

# The Use of eReaders in the Classroom and at Home to Help Third-grade Students Improve their Reading and English/Language Arts Standardized Test Scores

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## Abstract

This study explored the effects of a portable technology intervention, the Nook Simple Touch eReader, on student performance in Reading and English/Language Arts when included as an integral part of the teaching and learning process in an elementary third-grade classroom. This study used the participating students' end-of-year second-grade scores from the 2012 Georgia Online Assessment System (OAS) and end-of-year third-grade Criterion Referenced Competency Test (CRCT) as primary data sources. Findings indicate that a portable technology intervention, or in this case the Nook eReader, helped to demonstrate student responsibility and portable technology durability. Improved student achievement was observed during classroom activities in the 2012-2013 academic year.

**Keywords:** portable technology, elementary students, technology integration

Every country must address the learning capacities of its people and the capacity of its educational and cultural institutions to develop its population (Papert, 1993). This development will inevitably include using new technologies, trying out new concepts, imposing new strategies, and planning for the unexpected in

the twenty-first-century classroom. The twenty-first-century classroom is heavily influenced by the use of information technology, such as students using computers in a computer lab on a limited basis, or in a more integrated approach whereby many students in a classroom have personal laptops, iPads, or other similar forms of technology. The contemporary classroom is also influenced by millennial students who were born in the 1990s (Rocca, 2009) and have grown up in an era in which computers and digital technologies are ubiquitous in their vernacular speech and skill sets (McAlister, 2009). These millennial students apply their twenty-first-century skills, which include critical thinking and problem solving, creativity and innovation, communication and collaboration, information literacy, social and cross-cultural skills, productivity and accountability, and leadership and responsibility (Partnership for 21<sup>st</sup> Century skills, 2007) with technology to collaborate, communicate, create, and consume information in nontraditional ways.

Margolin, Driscoll, Toland, and Kegler (2013) and Zucker, Moody, and McKenna (2009) observed that portable technology interventions can significantly improve student performance in K-5 learning environments. An example of an innovative and popular portable technology is the eReader, a portable digital

device that enables the user to read electronic books using an image displayed on a screen (McKenzie, 2011). Electronic books (hereafter “eBooks”) are the electric files read on an eReader and are easily downloaded from a computer or website to an eReader (Library Journal, 2010a; 2010b; 2010c). Foote (2011) recommended that students use the motivational eReaders and eBooks. Furthermore, McKenzie (2011) found that when students are engaged in reading, their reading comprehension, achievement, and vocabulary skills increase.

In light of the potential of eReaders and eBooks to support the development of reading skills, our research focused on millennial students applying their twenty-first-century skills with a portable technology intervention in a nontraditional manner. Twenty-five students used Nook Simple Touch eReaders (black and white versions with add note and dictionary look up functions) and associated eBooks, both in the classroom and at home to complete Reading and English/Language Arts lessons called Nook Assignments that focused on Common Core Standards. We conducted a study that was designed to determine whether this specific portable technology intervention would improve student performance.

## Review of the Literature

### Technology in the Classroom and at Home

This research project was heavily influenced by Papert’s (1993) theory of new technology use, which he applied to the processes involved in trying new concepts, imposing new strategies, and planning for the unexpected in the twenty-first-century classroom. Our review of the relevant literature provided several supportive examples of how using technology in the classroom and at home can benefit student learning. Greaves, Hayes, Wilson, Gielniak, and Peterson (2010) asserted that properly implemented educational technology can substantially improve student achievement when employing a 1:1 student–computer ratio. Cheung and Slavin (2012) encouraged using educational technology applications because they produce a positive effect on reading outcomes for elementary school-level readers. In both cases, using technology in the learning process enabled school leaders to interrupt the generational trends (such as having limited access to technology) that plague low- and moderate-income communities by providing the technological foundation for many students to successfully achieve and establish the groundwork required to become life-long learners and productive digital citizens.

Research has supported using school leadership–sanctioned, technology integration–professional development models to develop confident teachers who can deliver meaningful lessons to students when using technology as means of improving student performance (Falloon, 2010; Hennessy & Onguko, 2010; Keengwe & Onchwari, 2009; Kumar, Rose, & Silva, 2008; Laurillard, 2007; Mosenson & Johnson, 2008; Peters, 2007). These studies found that competent and technology-literate teachers would be more willing to use potent and productive technology tools that offer exciting new approaches to teaching and learning.

On the other hand, several studies have identified barriers to using technology in the learning process. For example, Clark, Logan, Luckin, Mee, and Oliver (2009) and Park and Ertmer (2008) identified a lack of a clear, shared vision, a lack of knowledge and skills, unclear expectations, and insufficient feedback as factors that undermine the effectiveness of technology in the learning process. Trushell and Maitland (2005) similarly found that inconsiderate or annoying interactive features such as cued animations and sound effects could become a distraction and thus a barrier to successful technology use in learning. Finally, Walker and Shepard (2011) indicated that key barriers to technology integration include negative teacher attitudes and beliefs toward technology integration due to pressures associated with standardized testing, and also the lack of teacher power and social positionality whereby some teachers believed their opinions were not valued and technology integration was stymied. Overall, however, the general consensus in the literature is that barriers to the integration of technology into classroom learning should be overcome, with some recommending using a strategic plan that involves intervention strategies.

