Bamboo Learning
ESSA Level III Study (Spring 2022)

Prepared for:
Bamboo Learning

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EXECUTIVE SUMMARY

Bamboo Learning contracted with LearnPlatform, a third-party edtech research company, to examine the relationship between student usage of Bamboo Learning EDU and learning outcomes. LearnPlatform designed the study to satisfy Level III requirements (Promising Evidence) according to the Every Student Succeeds Act.

Study Sample and Measures
This study occurred during a 6-week period in spring 2022 and included 82 first grade students (42 treatment, 40 comparison) from one elementary school. Researchers used NWEA MAP Growth® Language Arts Reading RIT scores and vocabulary sub-scale scores as students’ reading achievement outcomes as well as Elementary Reading Attitude Survey scores (McKenna & Kear, 1990) as students’ reading attitudes outcomes. We conducted descriptive statistics, partial correlations, paired t-tests, and independent samples t-tests. Researchers examined Bamboo Learning EDU usage data, examined relationships between usage and outcomes, and investigated the impact of Bamboo Learning EDU on reading attitudes and reading achievement.

Findings
Student usage. Students accessed an average of 38 books (range: 23-83), students answered an average of 296 comprehension questions (range: 135-850), answered an average of 211 comprehension questions correctly (range: 68-778), and spent an average of 219 minutes in Bamboo Learning EDU (range: 81-748).

Student outcomes. Researchers conducted partial correlations to examine the relationship between Bamboo Learning EDU usage and reading attitudes and achievement while controlling for prior reading attitudes, achievement results, and race. After accounting for initial academic reading attitudes and race, students who accessed more books in Bamboo Learning EDU, had higher academic reading attitudes (r = 0.32) at the end of the study and this relationship was statistically significant. Researchers also conducted paired t-tests to examine how students’ reading grade levels and comprehension accuracy changed over the 6-week study period. There was statistically significant growth in: reading grade levels (i.e., average reading grade level increased from K/1 to 1/2), reading comprehension accuracy from Week 1 to Week 6 (66% to 72%) for grades K-5 comprehension questions, and reading comprehension accuracy from Week 1 to Week 6 (66% to 74%) for grades K-2 comprehension questions.

Independent samples t-tests were also conducted to examine the impact of Bamboo Learning EDU on students’ reading achievement. No statistically significant effects were found, however, students’ reading scores improved between the winter and spring NWEA administrations, indicating that Bamboo Learning EDU users and non-users had equivalent reading gains.

Conclusions
This study provides results to satisfy ESSA evidence requirements for Level III (Promising Evidence) given the study design and positive, statistically significant findings for student outcomes. In future studies, Bamboo Learning could consider selecting and recruiting a larger sample of students that engages with the platform over a longer period of time and as a result, see a greater likelihood of intermediate and long-term outcomes.
Pilot Study Key Takeaways

Bamboo Learning EDU successful implementation

Students have greater reading engagement with Bamboo Learning EDU.

- 70% of students met or exceeded the recommended time (5 minutes per day, 25 minutes per week, or 150 minutes over six weeks) on the platform
- 74% of students accessed more than 30 books in 6 weeks
- 76% of students answered more than 200 comprehension questions in 6 weeks
- 93% of students responded correctly to 40-80% of comprehension questions in the Bamboo Learning EDU platform

Bamboo Learning EDU positive short-term outcomes

Students read at higher grade levels and had greater comprehension accuracy over the 6-week study period.

- Students showed significant growth in reading grade levels over a 6-week period. On average, students began reading grades K and 1 books and six weeks later read grades 1 and 2 books. *Thirteen students read books at or above grade 2, six weeks later.

- Students showed significant growth in the reading comprehension accuracy of responses within the Bamboo Learning EDU platform. For K-5 comprehension questions, students showed 66% accuracy initially and 72% accuracy six weeks later. For K-2 comprehension questions, students showed 66% accuracy initially and 74% accuracy six weeks later.

Greater Bamboo Learning EDU usage was statistically significantly related to higher academic reading attitudes at the end of the 6-week study period (controlling for prior academic reading attitudes and race).

