Summative Evaluation of *PBS Kids Island*: Usability, Outcomes, and Appeal

Kelly L. Schmitt, Ph.D.
Laura Sheridan, M.S.
*KLMedia Research*

Katie McMenamin, B.A.
Deborah L. Linebarger, Ph.D.
*Children's Media Lab, University of Pennsylvania*

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For additional information, please contact:

Dr. Kelly L Schmitt
KLMedia Research
2457 North Halsted Street
Chicago, IL 60614
917.501.8310
Email: kschmitt@klmediaresearch.com
Website: www.asc.upenn.edu/childrenmedia
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Abstract

Research indicates that computers can be a useful learning tool in supporting young children’s pre-literacy skills (Pasnik, Penuel, Llorente, Strother, & Schindel, 2009). This study is unique in that it evaluates 4- to 6-year-olds learning from a pre-literacy website in a naturalistic environment, the home. 136 preschoolers and kindergarteners (Mean Age = 5.24 years) were recruited from urban Chicago schools serving a low income population. All children were pre-tested to assess baseline pre-literacy abilities and then were asked to use one of two websites at home for 15 minutes a day, four days a week, for a minimum of 6 weeks. Children were randomly assigned to one of three conditions: 1) Experimental: use PBS Kids Island at home, 2) Experimental Plus: use PBS Kids Island in their homes and receive additional outreach materials to support child’s learning from the site, and 3) Control: use Hit Entertainment, a website that does not have an emphasis on pre-literacy skills. Assessments and observations took place within participant’s schools. Children met individually with a trained research assistant to complete the pre-test assessments, which measured (1) alphabet knowledge, (2) beginning sound awareness, (3) rhyme awareness, (4) letter sequencing, (5) phonemic awareness, (6) phonics, and (7) vocabulary and print knowledge. At the mid-point of the intervention, 36 children (equally divided by condition) participated in brief interviews and observations while using the assigned website. After the intervention period, the same instruments were used as a post-test assessment, as well as an interview concerning website appeal. Additionally, parents filled out six surveys throughout the course of the study: An initial background questionnaire and five surveys to document exposure to the intervention content and parents’ overall perceptions of the site. ANCOVAs were conducted with statistical controls correcting for the child’s grade, a parent composite (z-score transforming and summing adjusted household income, mother’s education, and mothers age) and initial ability (pre-test scores). After using the Island children showed more learning gains than control children in several areas, but especially in terms of phonological and phonemic awareness skills, key early precursors to conventional reading success. In addition, parents frequently attributed children’s pre-literacy learning in other domains to use of the Island. However, the supplemental pre-literacy materials did not provide additional benefits to children’s literacy skills for participants in the Experimental Plus condition. Participants appreciated that the Island was easy to use and that children could, for the most part, play on their own. Nonetheless, some technical and structural challenges were encountered. Finally, the Island was highly appealing, especially games that are easy to use, have one clear goal, provide opportunities to create, contain rewards and are at the appropriate cognitive or developmental level. All together, these results indicate that PBS Kids Island can be an effective educational tool in enhancing young children’s early literacy learning.
Introduction

Computers and other new technologies have become increasingly popular as tools for learning and playing. Children today are growing up in a media-saturated environment, with many preschoolers using the Internet, video games and handheld computers for educational and entertainment purposes (Rideout, Vandewater, & Wartella, 2003).

Although media technology has a presence in homes across the income spectrum, this is less often the case with lower income households when it comes to computer ownership. However, despite disparities in access to computers at home, 37% of households with incomes under $25,000 were found to own a computer. Most households that have computers do have Internet access, regardless of income level, although low income families are less likely to have high speed Internet access. Caregivers who have computers report that some children begin playing and working on the computer as early as two years of age, but the first real jump in usage is at age four when 25% of children begin using the computer regularly and then again at age six when over 50% of children begin using the computer regularly (Michael Cohen Group, 2007). In fact, one study indicates that 5 and 6 year olds who used the computer spend an average of 50 minutes a day at the keyboard (Vandewater et al., 2007).