### Portable Technology Intervention

In addition to our discovery of supportive examples that indicate how using technology in the classroom can be beneficial to student learning, we also found several reasons to use *portable* technologies in the classroom. Portable technologies such as handheld devices in the classroom supported collaborative learning, and emphasized positive results by encouraging “anywhere, anytime” learning and bridging the gap between school, home, and other learning environments (Cheung & Hew, 2009; Korat, 2008; Laurillard, 2007; Lemke, Coughlin & Reifsneider, 2009; Liu, 2007).

Chau (2008), Dorian (2011), Larson (2009, 2010), and Maynard (2010) provided

a catalyst to our research as they promoted embedding e-readers into classroom practice, finding that e-readers facilitated collaboration, student learning, motivation, and independent working. More specifically, Larson (2009, 2010) demonstrated how students enhance their reading experience by using e-reader features such as adding personal notes, researching unfamiliar words using the dictionary look-up function, and highlighting important words, phrases, or paragraphs—ultimately increased their understanding of the reading assignment. Grimshaw (2007) reported that the reading comprehension skills of children improved when using e-Reader multimedia features such as animation, sound effects, and read-to-me functions. Additionally, eReader use in the classroom and at home allows students to demonstrate a longitudinal increase in sustained reading capabilities, stronger recall and reading comprehension skills, and familiarity with the standard “QWERTY” keyboard (Hennessy, Hassler, Lord, Jackson & Cross, 2011; Miranda, Williams-Rossi, Johnson, & Mckenzie, 2011). Finally, the abovementioned researchers supported all students’ having their own devices.

There were also some negative results associated with using eReaders. Gregory (2008) discovered that some students had difficulty navigating through the devices, while some complained of eyestrain. Additionally, it was interesting that Gregory found that some students simply preferred traditional printed books. Marinak and Gambrell (2009) indicated that most of students in their study reported that reading was boring, suggesting that eReaders might have limited effects on reading performance. Ash (2010) and Carter (2010) found some limited success in using eReaders to motivate reluctant readers, but the results were not significant. Finally, Damcast (2010) observed that navigation issues continued to be a problem along with eReader support, including difficulties on the part of teachers, some of whom failed to manage the eBooks and associated materials effectively.

### Summary

The results reported in the literature lend support to the effectiveness of the classroom intervention we intended to study. The literature generally indicates that the use of technology in the classroom and at home is warranted and, more specifically, that portable technologies such as eReaders are a viable choice. Therefore, the goals of our research included introducing a portable computer technology intervention (eReader use) as an integral part of the teaching and learning process in the classroom and at

home; determining if allowing third-grade students to take their own personal eReaders home to complete reading comprehension or Nook Assignments helped to engage them and motivate them to read and improve their standardized test scores; discovering the impact of teacher training on the use of portable computer technology as an educational tool in the classroom and at home; and, finally, establishing a foundation for success by developing the whole child through the use of portable computer technology interventions. We also wanted to learn whether, when used regularly by elementary school students, eReaders would be durable enough to be cost-effective educational tools.

### Method

A mixed-methods case study methodology was used for this study. For the quantitative analysis, we investigated the academic performance of third-grade students whose teacher we refer to as “Ms. H.” Ms. H’s students used Nook Simple Touch eReaders and similar eBooks to complete Nook Assignments in the classroom and at home during classroom activities in the 2012-2013 academic year. We compared Ms. H’s students with the academic performance of four other third-grade classrooms in which students did not use Nooks or eBooks. All five participating classrooms were from the same elementary school. The mandatory Georgia Online Assessment System (OAS) and the Criterion-Referenced Competency Test (CRCT) measured how well students acquire the skills and knowledge described in the state mandated content standards in reading and English/language arts. This information is used to diagnose individual student strengths and weaknesses as related to the instruction of the state standards, and to gauge the quality of education throughout Georgia. Because the Criterion-Referenced Competency Test (CRCT) is administered to students beginning in third grade, the participating students’ scores from the 2012 Georgia Online Assessment System (OAS) end-of-year second-grade scores were used as baseline data. Following the intervention, the students’ third-grade scores from the 2013 Criterion-Referenced Competency Test (CRCT) were collected. For the qualitative portion of this study, we recorded our notes and logs of daily events associated with the use of Nooks as an educational tool in the classroom and at home by third-grade students in Ms. H’s class. To ensure confidentiality, during the research period participating students, who ranged in age from 8 to 11 years, were

not specifically identified. Typically third grade students are 8 to 9 years old. However, we did have one student that was held back and reached the age of 11 before the study was over.