- Students who accessed more Bamboo Learning books had more positive academic reading attitudes six weeks later.
Voices from Educators: Implementation Feedback

Self-directed learning in action

One morning I observed a pod of my five 1st graders organizing a book club. The students came into the classroom and settled to work with the Bamboo Learning application. Except that morning they decided to do something different – instead of each selecting their own books in the Bamboo Learning library, the students agreed to read/listen to the same book. After they finished the books, I watched my students engage in a discussion about the book, the questions they had to answer, and their responses.

1st Grade Teacher, Participating School

The only way to scale reading & listening comprehension assessment

The Bamboo Learning application is a great way to engage students in reading and listening to an incredibly high volume of content, while their comprehension is being assessed behind the scenes. Our 42 students read/listened to 1,593 books and answered 14,300 comprehension questions over the course of 6 weeks! One 1st grader read 83 books! Another 1st grader answered 903 comprehension questions! This volume of books and comprehension questions is not possible via 1:1 student-teacher interaction.

1st Grade Teachers, Participating School

Immediate improvements in speaking and vocabulary

The Bamboo Learning application doesn’t only offer unique comprehension assessment data, but I saw an immediate improvement in students’ speech articulation – students articulated their words, phrases, and sentences better when verbally responding to the questions in the app, as well as when participating in class discussions. Students also happily shared with me new words they learned when answering vocabulary questions in the Bamboo Learning application. And content covered in Bamboo Learning helped my students reinforce concepts taught in other subject areas – for example, when I was teaching a science unit on the planets, one student exclaimed that they already knew so much about planets from reading the book called Moon Phases in Bamboo Learning.

1st Grade Teacher, Participating School
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Introduction

Bamboo Learning contracted with LearnPlatform, a third-party edtech research company, to examine the relationship between usage of Bamboo Learning EDU and student outcomes. LearnPlatform designed the study to satisfy Level III requirements (Promising Evidence) according to the Every Student Succeeds Act.

Bamboo Learning acknowledges that students, especially in underserved communities, often experience a low rate of conversational, interactive learning, as teachers may have insufficient time to work with students one-on-one and parents may not understand how to engage in meaningful, dialogic reading. Current edtech tools do not allow for such conversation through free response, which is critical to oral language, comprehension, vocabulary acquisition, and other foundational literacy skills. Bamboo Learning created Bamboo Learning EDU, a “Comprehension Through Conversation” application, to address these needs (see logic model in Appendix A; Styers, Long, & Shah, 2022).

The present study had the following research questions:

1. To what extent did first grade students engage in Bamboo Learning EDU during spring 2022?
   a. How many books did they read/listen to?
   b. How many reading comprehension questions did they answer correctly?
   c. How much time did they spend using Bamboo Learning EDU?
2. Was greater engagement with Bamboo Learning EDU related to more positive reading attitudes and higher reading achievement among first grade students?
3. Did first grade students who used Bamboo Learning EDU have higher reading achievement and better vocabulary performance compared to first grade students who did not use the product?

This report details the study design and methods, implementation, findings, conclusions, and recommended next steps.
Study Design and Methods

This section of the report briefly describes the study participants, measures, and analysis methods. Additional information on the study design is in Appendix B.

Participants

The study sample included 82 students from four classrooms (n = 42 treatment, 40 comparison students) at one charter school in the central south of the US. Additional demographic information is available in Appendix B.

Measures

Researchers used several measures in this study. For student attitudes, researchers used the Elementary Reading Attitude Survey (ERAS, McKenna & Kear, 1990), which measures academic and recreational reading attitudes that constitute a composite reading attitudes score. For student achievement in the short-term, researchers used Bamboo Learning EDU’s reading grade levels assigned to books by publishers and reading comprehension accuracy of responses to comprehension questions within the platform. For intermediate student outcomes, researchers used the NWEA MAP Growth® Language Arts Reading RIT scores and vocabulary subscale scores.