Numerous studies have demonstrated the effectiveness of educational television in improving young children’s pre-literacy skills (e.g., Linebarger, 2001; Linebarger, Kosanic, Greenwood, Doku, 2004; Wright et al., 2001), and recent studies point to the benefits of using multiple media as learning tools (such as TV, Internet and outreach; Fisch, Lesh, Motoki, Crespo & Melfi, 2010; Penuel et al., 2009). Some studies also suggest that computer software, especially those that emphasize drill and practice, may improve school-age children’s standardized test performance (e.g., Coley, Cradler & Engle, 1997).

The potential for learning from educational websites has been less extensively researched than other media. Given the record of learning from educational media and the highly interactive nature of games, educational computer games have the same or greater potential for learning. Interestingly, research shows that 2.5- and 3-year-olds are able to learn specific skills from playing an interactive computer game at a similar rate as from a live demonstration (Lauricella, Pempek, Barr & Calvert, 2010). Interactivity may very well be a key element to learning. This is significant, as one of the main arguments against computer use in classrooms is that screen time takes time away from interactive play, which is essential to healthy development. If computers can provide the opportunity for interactive play, children’s development of literacy skills may be highly supported.
This evaluation focuses on the effectiveness of an educational website, *PBS Kids Island*, in increasing language and early literacy skills in 4- to 6-year-old children from low-income backgrounds. Because of low-income families’ reduced access to learning-related resources, they may benefit even more from having access to a computer at home than less disadvantaged children (Wright et al., 2001). Both the National Association for the Education of Young Children (NAEYC, 1996) and the National Reading Panel (National Institute of Child Health and Human Development, 2000) have recognized the potential benefits of technology in early childhood programs. Nonetheless, there is a dearth of research on the applications of the Internet to reading instruction. Prior evaluations of learning from computers with children younger than 8 have taken place in a separate computer lab at school or pull-out programs (Pasnik et al., 2009). Thus, this is the first evaluation of young children’s learning from computers to take place in a naturalistic environment, the home, with the possibility for parental support.

**Purpose**

The primary goal of the study was to evaluate the effectiveness of *PBS Kids Island* in fostering low-income children’s emerging literacy skills: Letter awareness, letter sounds, rhyming, alliteration, phonics, phonemic awareness, and vocabulary. Specifically, did the *Island* produce positive changes in the acquisition of early literacy skills; was the *Island* age appropriate and easy to use; and did children find the site appealing? An experimental research design was used to answer these questions. Within each age and gender group, children were randomly assigned to one of three groups: (1) Experimental Group: used the *Island* website (2) Experimental Group Plus: used the *Island* website and received additional outreach materials to support children’s learning from the site, or (3) Control Group: used a different website without a focus on literacy.

Prior to this evaluation, a qualitative home study was conducted with a small sample of children to explore how, in what way, and whether children and parents interacted with the *Island* (Schmitt & Linebarger, 2009). The home study suggested that although the individual games were easy for children to use on their own, the structure of the *Island* required parental or adult assistance. In addition, prior research indicates that the majority of 4- to 6-year-olds are not able navigate websites on their own (e.g., Calvert et al., 2005) and that guidance is an important aspect of maximizing children’s computer learning (Haughland, 1997). Therefore, we conducted the summative evaluations with children at school but use of the website took place in the home where an adult would be available to assist children as needed.
We sought to answer basic questions about the Island’s ability to produce growth in early literacy skills over time. Specific objectives included:

- As measured by normative and website-specific early literacy tests, did children learn the actual content presented on the Island website?
- Throughout the course of the intervention, did parents observe pre-literacy and other learning from the site?
- Do children perform better on early literacy tests when provided with additional literacy materials?
- Are there barriers to usability? How easy is it to use and play on the Island?
- What was the overall appeal of the Island's content and games? Was the site sufficiently engaging and appealing to motivate learning?
Method

Participants

Participants were recruited from 14 schools in the city of Chicago. Nearly two-thirds (62.5%) of the sample attended one of six Chicago Public Schools (“CPS”), where on average 84.9% of students are considered low income. Percent low income population at these six schools ranged from 66.1% to 92.8% (CPS, 2008). The other eight schools were community-based preschool programs which primarily served low income families (e.g., state pre-k, Head Start and other early childhood programs with the goal of assisting low income families). At all but one of these community-based schools there were stringent income and work requirements for parents. As a result, we encountered more recruitment challenges at these schools than at CPS schools. The most frequent challenge was parents expressing interest but not being able to participate because they did not have a home computer and/or Internet access. As was found in previous studies, families with incomes below $25,000 are still less likely to have computers with Internet access than more affluent families (e.g., Madden, 2006; Michael Cohen Group, 2007). Further, some families expressed interest on site but when called for screening they chose not to participate due to time constraints. As a result, participants were recruited on a rolling basis, with start dates spread over a several month period in the Spring of 2010.

