reach their potential.

Larson's (2010) study of the use of e-Books increases motivation for students. She also believes that the use of e-Books in literacy instruction is rooted in cognitive constructivist theory. Almaguer and Pena (2010) agree with The National Association for the Education of Young Children (NAEYC) that using technology enhances the learning process. The ability to manipulate the e-Book through touch offers the student a multimodal learning experience (McClanahan, Williams, Kennedy, & Tate, 2012).

The Raz-Kids™ website includes not only e-Books, but also offers teachers a multitude of resources to facilitate individualized reading instruction in the classroom, including a variety of fiction and nonfiction books accompanied by comprehension quizzes that test multiple components of comprehension. This feature allows the teacher to create individualized lessons for students who struggle in specific areas. Electronic running records are a form of assessment that allows the teacher to pause and rewind while scoring. Raz-Kids™ is an affordable option for classroom teachers, with each subscription accommodating up to 36 students. Students are given access to an online database of books, which is a significant advantage because many educational e-Book sites require payment for each book per student.

## Problem

Not all readers benefit from standard reading instructional strategies, particularly low-performing readers.

## Purpose

The purpose of this study was to examine the effects of using e-Books as a reading support for low-performing readers to increase their reading comprehension.

## Question

What is the effect of e-Book reading on low-performing students' reading comprehension?

## Hypothesis

It was hypothesized that by using e-Books in the primary grades, reading outcomes, particularly comprehension, would improve for low-performing students and on-level students alike.

## Method

### Participants and Setting

The participants in this study consisted of 17 second-grade students in a rural/urban school district in North Texas. There were nine female students and eight male students. Out of the 17 students, there were two Asian students, five African American students, one unknown bi-racial student, and nine Caucasian students. Three students were part of the gifted and talented program and two students were considered English Language Learners. Four students were receiving Tier 2 intervention (small group support) in the classroom. No participants in this study were being served by Special Education. Economic statuses of the participating students varied greatly, including students who lived in poverty, students who lived with working grandparents, and students whose families were affluent.

This Action Research Study took place over a six-week time period in a second-grade classroom. The software platform used for this study was the Raz-Kids™ website. There were four computers in the classroom with mic headphones, and each student was allotted a 20-minute daily time slot. Once a week, students attended a computer lab where they had the option of using the Raz-Kids™ website; at least half of the class chose to use the website during the

computer lab session. Some students who had Internet access via computer or device outside of school spent additional time on the site.

**Instrumentation**

**Raz-Kids™.**The Raz-Kids™ website provides a variety of supports and tools available to both students and teachers at a reasonable cost. The site was "created to mirror best practices as defined by years of classroom research and as described by the National Reading Panel's 2000 report" (Klein, n.d., p. 9).

This site has won four recent awards: 2014 Teachers' Choice Award in the Classroom; 2013 SIIA CODiE Award; 2013 Best Reading Resource Website, Teacher's Tool; and 2013 District Administration Top 100. The Teachers' Choice Award in the Classroom is determined by a group of teacher-judges from nominations by teachers in the field. The SIIA CODiE award is given for excellence in software programs for education and content. It has a prestigious 28-year history, and the nominees are evaluated by peers in the software industry, making this award a market validation for the product. The Best Reading Resource Website award is presented by ComputED Gazette, and nominees are evaluated by educators in the field. This award has a 19-year history. The 2013 District Administration Top 100 was chosen from a field of 1,800 nominations. The staff at District Administration Magazine had to review testimonials for each of the 1,800 products from numerous educators. This award continues to grow in the number of yearly nominations.

On this site, each student has a log-in account and a customized e-Book library with a selection of e-Books based on the student's current reading level. The students' reading levels were provided by the classroom teacher and inputted into the Raz-Kids™ website by the facilitator of this study. The program has a built-in incentive program that allows students to earn

stars for completing an online assessment, reading a book, listening to a book, successfully completing a quiz, recording themselves reading a book, and completing an assignment. Students can use their stars to customize their robot avatars and their Raz Rockets™.