## Research Questions

Our literature review supported Papert's (1993) theory of new technology use, which he applied to the processes involved in trying new concepts, imposing new strategies, and planning for the unexpected in the twenty-first-century classroom. Therefore, to help determine the impact of using a new strategy that included using the Nook portable technology intervention as an educational tool in the classroom and at home at the third-grade level, the following research questions were used to help guide the study:

1. Are there differences between the average CRCT reading scores of students who learned with eReaders and those of students in other classes who did not learn with eReaders?
2. Are there differences between average CRCT English/Language Arts (E/LA) scores of students who learned with eReaders and those of students in other classes who did not learn with eReaders?
3. In what ways does the behavior of students who used eReaders in the study reflect student responsibility and the physical durability of the eReaders?

## Data Collection and Analysis

Data collection commenced with the researchers' arranging with the principal of an elementary school in Northeast suburban Atlanta to collect the participating students' end-of-year second-grade scores on the 2012 Georgia OAS, end-of-year third-grade CRCT scores. As well, researchers' logs of and notes on the daily experiences of students results page who were using Nooks were collected. Regarding the data collected from the 2012 Georgia OAS (pre-data) and data collected from the CRCT performance scores (post-data), an analysis was conducted to identify differences in CRCT performance. For the quantitative analysis, an analysis of covariance (ANCOVA) was proposed to investigate the effects of the independent variables (eReader usage) on the dependent variable (2013 test scores), after controlling for the baseline test score (2012 test scores). The interaction effect of eReader usage by baseline test score was included in the model to investigate whether the effects of "eReader usage" on the dependent variable depends on the baseline test score. Two dependent variables were considered: 2013 reading scores and 2013 E/LA scores.

F-tests based on the type III estimable functions for each effect were conducted to test

whether the effect of a term might be statistically significant, under the assumption that the sampled populations are normally distributed. In general, the null and alternative hypotheses for testing each effect are:

$H_0$ : There was no relationship between the dependent variable and the independent variable.

$H_a$ : There was a relationship between the dependent variable and the independent variable.

Without further specification, a p-value of less than 0.05 indicates that the effect is statistically significant.

The residual plot (residuals versus the fitted values) was used to investigate whether the variances are constant/equal. Plotting residuals versus the value of a fitted response should produce a distribution of points scattered randomly about 0, regardless of the size of the fitted value. The residuals should be:

- Unbiased: the average value of residuals in any vertical strip should be zero.
- Homoscedastic (homogeneity of variance): the spread of the residuals should be the same in any vertical strip.

ANCOVA models are robust against minor violations of the model assumptions, which occur if, for example, the error terms are not exactly normally distributed or the error variances are unequal, but all factor-level sample sizes are approximately equal. However, if the ANCOVA assumptions are seriously violated and sample sizes are not approximately equal, the results of the ANCOVAs should be interpreted with caution and data transformation is recommended to be applied to the dependent variable to stabilize the variances.

For the qualitative analysis of the researchers' logs and notes, the following data were collected and analyzed from the six stages of the research to determine how student behavior reflected responsibility and durability when using portable technology:

1. Stage 1 (August 6 and 9): Introduction. On August 6, Ms. H introduced the researchers to her class; they provided a brief summary of the research and expectations. August 9 was the date of first issuance of Nooks to students and subsequent training and indoctrination. The goal was to demonstrate how to turn the Nooks on, how to navigate through the Nooks to obtain certain parameters, and how to use some of the Nook's functionalities.

2. Stage 2 (August 14–Dec 6): Nook Familiarization Period. During this stage students

continued mastering Nook functionalities in the classroom only while participating in their reading and E/LA blocks. Nook Assignments were designed to give the students practice in reading and working on Common Core skills and Essential Questions. For example, Figure 1 shows a Nook Assignment that was given to the students to complete during this stage.

3. Stage 3 (Jan 8 – March 22): Refresher Training and Take Nooks Home. Since the Students were returning from Christmas break, they were provided refresher training on Nook functionalities. Additionally, during this stage students were assigned to complete their Nook Assignments at home over the weekend. For example, Figure 2 shows a Nook Assignment that was given to the students to complete during this stage.

4. Stage 4 (Spring Break or April 5–15): Nook or Book. Each student was provided a paperback version of the book *Mr. Macky is Wacky*. Students were also provided with the eBook *Mr. Macky is Wacky* on their Nook. Students were assigned to choose whether they wanted to read the paperback version or eBook and then, complete a Nook Assignment. Figure 3 shows a Nook Assignment that was given to the students to complete during this stage.

5. Stage 5 (April 26–May 22): Permanent Nook Issue to Students. During this stage the researchers used the rest of the school year to determine if the students could be responsible for their keeping the Nooks until the last week of school. This included handing out the Nooks along with the charging cords and giving students the freedom of reading without assigned lessons. The researchers were there to address questions or concerns but students kept the Nooks in their possession. During the week, students had access to their Nooks during in-class reading times when Ms. H allowed them to read and they were also able to take the Nooks home to read at night.