All participants were screened prior to inclusion in the study. Screening requirements included having:

- A four- or five-year-old preschooler who would be attending kindergarten in September 2010 or a five- or six-year-old kindergartner who began elementary school in September 2009.
- A working computer with high speed Internet access at home.
- Target child has used a computer before and is able to use a mouse.
- Some mastery of English. This was defined as having at least one parent able to read English and complete online and/or phone surveys in English, and families in which the child said letters in English. We required this mastery of English because the Island website is in English1, and prior research suggested that children who knew few letters in English found the site too difficult and quickly lost interest (Schmitt & Linebarger, 2009).

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1 Although parent support materials describing the Island are available on the site in Spanish, the actual Island environment and games are presented in written and spoken English.
160 families who met the criteria for participation began the study. Twenty-four families were dropped after the beginning of the study. Five children were removed because their computer was no longer working, one child left their school prior to the post-test phase, nine never used the website or played a few games and then stopped, seven parents failed to complete surveys, one no longer wanted their child to use the computer and one prohibited computer use as a form of punishment. Study participants did not differ from dropped families in terms of key demographic characteristics (i.e., gender, grade, ethnicity, marital status, employment status, parental educational, and number of children) other than dropped participants having lower income-to-needs ratios than participating families (F (1, 153) = 4.52, p < .05).

As a result, 136 children, distributed among the three conditions, were included in the final analyses. Children in our sample were attending preschool and kindergarten, and their average age was 5.24 years (SD=1.05). Forty-eight percent of children were male. The sample included a mix of races and ethnicities, with child participants being Caucasian (30.9%), Hispanic (28.7%), African American (17.6%), Mixed (14.7%) and Asian (8.1%). The majority of survey respondents were parents (86% mothers and 10.8% fathers); the remainder was completed by other adult caregivers. Most mothers reported having a college degree (47%), some college (14.7%) or an associate’s degree (9.6%), and the majority was married (75%). Most parents in the study were employed full-time (44.9% of mothers and 71.2% of fathers). On average, households consisted of 4.35 people with 2.38 children. See Table 1 for condition assignment by demographic characteristics. There were no significant demographic differences by condition.
Table 1. Child and Family Characteristics Overall and By Group

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Island Plus</th>
<th>Island</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample size (N)</strong></td>
<td>136</td>
<td>45</td>
<td>48</td>
<td>43</td>
</tr>
<tr>
<td><strong>Child characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female (N)</td>
<td>71</td>
<td>22</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>Male (N)</td>
<td>65</td>
<td>23</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>Birth Order (Mean)</td>
<td>1.73</td>
<td>1.64</td>
<td>1.65</td>
<td>1.93</td>
</tr>
<tr>
<td>Preschoolers (N)</td>
<td>96</td>
<td>32</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Kindergarteners (N)</td>
<td>40</td>
<td>13</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>Mean Age of Preschoolers</td>
<td>58.63 mo</td>
<td>58.13 mo</td>
<td>58.31 mo</td>
<td>59.47 mo</td>
</tr>
<tr>
<td>Mean Age of Kindergarteners</td>
<td>73.08 mo</td>
<td>72.92 mo</td>
<td>73.38 mo</td>
<td>72.82 mo</td>
</tr>
<tr>
<td><strong>Family characteristics (Mean)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother's Education</td>
<td>14.80 (SD=2.83)</td>
<td>14.89 (SD=2.99)</td>
<td>15.3 (SD=2.6)</td>
<td>14.16 (SD=2.85)</td>
</tr>
<tr>
<td>Parental Education</td>
<td>14.63 (SD=2.66)</td>
<td>14.99 (SD=2.82)</td>
<td>15.00 (SD=2.19)</td>
<td>13.77 (SD=2.88)</td>
</tr>
<tr>
<td>Family Income</td>
<td>$56,635</td>
<td>$59,999</td>
<td>$61,680</td>
<td>$47,159</td>
</tr>
<tr>
<td>Adjusted Family Income</td>
<td>$43,932</td>
<td>$47,029</td>
<td>$47,280</td>
<td>$36,695</td>
</tr>
<tr>
<td>Income-to-Needs</td>
<td>1.96 (SD=1.42)</td>
<td>2.02 (SD=1.36)</td>
<td>2.13 (SD=1.50)</td>
<td>1.72 (SD=1.39)</td>
</tr>
<tr>
<td>Household size</td>
<td>4.35 (SD=1.32)</td>
<td>4.44 (SD=1.20)</td>
<td>4.29 (SD=1.13)</td>
<td>4.29 (SD=1.64)</td>
</tr>
<tr>
<td>Mother’s Age in Years</td>
<td>35.9</td>
<td>35.6</td>
<td>35.1</td>
<td>37.0</td>
</tr>
</tbody>
</table>