**Raz-Kids™ leveling system.** For this study, the Raz-Kids™ leveling system was selected because it most closely mirrored the leveling system of the district. The leveling was determined according to research-based guidelines and was created through a proprietary levelling process. Pictures, text, and difficulty of text in every book were analyzed and tested by education professionals.

**Running records system.** Running records are a way to measure students' accuracy and fluency. A teacher listens to a student read aloud a passage, and then he or she scores the reading by noting mispronunciations, omissions, insertions, and substitutions. Running records are commonly used to assess a student's reading level. Electronic running records were used for this study and have the added benefit of calculating words correct per minute.

**Data Collection**

The students' reading levels were determined by the classroom teacher the week prior to the pre-assessment. Reading levels were used when students were administered an electronic pre-assessment on the Raz-Kids™ website. Both assessments were 3-prong, composed of an electronic running record, a retelling of the passage, and a short comprehension quiz. Once the initial data were collected, students were instructed on how to use the website's features.

During each student's allotted time on the computer (20 minutes daily across six weeks), he or she would either complete an assignment chosen by the facilitator or would go into his or her leveled book library and choose a selection to read. The facilitator created assignments for students at least once a week. The assignments could be e-Books about what the class was

studying that was not on a student's reading level or a particular e-Book he or she would enjoy. Students earned more stars for completing an assignment than for reading an e-Book independently, so they were excited to receive assignments. At other times, the student would choose a book from his or her e-Library. After each book, the student was prompted by the Raz-Kids™ program to complete a short comprehension quiz. The site captured data regarding the number of books, quizzes, listens, and logins, as well as statistics on how each student was performing on the comprehension quizzes. At the end of the six weeks, the students completed a final assessment that aligned with the pre-assessment. The facilitator listened to the online recordings, and then scored the running records and the retellings. The comprehension quizzes were graded electronically on the website.

The data are represented in four categories: accuracy, words correct per minute (WCPM), retelling accuracy, and comprehension (noted in Figures 1-3). To obtain the data, the facilitator assigned each student a leveled reading passage on Raz-Kids™. Each student recorded himself or herself reading the passage via mic headset. The accuracy and WCPM were electronically calculated on the site via running record. Once the students recorded themselves reading the passage, the facilitator listened to the recording and scored the running record, as seen in Figure 1. Once the students completed the running record, the site prompted them to record themselves retelling the passage. The facilitator listened to the recordings and graded them through a rubric provided on the site, as seen in Figure 2. The final step of the electronic assessment was a short comprehension quiz, the length of which was determined by reading level.

Figure 3 shows a representation of a struggling reader's pre- and post-assessment data. The purple box in Figure 3 represents the student's reading level and is followed by accuracy,

retelling score, and number correct in comprehension quiz. The WCPM is not represented in this figure.

Weekly comprehension changes were tracked by collecting each week's comprehension data. This was recorded by taking the percentage of correct answers from the daily comprehension quizzes to the comprehension questions and averaging them to obtain a weekly percentage, as seen in Table 3. Students were prompted to take a quiz after listening to or reading an e-Book on the site; however, it was the students' choice whether or not they took the quiz. Because some of the students chose not to take a quiz during a given week, a non-applicable value was recorded for them for that week. Students were motivated to take quizzes because they were able to earn more stars for passed quizzes. All data for the weekly comprehension quizzes was scored electronically on the website; the facilitator only reviewed the data.

**Data and data analysis**

The data collected were compared using a t-test to determine the significant differences at the $p < .05$ level. A t-test is a statistical calculation to determine significance between the mean values of two independent samples. The results are indicated through a probability value (p-value). Data with p-values of $< 0.05$ are considered significant, data with p-values between 0.05-0.1 show a weaker significance, and data values with p-values greater than 0.1 are not considered significant. P-value data can be found in Table 2 and Table 4. The t-tests were run in Excel with data collected from the Raz-Kids™ website.

**Results**

The effect of using e-Books in the classroom to improve reading outcomes was statistically significant at the $p < .05$ level, according to t-tests results. The weekly comprehension data illustrates significant changes between weeks one and two, two and three,

and one and six with a score of $< 0.05$. The differences were not significant between weeks three and four, four and five, and five and six. The results of this study support the hypothesis that e-Books can improve reading outcomes in a primary classroom. Improvement was observed for all students, across various categories, and with varying levels of improvement.