Study Procedures and Timeline

This study occurred during the spring 2021-22 school year. Students used Bamboo Learning EDU for six weeks, beginning on March 21, 2022, continuing through April 29, 2022. Bamboo Learning EDU students completed the ERAS survey prior to beginning the program (early March 2022) and immediately after (late April 2022). Bamboo Learning EDU student users and non-users completed the NWEA MAP Growth® Language Arts Reading assessment in late January 2022 and early May 2022.
Program Implementation

The charts below highlight Bamboo Learning EDU use during the spring of the 2021-22 school year based on Bamboo Learning EDU internal usage data. Students accessed an average of 38 books (range: 23-83), students answered an average of 296 comprehension questions (range: 135-850), answered an average of 211 reading comprehension questions correctly (range: 68-778), and spent an average of 219 minutes in Bamboo Learning EDU (range: 81-748). The following tables and graphs reflect usage by category.

### Average Bamboo Learning EDU usage

<table>
<thead>
<tr>
<th>Average Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of books accessed</td>
</tr>
<tr>
<td>Number of responses</td>
</tr>
<tr>
<td>Number of correct responses</td>
</tr>
<tr>
<td>Proportion of correct responses</td>
</tr>
<tr>
<td>Number of minutes</td>
</tr>
</tbody>
</table>

### Most students read/listened to 20-40 books in Bamboo Learning EDU

![Bar Chart]

Most students read/listened to 20-40 books in Bamboo Learning EDU.
Most students answered 100-300 comprehension questions in Bamboo Learning EDU

Most students answered 100-300 comprehension questions correctly in Bamboo Learning EDU

Most students responded correctly to 40-80% of the comprehension questions in Bamboo Learning EDU
All students used Bamboo Learning for at least 81 minutes and 29 students met or exceeded the recommended dosage of 150 minutes.
Findings

To answer the study research questions, researchers conducted descriptive statistics, partial correlations, paired t-tests, and independent samples t-tests. The following sections detail the findings for the treatment-only and quasi-experimental designs.

Outcomes for Bamboo Learning EDU students (treatment-only)

For each analysis, researchers conducted partial correlations examining the relationship between Bamboo Learning EDU usage in spring 2022 and student outcomes, while controlling for prior results and race, as appropriate. Researchers report statistically significant findings at the $p = .05$ level. Statistically significant findings are marked green (positive correlation) or red (negative correlation) in correlation coefficient graphs. Findings that are not statistically significant are marked yellow.

Reading attitudes. Researchers examined average recreational and academic reading attitudes before and after Bamboo Learning EDU students used the program. Based on visual examination of the data, students reported approximately the same recreational reading attitudes and slightly higher academic and composite reading attitudes over the course of the study. The latter two were not statistically significant gains ($p < .05$; Appendix C).

Students’ reading attitudes remained relatively constant over time. There were slight increases in academic and composite reading attitudes, but these were not statistically significant.

Researchers then conducted partial correlations to examine the relationship between number of books accessed in Bamboo Learning EDU and student reading attitudes. The models included prior reading attitudes and race as covariates. The relationship between the number of books accessed and students’ academic reading attitudes was statistically significant ($r = .32, p < 0.05$).
Researchers then conducted partial correlations to examine the relationship between number of correct responses in Bamboo Learning EDU and student reading attitudes. The models included prior reading attitudes and race as covariates. Overall, there was no statistically significant correlation between the number of correct responses in Bamboo Learning EDU and reading attitudes at the end of the study.

There was no clear positive or negative relationship between number of correct responses in Bamboo Learning EDU and students’ reading attitudes.
Researchers then conducted partial correlations to examine the relationship between number of minutes spent using Bamboo Learning EDU and student reading attitudes. The models included prior reading attitudes and race as covariates. Overall, there was no statistically significant correlation between the number of minutes spent in Bamboo Learning EDU and reading attitudes.

There was no clear positive or negative relationship between number of minutes spent in Bamboo Learning EDU and students’ reading attitudes.

Reading achievement. Researchers examined the reading grade level and comprehension accuracy of student responses within the Bamboo Learning EDU platform. Paired t-tests were conducted between students’ reading grade level and comprehension accuracy from Week 1 and Week 6. Results showed that both reading grade level and comprehension accuracy significantly improved over the course of the six weeks.