## Results

Data were analyzed for themes and patterns that were relevant to the three research questions. The questions focused on how a portable technology intervention that included reading materials that were loaded onto Nook eReaders combined with Nook Assignments that supported Reading and English/Language Arts Common Core skill development influenced student performance. The results pertaining to Research Questions 1 and 2, based on the comparative analysis of the end-of-year second-grade 2012 Georgia OAS scores and the

Nook Assignment 8 – Possessive Nouns and Pronouns

Possessive Noun definition: **By adding an apostrophe and an s we can manage to transform most singular nouns into their possessive form:**

- the car’s front seat
- Charles’ car
- Bob’s book
- a hard day’s work

Objective: Practice identifying possessive nouns in the reading(s).  
 Assignment: Read page 42 of the chapter “Frederick Becomes a Field Hand” in the eBook *Frederick Douglass, Abolitionist Hero*. Look for all the possessive nouns in the reading. Highlight each possessive noun and label “PN” with the “Add Note” function. How many possessive nouns did you find? \_\_\_\_\_  
 Bonus question: What did Frederick want to learn how to do? \_\_\_\_\_

Figure 1. A typical Stage 2 Nook Assignment.

Nook Assignment 12 – Summary

Objective: Practice summarizing  
 Assignment: Find the eBook *Clever Little Mouse (A Children’s Picture eBook)* in your library and then read. Highlight the last word of the story and use the “Add Note” function to type in a summary of the story. I’ll review your summary next week after you bring your Nook back on Monday. If you have any questions or concerns, feel free to call Dr. XXXXX at (770) XXX-XXXX. Happy reading!!

Figure 2. A typical Stage 3 Nook Assignment.

Nook Assignment 16 – Nook or Book and Summary

Objective: Practice summarizing  
 Assignment: Choose whether you want to read *Mr. Macky is Wacky* from your Nook or paperback book. It’s your choice!

Circle your choice:

Nook or Book

For the Nook: Read the eBook and summarize by using the “Add Note” function to type in a summary at the end.

For the paperback book: Read the book and write your summary in the space below:

Figure 3. A typical Nook Assignment from Stage 4.

end-of-year third-grade CRCT scores for all participating third-grade students (comparing scores for those who were issued Nook eReaders with scores for those who were not issued Nook eReaders), were triangulated with data from the researchers’ logs of and notes on the daily experiences of the students who were using the Nooks. Based on this triangulation, we were

Table 1

Descriptive statistics of reading scores at baseline and after intervention, by eReader usage (learning without eReaders vs. learning with eReaders). N = sample size. SD = standard deviation.

eReader usage	Year	N	Mean	SD	Median	Min	Max
Without eReaders	2012	65	844.09	28.09	850	775	920
	2013	65	839.92	30.74	835	781	920
With eReaders	2012	16	835.25	37.74	824	780	920
	2013	16	845.06	30.77	839	803	909

able to generate common themes and patterns that informed our conclusions.

### Research Question 1

In this section, we present the results pertaining to Research Question 1: Are there differences between the average CRCT reading scores of students who learned with eReaders and those of students in other classes who did not learn with eReaders?

There were 16 students in Ms. H’s class who used eReaders and 65 students in other classes who did not use eReaders. Table 1 presents the descriptive statistics for the reading scores at baseline and following the intervention (learning without eReaders vs. learning with eReaders). Figure 4 shows the plot of mean reading scores in 2012 and 2013, differentiated by eReader usage. It appears that the average reading scores for students learning with

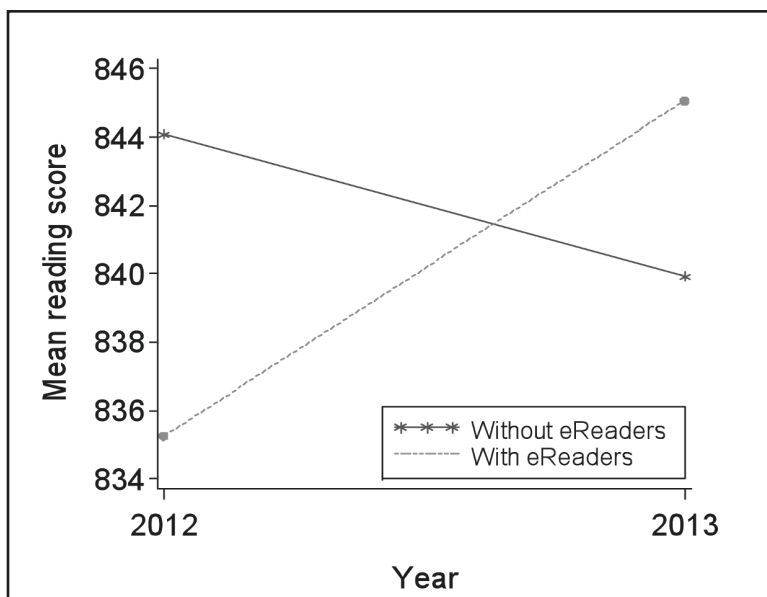


Figure 4. Plot of mean reading scores in 2012 and 2013, differentiated by eReader usage.

eReaders improved following the intervention while the average reading scores for students learning without eReaders declined following the intervention.

The effect of the independent variable (eReader usage) on the dependent variable (2013 reading scores) after controlling for the baseline (2012 reading scores) was measured. No interaction effect was included in this model. The results of the F-tests suggest that there was no relationship between the 2013 reading scores and eReader usage, after controlling for the baseline reading score ( $F(1, 77) = 2.90, p = 0.0927$ ).