**WCPM.** The class showed great gains in WCPM, as seen in the t-test which resulted in a p-value of $< 0.05$. Due to technical difficulties with the computer, 2 students' data – students 6 and 16 – were compromised, thus their ending data was inaccurate and was not used in the t-test. Fourteen out of 15 students improved in WCPM, with an average improvement of 22 WCPM. Figure 1 shows an example of a student's running record, where the resulting WCPM can be seen. The mean for the pre-test was 67 and the mean for the posttest was 112. The t-test for differences shows a significant difference between the two tests with a p-value of 0.0093.

**Accuracy.** The t-test scored a significant p-value of $< 0.05$ for the accuracy data collected. Figure 1 illustrates a running record, which shows the accuracy rate for one student. Fifteen out of 17 students improved by at least 1% in accuracy. The student who showed the greatest percentage gain improved by 28% in accuracy while reading the assigned passage. The mean for the pre-test was 90% and the mean for the posttest was 96%. The t-test for differences shows a significant difference between the two tests with a p-value of 0.004.

**Comprehension.** Comprehension data from beginning assessment to ending assessment revealed growth for 10 of the 17 participating students. Five students remained the same, and 2 students' scores decreased from their beginning assessment. The scores were calculated by percentage of correct answers on the comprehension quiz following the running record and digital retelling. Two students improved their quiz score by 60% and 2 other students improved by 40%. The 2 students whose scores decreased did so by 20% and 40%. The mean for the pre-

test was 57% and the mean for the posttest was 75%. The t-test for differences shows a significant difference between the two tests with a p-value of 0.0078.

**Retelling.** The results of the student retelling of the passage is more varied than the other three categories. Sixteen out 17 students showed improvement in this area; however, the improvements were less significant, according to the t-test. Retelling had a calculated p-value of > 0.05 and < 0.1.  The one student whose score decreased did so by only 1%. Most students' increases were in the single digits; however, 2 students' percentage increase was in the high twenties, 28% and 27%, while 2 students showed an increase of 12% (see **Figure 2** for a screen shot of the retelling scoring sheet). The mean for the pre-test was 55% and the mean for the posttest was 69%. The t-test for differences shows a significant difference between the two tests with a p-value of 0.0783.

**Comprehension by week.** The final category analyzed for this study was comprehension taken daily from students as they took quizzes after reading or listening to an e-Book. These data differ from the previous comprehension scores because they were not part of a formal assessment; they were data collected over the entire course of the study. According to the t-test, the results of this category, found in Tables 3 and 4, were significant between the first and second weeks, between the second and third weeks, and between the first week and the last week. Four students' data showed a slight decrease in comprehension scores from the first week to the last week. The greatest decrease for any student was 10%. Thirteen students' comprehension scores improved over the six-week period. The greatest percentage was 44%, with an average increase of 22%. The mean for the first week was 64% and the mean for the last week was 80%. The t-test for differences shows a significant difference between the two tests with a p-value of 0.00074.

**Summary.** The results of this study are promising, considering that four out of five categories tested showed significant improvements. Each student improved in at least two of the five categories, with four students improving in all five categories and five students improving in four out of the five categories. Although it is not represented in the data, according to the classroom teacher, the two students who struggled the most at the start of this study, and who failed to improve with Tier 3 interventions, made large strides during this study and the following two weeks. One of those students increased four reading levels while the other increased two.

## Discussion

The use of e-Books in this second-grade classroom was effective for a myriad of reasons. Today's student is inundated with technology at an early age, and oftentimes proficient at using it before stepping foot into a school classroom. Technology is interesting to children, and it is engaging. Getting students engaged is the first step in teaching them to read. This program made reading fun and rewarding for students; thus, they worked hard and made incredible progress. Teachers need to meet students where they are, and using technology to engage students and improve their reading is an innovative way to accomplish this feat.