On average, students began reading grades K and 1 books and six weeks later read grades 1 and 2 books. Thirteen students read books at or above grade 2, six weeks later.

In terms of reading comprehension accuracy for grades K-5 comprehension questions, on average, students were 66% correct in their responses to comprehension questions in the Bamboo Learning EDU platform in Week 1 of the study. By Week 6, students were 72% correct, on average.

In terms of reading comprehension accuracy for grades K-2 comprehension questions, on average, students were 66% correct in their responses to comprehension questions in the Bamboo Learning EDU platform in Week 1 of the study. By Week 6, students were 74% correct, on average.
Bamboo Learning EDU students' reading grade level significantly improved with all students reading grade K-2 books at the beginning of the study and 13 students reading at or above Grade 2 by the end of the 6-week study. This finding was statistically significant.

![Diagram showing reading grade level improvement](image)

Bamboo Learning EDU students' reading grade level significantly improved over the 6-week study period. This finding was statistically significant.

![Diagram showing reading grade level improvement](image)

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Before Bamboo Learning EDU</th>
<th>After Bamboo Learning EDU</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-Gr. 1</td>
<td>0.86</td>
<td>1.43 (Grade 1-2)</td>
</tr>
</tbody>
</table>
Bamboo Learning EDU students' reading comprehension accuracy for K-5 books improved over the 6-week study period. This finding was statistically significant.

Bamboo Learning EDU students' reading comprehension accuracy for K-2 books improved over the 6-week study period. This finding was statistically significant.
Researchers conducted partial correlations to examine the relationship between Bamboo Learning EDU usage and spring 2022 NWEA MAP Growth® Language Arts Reading achievement scores. The models included prior (winter) NWEA MAP Growth® Language Arts Reading scores and race as covariates. Overall, there were no significant relationships between Bamboo Learning engagement (i.e., number of books accessed by students, number of correct responses, time spent in the platform) and 2022 NWEA MAP Growth® Language Arts Reading achievement scores (i.e., overall, vocabulary subscale).

There was no clear positive or negative relationship between number of books accessed in Bamboo Learning EDU and NWEA MAP Growth® Language Arts Overall or Vocabulary scores.

There was no clear positive or negative relationship between number of correct responses in Bamboo Learning EDU and NWEA MAP Growth® Language Arts Overall or Vocabulary scores.
Impacts for Bamboo Learning EDU students (quasi-experimental)

Researchers examined students’ NWEA MAP Growth® Language Arts Reading RIT scores and vocabulary subscale scores from January 2022 to May 2022 for Bamboo Learning EDU students and comparison students. Based on visual examination of the data, students had some growth in achievement and vocabulary scores across both groups. Researchers conducted independent samples t-tests to examine differences in intermediate outcomes for Grade 1 students who used Bamboo Learning EDU and those who did not. There were no differences in NWEA MAP Growth® Language Arts Reading RIT and Vocabulary scores between groups. Bamboo Learning EDU student users and non-users performed similarly on both measures (see Table C3 in the Appendices).

NWEA MAP overall scores increased from winter to spring for Bamboo Learning EDU users and non-users
NWEA MAP Vocabulary scores showed slight increases from winter to spring for Bamboo Learning EDU users and non-users.
Conclusions

Students have greater reading engagement with Bamboo Learning EDU after the 6-week study period; they accessed an average of 38 books (range: 23-83), students answered an average of 296 comprehension questions (range: 135-850), answered an average of 211 comprehension questions correctly (range: 68-778), and spent an average of 219 minutes in Bamboo Learning EDU (range: 81-748).

After accounting for initial academic reading attitudes and race, students who accessed more books in Bamboo Learning EDU, had higher academic reading attitudes ($r = 0.32$) at the end of the study and this relationship was statistically significant. There was statistically significant growth in reading grade levels (i.e., average reading grade level increased from K/1 to 1/2), reading comprehension accuracy from Week 1 to Week 6 (66% to 72%) for grades K-5 comprehension questions, and reading comprehension accuracy from Week 1 to Week 6 (66% to 74%) for grades K-2 comprehension questions.