The assumption of this model was checked and skewness and kurtosis of the residuals from the fitted model were 0.92 and 0.83, respectively. Although the Shapiro-Wilk test rejected the null hypothesis that the residuals were derived from a normal distribution ( $p = 0.0010$ ), the QQ plot (Figure 5 on the facing page) suggests that the residuals do seem to follow a normal distribution. The plot of residuals and fitted values (Figure 6 on the facing page) suggests that the variances are homogeneous. Thus we conclude that the assumptions of this model were satisfied and hence the fitted model was adequate.

### Research Question 2

In this section, we present the results pertaining to Research Question 2: Are there differences between the CRCT average English/Language Arts (E/LA) scores of students who learned with eBooks and those of students in other classes who did not learn with eReaders?

There were 16 students in Ms. H’s class who used eReaders and 65 students in other classes who did not use eReaders. Table 2 (page 78) presents the descriptive statistics for E/LA scores at baseline and following the intervention, differentiated by eReader usage (learning without eReaders vs. learning with eReaders). Figure 7 (page 78) shows the plot of mean E/LA scores in 2012 and 2013, differentiated by eReader usage. It appears that the average E/LA scores for students learning with eReaders improved following the intervention while the average E/LA scores for students learning without eReaders exhibited little change following the intervention.

The effect of the independent variable (eReader usage) on the dependent variable (2013 E/LA score) after controlling for the baseline (2012) E/LA score was measured. No interaction effect was included in the model. The results of the F-tests suggest that there was

a statistically significant relationship between mean 2013 E/LA score and eReader usage, after controlling for the baseline E/LA score ( $F(1, 77) = 6.21, p = 0.0148$ ).

The assumption of this model was checked, and skewness and kurtosis of the residuals from the fitted model were -0.18 and 0.03, respectively. A Shapiro-Wilk test did not reject the null hypothesis that the residuals were derived from a normal distribution ( $p = 0.9067$ ). The QQ plot (Figure 8 on page 79) also suggests that the residuals seem to follow a normal distribution. The plot of residuals and fitted values (Figure 9 on page 79) suggests that the variances are homogeneous. Thus we conclude that the assumptions of the model were satisfied and hence the fitted model was adequate.

### Research Question 3

In this section we present our results pertaining to Research Question 3: In what ways does the behavior of students who used eReaders in the study reflect student responsibility and the physical durability of the eReaders? To answer this question we analyzed our logs and notes that were collected over the six stages of the research period.

Five themes emerged during the six stages of this study. The majority of students completed all Nook Assignments, which resulted in improved student focus when it came to comprehending assigned reading. Students demonstrated technological skill sets as they successfully operated the functionalities of the Nook throughout the duration of the project. Students were fully responsible for their assigned Nooks as there were no issues with damaged, lost, or stolen equipment throughout the duration of the project. Student Reading and E/LA skills improved as indicated by the noticeable improvement in Common Core understanding over the course of the project. It was discovered that having buy-in and support from the school's principal helped to a measureable extent. Daily support from a technology-savvy teacher who encouraged, enforced, supported, and most of all understood the vision of using this portable technology intervention helped in achieving successful results. Finally, parental involvement was also a factor, as the notes collected from students and teachers indicated how parents helping their students to complete Nook Assignments were extremely valuable to the success of the project.

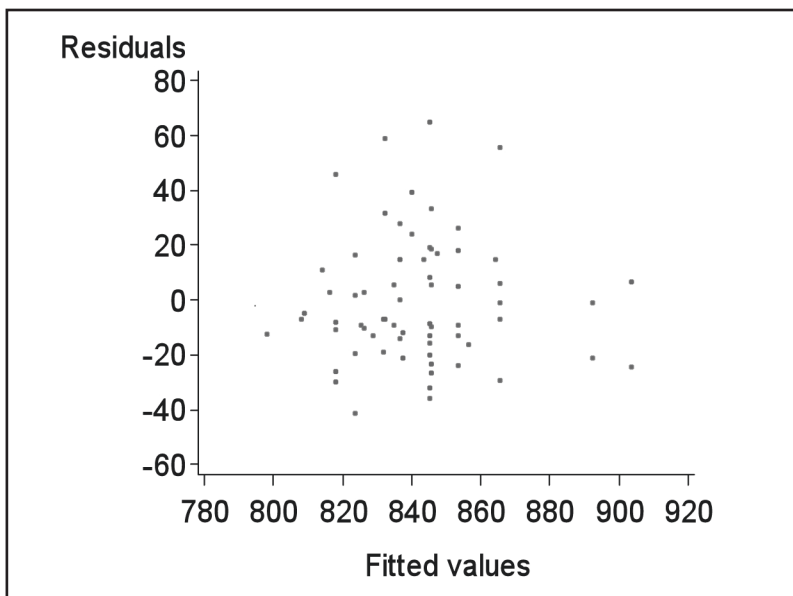


Figure 5. QQ plot.