Raz-Kids™ reinforces students for reading and improving comprehension with a reward system. Students earn stars for reading e-Books and passing the accompanying comprehension quizzes. With the reward stars, students can purchase items to personalize their robot avatars. They can also purchase items to customize their rockets. Some of the upgrades to the robots and rockets are easily earned while others require students to save a large quantity of stars in order to purchase them.

The students in this second-grade class were very motivated by stars, and some of them even logged on at home to earn more. One student earned almost 15,000 stars. The site logs the number of minutes each student is logged on to the site and how many minutes are spent working on the robot avatar and the rocket. It was interesting to note that out of 190 hours spent online by the whole class, only 12 of those hours were spent on the robot and rocket; 93% of the time onsite was spent reading. According to the classroom teacher, the students' time on task for read-to-self improved significantly when students were reading the e-Books. There was a small correlation between the number of stars a student earned overall and the level of improvement.

Another rewarding feature of the Raz-Kids™ website was the parental component. The teacher was able to set up each parent with access to his or her child's reading data. Parents could also send their child a message that the student would see the next time he or she logged into the site. In conversations with the children, it was determined that parental messages were motivating to students. Parents were able to listen to recordings of their children reading aloud, and the students enjoyed recording themselves. The classroom teacher stated that the students read with more expression when they were recording. This increased fluency, although those results were not measurable and are thus not included in the results.

The original 17 students from this study are still using the site regularly. As a result of the success of this study, the second-grade team at the school where the study was conducted has started using this program with all of their struggling readers who currently do not benefit from small group intervention. They have also stated a desire to purchase software licenses next year with classroom funds. Before this study, the team was not familiar with this site or the use of e-Books in the classroom.

There are not enough studies on using e-Books in the primary classroom. This study focused on e-Books in the classroom and was not focused on motivation; however, it is apparent that motivation is a key factor in the success of this study. A limitation to this study was that only one medium was used to gather data. Further studies need to be conducted to compare different hardware devices and software applications to see what is most beneficial to students. There are many e-Book options available to students today, and educators need to conduct research in the classroom to see what works best for their situations. Some schools have iPads, others have Kindles, and some have personal computers; nevertheless, no matter what hardware is being used, some type of e-Book software will be available. Future studies are critical for the future of e-Books in the classroom. Middle schools and high schools are already becoming more technologically savvy and utilizing more electronic formats. Based on the results of this study, elementary schools students would benefit from this as well.

## Conclusion

The results of this study support the hypothesis that by using e-Books in the primary grades, reading outcomes, particularly comprehension, would improve. In conclusion, using e-Books in the classroom is something primary teachers should consider as a way to increase reading among elementary students. This study took place in a short six-week time period. Given the positive results during this short trial, it is a likely conclusion that students would make greater strides over an extended period of time. Equally important is the replication of this study in other action research settings, such as the PDS program at UNT.  By coupling pre-service and in-service teachers together as researchers, more learning about what works for students and their education can be ascertained and applied.

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Figure 1. Running Record Screen Shot

Figure 2. Retelling Screen Shot

At the Playground Level D    **Recorded** 02/18/14    **Full Duration** 00:45

**Use The Rubric to Score The Retell Recording**

| 0:00 | 5s | 10s | 15s | 20s | 25s | 30s | 35s | 40s |

**Fiction**

**Scoring Guide**

0 = Inaccurate or not included

1 = Fragmentary (sketchy)

2 = Partial

3 = Complete

**Sequence**
Did the student describe what happened in the proper order?     2

**Problem**
Did the student tell the problem in the story?     3

**Characters**
Did the student tell who the main characters are and why they are the most important?     3

**Resolution**
Did the student tell how the problem in the story is solved and how the story ends?     3

**Setting**
Did the student describe where the story takes place?     3

**Level of Prompting**
Score the amount of prompting the student needed during the retell.     None (3)

| Score | 17 |
|-------|-----|

| Skill Level | Total Points |
|-------------|--------------|
| Skilled | 12-18 |
| Developing | 7-11 |
| Needs Work | 0-6 |