Given positive short-term outcome findings, this study provides results to satisfy ESSA evidence requirements for Level III (Promising Evidence). Specifically, this study met the following criteria for Level III:

- Correlational study
- Proper design and implementation
- Statistical controls through covariates
- At least one statistically significant, positive correlation with statistical controls for selection bias

In future studies, Bamboo Learning could consider promoting program use over a longer period (e.g., at least three months) and with a larger sample size in order to see more intermediate and long-term impacts of program participation.

Recommended Next Steps

For next steps, we recommend that Bamboo Learning select and recruit:

- a school or district that can assign a larger population of students ($n = 100$) to the treatment group;
- a school or district that can participate in the study for at least one full semester during the 2022-23 school year; and
- a larger sample of students from different achievement levels in order to examine differences in Bamboo Learning EDU impacts by prior achievement.
References

Appendix A. Bamboo Learning EDU Logic Model and Theory of Change

Logic Model

**Problem Statement:** Students, especially in underserved communities, often experience a low rate of conversational, interactive learning as teachers may not have sufficient time to work with students one-on-one, and parents may not know how to engage in meaningful, dialogic reading. Current edtech literacy tools do not allow for such conversation through free response, which is critical to oral language, comprehension, vocabulary acquisition, and other foundational literacy skills.

### Inputs
- **What we invest:**
  - Devices (iPads, provided by schools/school districts/nonprofits)
  - Voice-enabled integrations that evaluate free-form responses
  - Library of high-interest, diverse, culturally responsive fiction and nonfiction texts
  - Content aligned to grade-level standards (e.g., comprehension questions, language arts activities)

### Participants
- **Who we reach:** PreK-5 students
- **Educators**
- **Parents/guardians**

### Activities
- **What we do:**
  - Students select books based on their grade level and interest for a personalized learning experience
  - Students use application to listen to (and read along with) books and respond to CROWD prompts (i.e., completion, recall, open-ended, who, what, when, why, where) in a conversational, free-form style
  - Students can redeem earned tokens for special content
  - Bamboo Learning provides immediate verbal feedback and offers hints for incorrect responses
  - Educators can monitor students’ progress in Bamboo Learning and offer off-platform support
  - Parents learn how to engage in dialogic reading with their children

### Outputs
- **Products of activities**
  - Number of books read/listened to
  - Number of questions answered (by prompt type)
  - Number of hints needed
  - Number of tokens received
  - Number of educator logins
  - Time spent in app daily (in school, out of school)

### Outcomes

#### Short-term
- Educators become aware of students’ literacy needs

#### Intermediate
- Educators personalize instruction to meet the specific literacy needs of subgroups or individual students
  - Students, including emergent & struggling readers, EL learners, and students with learning difficulties such as dyslexia & dysgraphia, have greater reading confidence
  - Students have greater reading interest and engagement
  - Students engage in more independent reading
  - Students gain content knowledge in a variety of areas (e.g., science, history, etc.)
  - Students gain decoding skills

#### Long-term
- Students have higher literacy achievement
  - Students have stronger communication and other life skills that prepare them for life after K-12
  - Gaps in literacy achievement are reduced
  - Students have higher literacy achievement
Appendix B. Additional Information on Study Design and Methods

Additional Information on Participating School

The present study included one charter school in Oklahoma. Table B1 documents NCES school-level demographic data for the participating school.

Table B1. Description of participating school

<table>
<thead>
<tr>
<th></th>
<th>School A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State</strong></td>
<td>Oklahoma</td>
</tr>
<tr>
<td><strong>Number of participating students</strong></td>
<td>82</td>
</tr>
<tr>
<td><strong>Locale (school)</strong></td>
<td>City</td>
</tr>
<tr>
<td><strong>Grade levels (school)</strong></td>
<td>PK-8</td>
</tr>
<tr>
<td><strong>Title I school?</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>School type</strong></td>
<td>Charter</td>
</tr>
<tr>
<td><strong>Total students (school)</strong></td>
<td>717</td>
</tr>
<tr>
<td><strong>n</strong></td>
<td>%</td>
</tr>
<tr>
<td><strong>Students certified for the National School Lunch Program</strong></td>
<td>121</td>
</tr>
<tr>
<td><strong>English Language Learners</strong></td>
<td>86</td>
</tr>
<tr>
<td><strong>American Indian/Alaskan Native</strong></td>
<td>27</td>
</tr>
<tr>
<td><strong>Asian</strong></td>
<td>30</td>
</tr>
<tr>
<td><strong>Black</strong></td>
<td>139</td>
</tr>
<tr>
<td><strong>Hispanic or Latino</strong></td>
<td>156</td>
</tr>
<tr>
<td><strong>Native Hawaiian/Pacific Islander</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>White</strong></td>
<td>280</td>
</tr>
<tr>
<td><strong>Two or more races</strong></td>
<td>84</td>
</tr>
</tbody>
</table>