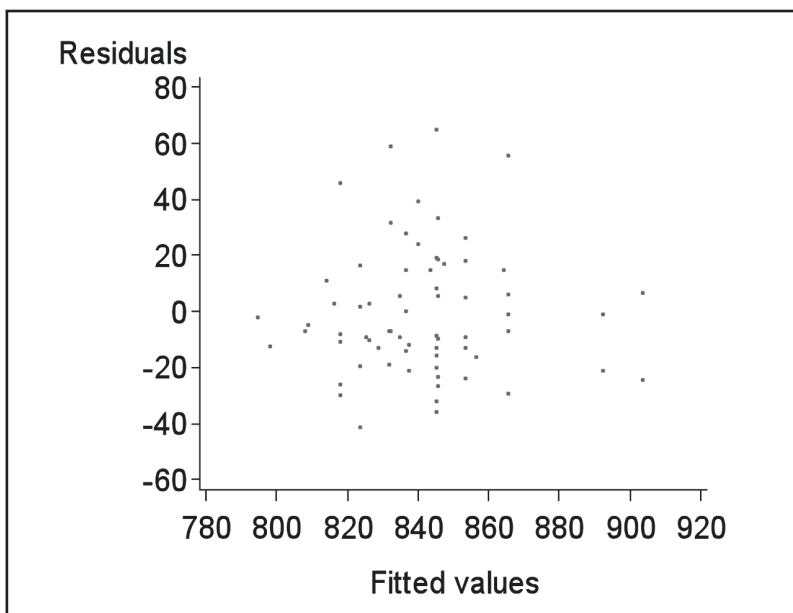


Figure 6. Plot of residuals and fitted values.

### Discussion

We undertook this study mindful that millennial students may demonstrate a weak motivation to read. Furthermore, we wanted to determine whether the millennial students (third graders) who participated in this study and used eReaders as a portable technology intervention in the classroom and at home improved their performance as measured by standardized tests. We found the need for such a study even greater after our literature review revealed no studies have focused on how students have used eReaders as an educational tool in both the classroom and home. This

Table 2. Descriptive statistics of E/LA scores at baseline and after intervention, by eReader usage (learning without eReaders vs. learning with eReaders). N = sample size. SD = standard deviation.

eReader usage	Year	N	Mean	SD	Median	Min	Max
Without eReaders	2012	65	829.45	21.79	830	776	888
	2013	65	829.69	27.11	829	765	890
With eReaders	2012	16	822.00	23.49	812	796	888
	2013	16	835.94	31.36	829	771	908

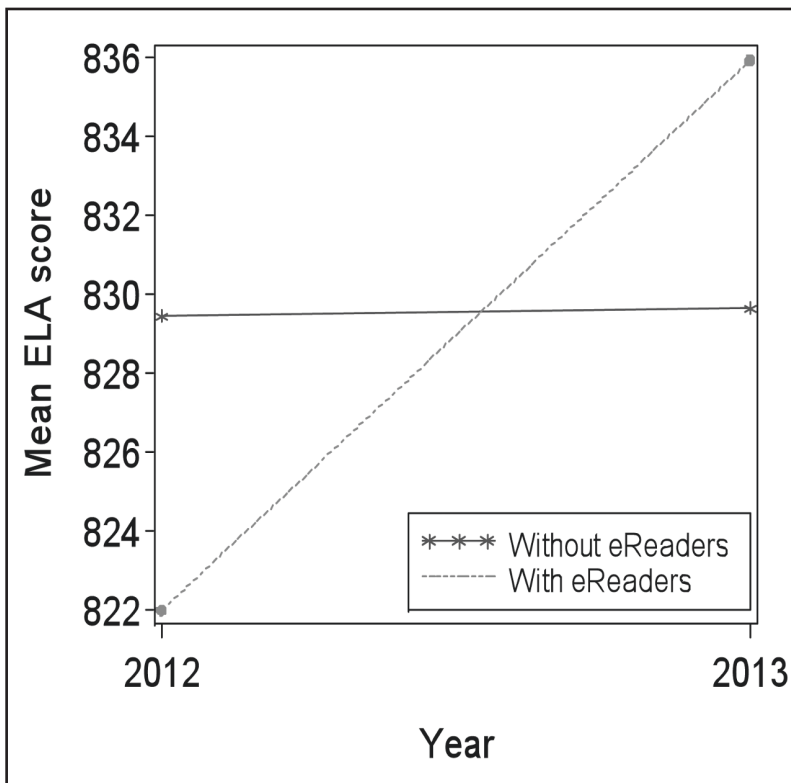


Figure 7. Plot of mean E/LA scores in 2012 and 2013, differentiated by eReader usage.

study was therefore designed to fill a gap in the research on the effects of nontraditional practices in elementary schools on the behaviors and attitudes of students who use eReaders in the classroom and at home.

Three research questions guided the study. To keep track of data and emerging themes we collected the relevant data and findings pertaining to each of the research questions by organizing data and data sources, including the participating students' end-of-year 2012 Online Assessment (OAS) second-grade scores, end-of-year 2013 Criterion-Referenced Competency Test (CRCT) third-grade scores, and the researchers' notes on and logs of daily events during the participating students' third-grade year. This consolidation effort revealed distinct sets of data in a triangulation matrix.