Socioeconomic status (SES) categories used in this study were formed using family income, household size, and Chicago cost of living adjustments. Household income was measured on a 9-point scale ranging from 1 = under $20,000 to 9 = $125,000 or more. First, the mean of each reported income range was converted using the Chicago cost of living index to adjust for the high cost of everyday items and living expenses in this city (ACCRA, 2007). Second, income-to-needs ratios were created by dividing family income by the US poverty threshold for a particular family’s size (Institute for Research on Poverty, 2010). This ratio reflects absolute income as a proportion of the official poverty line for a family of a
particular size in 2009. The median income to needs ratio was 1.29 (SD=1.42) and the mean income to needs ratio was 1.96 (SD=1.42). In addition, nearly half (46.3%) of participants reported receiving at least one form of federal or state assistance including Medicaid (31.6%), Food Stamps (19.9%), WIC (14.7%), Head Start (11.8%), and other forms of assistance such as Illinois Link Card or All Kids healthcare (14.0%)

**Research Design**

To test the hypotheses and research questions, an experimental framework was used. Children were randomly assigned to one of three groups:

1. **CONTROL GROUP**: The control stimulus was a preschool website with no specific focus on literacy (i.e., http://www.hitentertainment.com). This site contains games focusing on cognitive skills including matching, spatial relations, memory, and building, as well as creative/artistic activities. The control group served as a monitor of normative pre-literacy skills during the data collection period.

2. **ISLAND Group**: Children in the Island group were encouraged to use the **PBS Kids Island** website (http://pbskids.org/island), focusing on pre-literacy skills. Each participant was assigned a username and password so that usage could be tracked using PBS's parent tracking software. No additional support materials were provided.

3. **ISLAND PLUS Group**: In addition to the Island website, parents were provided with literacy support materials and a step-by-step guide to using the Island.

A four-tiered approach was used to gauge the impact of **PBS Kids Island**. First, it was important to establish use of the website in a manner compliant with the intervention. Second, learning was assessed, primarily through the use of standardized assessments. Although learning website-specific content is a necessary pre-condition, a more critical evaluation of the strength of a program or website is whether children demonstrate more generalized gains on standardized assessments of early literacy skills (Fisch, Kirkorian, & Anderson, 2005). Parents’ observations and reports of children’s learning were used to further substantiate our understanding of what children take away from the Island website. Third, it was important to determine if ease of using the website was optimal to promote engagement with the educational content. Fourth, when gauging the overall impact of a property, it is essential to not only demonstrate learning but also demonstrate appeal (Fisch, 2004). If children like a property they will be more likely to continue to use it and to learn the specific content.
Stimuli Website

Children in the experimental conditions (Island, Island Plus) played games on *PBS Kids Island*, a pre-literacy website created by PBS with support from the Department of Education. The website is directed toward children four- to six-years-old and aims to teach language and literacy skills. The game characters are drawn from five PBS properties: *Word World*, *Super WHY!* *Between the Lions*, *Sesame Street*, and *Martha Speaks*.