*Data retrieved from IES, NCES Common Core of Data [https://nces.ed.gov/ccd/](https://nces.ed.gov/ccd/)

<sup>1</sup> Data for English Language Learners retrieved from the school website.
Participant Demographics

The sample consisted of 82 students across four 1st grade classes. Researchers did not have access to demographic data for students who were not in the treatment group.

Table B2. Description of participating classes

<table>
<thead>
<tr>
<th></th>
<th>Users of Bamboo Learning EDU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total first grade students</td>
<td>42</td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>3 7</td>
</tr>
<tr>
<td>Asian</td>
<td>9 21</td>
</tr>
<tr>
<td>Black</td>
<td>8 19</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>0 0</td>
</tr>
<tr>
<td>Native Hawaiian/Pacific Islander</td>
<td>0 0</td>
</tr>
<tr>
<td>White</td>
<td>22 52</td>
</tr>
<tr>
<td>Two or more races</td>
<td>0 0</td>
</tr>
</tbody>
</table>

Measures

Bamboo Learning EDU usage data. Researchers accessed classroom-level usage data for 1st grade study participants March 21 to April 29, 2022. Specifically, researchers collected the following classroom-level usage data for the 6-week period:

- number of books accessed in the Bamboo Learning EDU application,
- number of correct responses, and
- amount of active time (in minutes) spent on the Bamboo Learning EDU application.

Elementary Reading Attitude Survey (ERAS). The ERAS survey tool is designed to measure a student’s attitude and perception of reading. The survey is in a pictorial format to allow for easy comprehension by young students. Teachers administered the survey during spring 2022, before and after using Bamboo Learning EDU. The survey addresses a total of 20 questions. The first ten questions pertain to a student’s attitude towards recreational reading and the next ten pertain to a student’s attitude towards academic reading. Researchers created total scores for each reading attitude component (i.e., recreational reading, academic reading; possible score range: 1-40) and overall (i.e., composite score; possible score range: 1-80).
**Reading Grade Level and Reading Comprehension Accuracy of Responses in Bamboo Learning EDU.**
The reading grade level is assigned to books in Bamboo Learning EDU by publishers independent of Bamboo Learning EDU. Publishers convert Lexile levels to grade level (e.g., Kindergarten, Grade 1, Grade 2, etc.) for Bamboo Learning EDU ease of use. For analyses, researchers translated the grade level assignments to numerical values (e.g., Kindergarten = 0, Grade 1 = 1, and so on). Researchers calculated the accuracy of students’ responses using measures from the Bamboo Learning EDU platform (i.e., reading comprehension accuracy in a week (% correct) = total number of correct responses / (total responses – skipped questions) * 100).

**NWEA MAP Growth® Language Arts Reading Scores.** NWEA MAP Growth® RIT scales are stable, equal interval scales that use individual item difficulty values to measure student achievement independent of grade level. The scores are vertically scaled so that student scores can be compared over time and across grade levels. Researchers used the RIT score as an overall Language Arts performance score and vocabulary subscale scores. Researchers converted the categorical vocabulary 5-point scale to a numerical 5-point scale for analyses: Low (1), LoAvg (2), Average (3), HiAvg (4), and High (5).
Appendix C. Additional information on program implementation & outcome findings

Program Implementation

Researchers conducted paired t-tests to examine differences in reading attitudes of students who used Bamboo Learning EDU over the 6-week study period. There were no statistically significant improvements in reading attitudes. Results of the paired t-tests by sub-domains (recreational and academic reading attitudes) and composite reading attitude are presented in Table C1.