Triangulation was accomplished by reviewing and comparing data from this matrix. We combined the scores and emerging themes from each data source into an integrated whole to assess how student use of eReaders in the classroom and at home affected student performance.

The first component of the triangulated data represented the response to Research Question 1, which resulted from the reading scores at baseline and following the intervention. It appears that the average reading scores for students learning with eReaders improved following the intervention while the average reading scores for students who did not use eReaders declined following the intervention. However, results of the F-tests suggest that there was no relationship between the 2013 reading scores and eReader usage after controlling for the baseline reading score ( $F(1, 77) = 2.90, p = 0.0927$ ). Nevertheless, even though this component was not statistically significant, the measurable improvement in student performance based on the average test scores suggests that the use of eReaders may well have been a successful intervention. We note that an improvement in the test scores of similar magnitude would likely be statistically significant with increased sample size because that would likely increase the model's statistical power at the 0.05 level.

The second component of the triangulated data represented the responses to Research Question 2, which were comprised of the E/LA scores at baseline and following the intervention and it appears that the average E/LA scores for students learning with eReaders improved following the intervention while the average E/LA scores for students who did not use eReaders changed little following the intervention. Moreover, the results of the F-tests suggest that there was a statistically significant relationship between the 2013 E/LA scores and eReader usage, after controlling for the baseline E/LA score ( $F(1, 77) = 6.21, p = 0.0148$ ).

The third component of the triangulated data was based on the researchers' notes on and logs of daily activities that took place as the third-grade students from Ms. H's class used the Nooks as an educational tool in the classroom and at home. These qualitative data indicated that using a portable technology intervention with third-grade students in the classroom and at home helped, to a measureable extent, to engage the students in reading and demonstrate student responsibility. We also found that the portable technologies



demonstrated durability by withstanding the rigors of being used by third-grade students over the course of the study.

## Conclusion

Electronic books have shown the ability to engage students and motivate them to read. When motivated students are engaged in reading, their reading comprehension and achievement as well as their vocabulary improve. Thus, portable technology interventions seem able to significantly improve student performance in K-5 learning environments. This research incorporated millennial students (third graders) who applied their twenty-first-century technology skills with a portable technology intervention in a nontraditional manner. Millennial students used Nook eReaders and associated eBooks in the classroom and at home to complete Reading and English/Language Arts lessons called Nook Assignments that reflected Common Core Standards. We designed and conducted a study to determine whether this type of portable technology intervention would help improve student performance.

Based on the integrated whole of triangulated data that constituted our research results, we conclude that the use of eReaders in the classroom and at home by third-grade students, when integrated with the everyday lessons provided by classroom teachers, can contribute to improving student reading performance. As such, we encourage the use of eReaders in the classroom and at home in order to help teachers use nontraditional methods and tools to improve student reading and E/LA performance. However, we cannot definitively assert that the use of eReaders in the classroom and at home alone improves student reading and E/LA performance. More research will be needed to affirm that proposition. We can, however, say that the use of eReaders in the classroom and at home did not lower reading and E/LA CRCT scores or cause student performance to decline over the course of this study.

The study also revealed that the portable technology applied for the study withstood the rigors of being used by third-grade students. Finally, it was discovered that having buy-in and support from the principal; daily support from a technology-savvy teacher who encouraged, enforced, supported, and most of all understood the vision of using this portable technology intervention; and parental involvement and support at home with student assignments and homework contributed to the improvement in student performance that we observed.

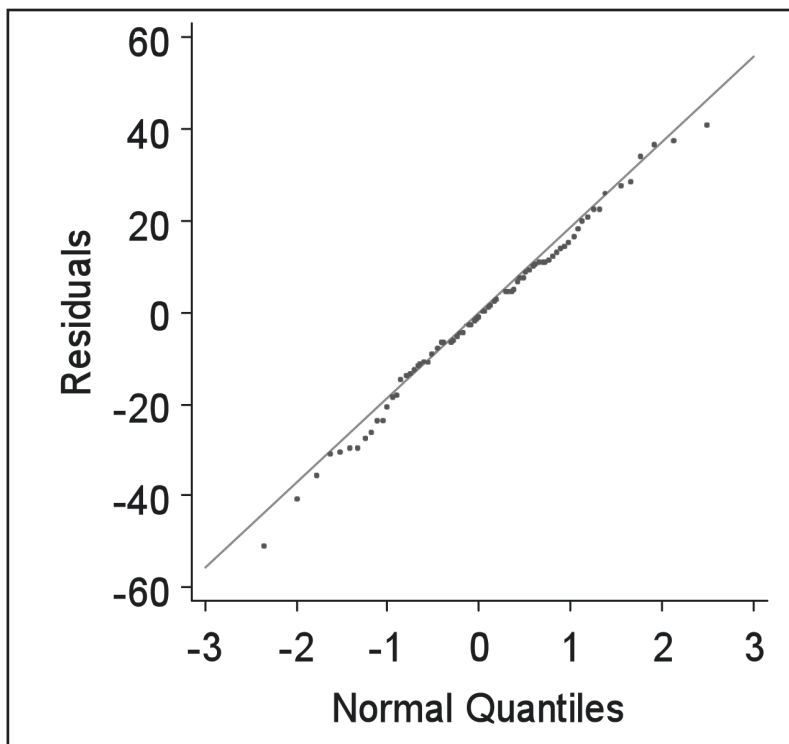


Figure 8. QQ plot.