Figure 3. Assessment Active Report Screen Shot

Table 1.Beginning and ending values for first and last weeks' assessments

| Student | Begin WCPM[1] | End WCPM[1] | Begin Accuracy% | End Accuracy% | Begin Comp% | End Comp% | Begin Retell% | End Retell% |
|---|---|---|---|---|---|---|---|---|
| 1 | 68 | 89 | 94 | 95 | 67 | 80 | 94 | 100 |
| 2 | 56 | 49 | 89 | 91 | 60 | 60 | 17 | 22 |
| 3 | 92 | 112 | 95 | 98 | 60 | 60 | 94 | 50 |
| 4 | 128 | 158 | 99 | 100 | 60 | 80 | 67 | 100 |
| 5 | 65 | 93 | 97 | 100 | 60 | 60 | 17 | 100 |
| 6 | 100 | 300 | 98 | 100 | 60 | 80 | 17 | 28 |
| 7 | 76 | 118 | 98 | 98 | 40 | 80 | 100 | 100 |
| 8 | 35 | 49 | 98 | 97 | 33 | 67 | 83 | 83 |
| 9 | 17 | 27 | 60 | 87 | 67 | 100 | 61 | 94 |
| 10 | 72 | 108 | 92 | 94 | 100 | 100 | 72 | 61 |
| 11 | 63 | 75 | 93 | 99 | 60 | 60 | 100 | 94 |
| 12 | 45 | 47 | 72 | 84 | 40 | 100 | 33 | 39 |
| 13 | 65 | 86 | 93 | 96 | 80 | 40 | 17 | 0 |
| 14 | 47 | 80 | 93 | 99 | 0 | 60 | 0 | 89 |
| 15 | 70 | 98 | 70 | 98 | 40 | 100 | 56 | 94 |
| 16 | 41 | 300 | 88 | 100 | 100 | 80 | 44 | 89 |
| 17 | 91 | 111 | 96 | 98 | 40 | 80 | 67 | 22 |

Note: [1] WCPM – Words Correct Per Minute

Table 2. T-tests

| Difference in WCPM | Difference in Accuracy | Difference in Comprehension | Difference in Retelling |
|---|---|---|---|
| 0.009286* | 0.004004* | 0.007813* | 0.078309** |

*p<.05, **.05<p<.1, †p>.1

Table 3. Weekly Comprehension Percentages

| Student | January 10-January 16 | January 17-January 23 | January 24-January 31 | February 1-February 7 | February 8-February 14 | February 15-February 21 |
|---|---|---|---|---|---|---|
| 1 | 63 | 70 | N/A | 72 | 80 | 60 |
| 2 | 47 | 67 | 60 | 63 | 60 | 90 |
| 3 | 68 | 84 | 76 | 78 | 89 | 86 |
| 4 | 44 | 67 | 84 | 100 | 83 | 83 |
| 5 | 72 | N/A | 77 | 74 | 84 | 82 |
| 6 | 59 | 76 | 84 | 92 | 90 | 70 |
| 7 | 66 | 76 | 88 | 65 | 93 | 88 |
| 8 | 72 | 69 | 82 | 75 | 73 | 78 |
| 9 | 75 | 89 | 86 | 88 | 100 | 89 |
| 10 | 68 | 74 | 74 | 82 | 73 | 78 |
| 11 | 76 | 77 | 80 | N/A | 80 | 74 |
| 12 | 40 | 73 | 85 | N/A | N/A | 82 |
| 13 | 87 | 68 | 90 | 79 | 90 | 77 |
| 14 | 23 | 60 | 66 | 66 | 68 | 67 |
| 15 | 83 | 57 | 80 | 70 | N/A | 80 |
| 16 | 71 | 87 | 86 | 100 | 95 | 90 |
| 17 | 69 | 71 | 68 | 69 | 73 | 80 |

Table 4. Weekly Comprehension T-Test

| Week1-Week2 | Week2-Week3 | Week3-Week4 | Week4-Week5 | Week5-Week6 | Week1-Week6 |
|---|---|---|---|---|---|
| 0.017490* | 0.014921* | 0.500000† | 0.134275† | 0.211705† | 0.000740* |

*p<.05, **.05<p<.1, †p>.1