Table C1. Means and standard deviations for ERAS reading attitudes survey scores

<table>
<thead>
<tr>
<th></th>
<th>Before using Bamboo Learning EDU Mean (SD)</th>
<th>After using Bamboo Learning EDU Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 42)</td>
<td>(n = 42)</td>
</tr>
<tr>
<td>Recreational reading attitudes</td>
<td>29.7 (6.4)</td>
<td>29.5 (6.7)</td>
</tr>
<tr>
<td>Academic reading attitudes</td>
<td>28.2 (7.1)</td>
<td>29 (5.6)</td>
</tr>
<tr>
<td>Composite reading attitudes</td>
<td>58.0 (12.7)</td>
<td>58.5 (11.2)</td>
</tr>
</tbody>
</table>

There was no difference in recreational reading attitudes of Bamboo Learning EDU users over the 6-week period $t(41) = 0.25, p = 0.80$. There was no difference in academic reading attitudes of Bamboo Learning EDU users over the 6-week period $t(41) = -0.80, p = 0.43$. There was no difference in composite reading attitudes of Bamboo Learning EDU users over the 6-week period $t(41) = -0.29 p = 0.78$.

Researchers conducted paired t-tests to examine differences in short-term outcomes; reading grade level and reading comprehension accuracy, for Grade 1 students who used Bamboo Learning EDU. There were statistically significant differences in reading grade level and reading comprehension accuracy. Results of the paired t-test are presented in Table C2.

Table C2. Means and standard deviations for Bamboo Learning EDU reading grade level and comprehension accuracy

<table>
<thead>
<tr>
<th></th>
<th>Before using Bamboo Learning EDU Mean (SD)</th>
<th>After using Bamboo Learning EDU Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 42)</td>
<td>(n = 42)</td>
</tr>
<tr>
<td>Reading grade level</td>
<td>0.86 (0.35)</td>
<td>1.43 (1.18)**</td>
</tr>
<tr>
<td>K-5 reading comprehension accuracy</td>
<td>66% (15%)</td>
<td>72% (15%)*</td>
</tr>
<tr>
<td>K-2 reading comprehension accuracy</td>
<td>66% (14%)</td>
<td>74% (14%)**</td>
</tr>
</tbody>
</table>

*There was a statistically significant improvement in reading grade level of Bamboo Learning EDU users over the 6-week period $t(41) = -3.39, p = 0.002$. There was a statistically significant improvement in K-5 reading comprehension accuracy of Bamboo Learning EDU users over the 6-week period $t(41) = -6, p = 0.03$. There was a statistically significant improvement in K-2 reading comprehension accuracy of Bamboo Learning EDU users over the 6-week period $t(40) = -3, p = 0.004$. 
Researchers conducted t-tests to examine differences in intermediate outcomes for Grade 1 students who used Bamboo Learning EDU and those who did not. There were no differences in their NWEA MAP Literacy Achievement scores, overall or for the vocabulary subscale. Results of the t-tests by treatment condition are presented in Table C2.

Table C3. Means and standard deviations for NWEA MAP Literacy Achievement Scores

<table>
<thead>
<tr>
<th></th>
<th>Users of Bamboo Learning EDU Mean (SD)</th>
<th>Non-users of Bamboo Learning EDU Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 42)</td>
<td>(n = 39)</td>
</tr>
<tr>
<td>NWEA MAP Growth® Language Arts Reading spring RIT score</td>
<td>178 (12)</td>
<td>178 (11)</td>
</tr>
<tr>
<td>NWEA spring vocabulary subscale</td>
<td>3.6 (1.3)</td>
<td>3.6 (1.4)</td>
</tr>
</tbody>
</table>

*There was no difference in NWEA MAP Literacy Achievement Scores for the users and non-users of Bamboo Learning EDU \( t(79) = 0.008, p = 0.99 \). There was no difference in NWEA MAP vocabulary sub-scores for the users and non-users of Bamboo Learning EDU \( t(79) = -0.267, p = 0.79 \).*