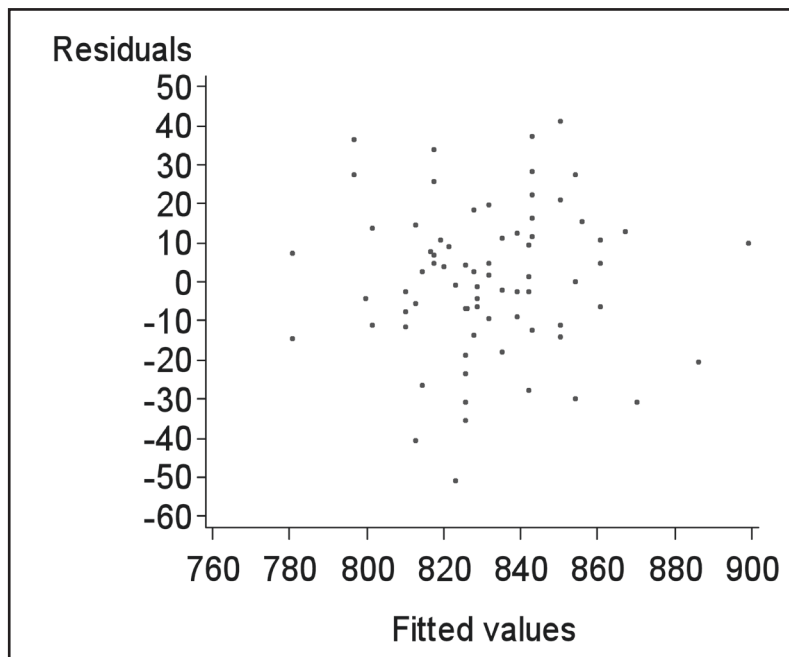


Figure 9. Plot of residuals and fitted values.

**Craig D. Union** is an independent researcher located in Lawrenceville, GA who completed this research while earning Walden University's Graduate Certificate in Integrating Technology in the Classroom. Recently completing his Ph. D. in Educational Technology from Walden University, his research goals include maximizing the use of technology at home, in the classroom and globally. Additionally, he has over 21 years of middle and top management experience including a wide range of leadership positions as a Naval Officer in the U. S. Navy. Address correspondence regarding this article to him via email at: [cunion31@gmail.com](mailto:cunion31@gmail.com).

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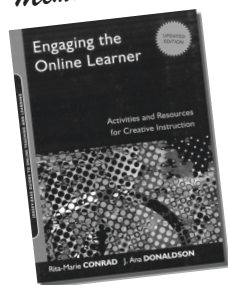
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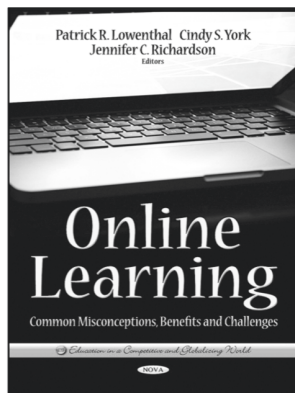
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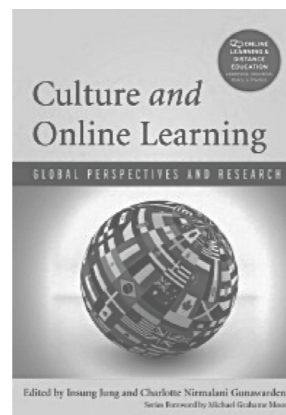
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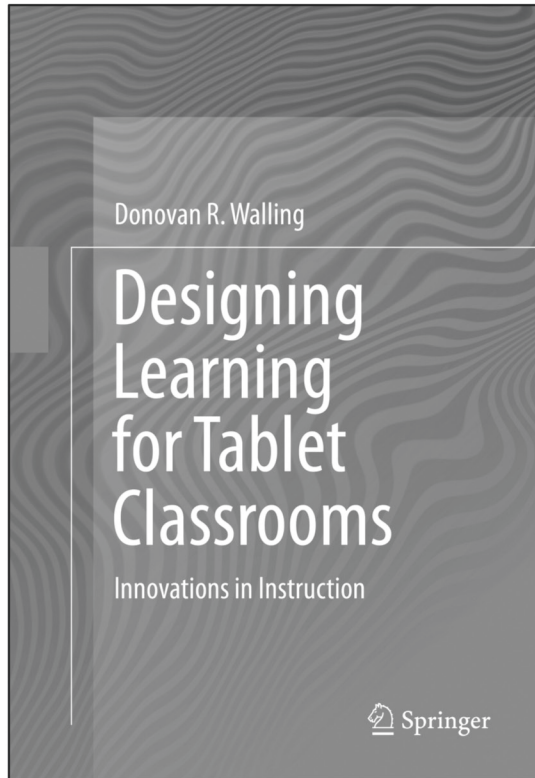
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