The *Island* website allows children to build their own island amusement park by playing games that support literacy skills as well as games that support more general cognitive skills. The 32 games on the *Island* work on rhyming, letter identification, alliteration, phonics, letter sequencing, phonemic awareness, and reading and vocabulary (See Appendix A). Of the 32 games on the site, 15 were *Super WHY!*, 9 *Between the Lions*, 3 *Martha Speaks*, 3 *Word World*, and 2 *Sesame Street*. There is a structured path through these games; children need to complete 4 games on one skill level before games of the next level become available in the form of a new “ride.” Children are given the autonomy to choose the next ride, but the leveled games are the same regardless of ride. Children are given tickets for completing games, which may be traded in at the Prize booth for videos, animated toys, and coloring sheets. Prizes are stored in the Treehouse, an interactive space where the child can change the wall color, print their coloring sheets, watch videos, and store their toys in a treasure chest. This structure also includes a progress report whereby caregivers can log on to view which games their children have played most frequently, what level they are on, and what skills each game works on.

Support Materials

A packet of support materials was mailed to the Island Plus participants at the beginning of the study (See Appendix B). The packet contained two books, *Sheep in a Jeep* by Nancy E. Shaw, and *Exactly the Opposite* by Tana Hogan, along with suggestions on how to interactively use the books to encourage literacy skills. Families were also given magnetic letters with game suggestions, picture and letter cards for literacy activities, literacy “coupons” to encourage the child’s skills, and descriptions of literacy activities parents and children could do together. The activities were designed to support the skills on the *Island*: rhyming, letter identification, phonemic awareness, phonics, alliteration, and concepts of print. Finally, the packet also included a step-by-step guide to using the *Island* with a troubleshooting guide (See Appendix C).
Measures

Six basic types of data were used to generate the present report: (1) parent report of family demographics and the home environment; (2) parent reports of website usage, usability, learning and appeal, (3) PBS Kids Island tracking data, (4) a child appeal measure and (5) early literacy skill measures.

Child and Family Characteristics.

All of the parents completed an initial survey concerning demographic information, home media environment and media use. Questionnaires were hand delivered to parents through the school attended by the child. If questionnaires were not returned to the school, participants were sent the questionnaire in the mail and/or given the option to complete the survey online.

Parent Questionnaires.

Parents were asked to complete five additional surveys over the course of the study intervention. The mid-point surveys were administered during weeks 2, 3, 5 and 6. These surveys concerned usage of six websites (including PBS Kids, Island, Hit Entertainment, Sprout, Disney, and Nick Jr.) and contained specific questions about their assigned site such as who the child was playing with, the level of assistance the child needed, what parents felt their child was learning from the site, likes and dislikes, and any technical problems. Survey 6 was completed at the end of the intervention and included questions about parents’ and child’s perceptions of the site, website preferences, issues contributing to any loss of interest, specific games played, what was learned, intent to use, and whether they would recommend the site to others.

Child Appeal Measure.

The child appeal questionnaire concerned children’s favorite websites, comprehension of how to use the assigned website, appeal of the assigned website, favorite games, and perceptions of learning from the site.

Literacy Measurement Strategy

Games on the Island website focused on seven skill areas have been demonstrated to support children in developing the ability to read (See Table 2). Further, phonemic awareness allows children to begin manipulating the sounds of language, which supports their ability to read and spell (National Institute of Child Health and Human Development, 2000).
Researchers chose measures to assess learning in each of the seven skill areas addressed on the Island. In particular, this study sought to determine whether website content produced specific changes on standardized measures of early literacy that are predictive of later reading success. Further, website-specific measures were developed when standardized assessments were not available or were not considered adequate to assess learning on the site. See Appendix D for samples of each child measure.

Table 2. Skills Addressed by PBS Kids Island Games and Associated Assessment Tools

<table>
<thead>
<tr>
<th>Skill</th>
<th>Number of Games</th>
<th>Assessment Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter Identification</td>
<td>9</td>
<td>PALS (Alphabet Knowledge)</td>
</tr>
<tr>
<td>Rhyming</td>
<td>5</td>
<td>PALS (Rhyme Awareness)</td>
</tr>
<tr>
<td>Alliteration</td>
<td>4</td>
<td>PALS (Beginning Sound Awareness)</td>
</tr>
<tr>
<td>Letter Sequencing</td>
<td>1</td>
<td>Website-Specific Assessment (Letter Sequencing)</td>
</tr>
<tr>
<td>Phonemic Awareness</td>
<td>5</td>
<td>PALS (Letter Sounds) Website-Specific Assessment (Phonological Awareness)</td>
</tr>
<tr>
<td>Phonics</td>
<td>6</td>
<td>Website-Specific Assessment (Phonological Awareness)</td>
</tr>
<tr>
<td>Reading/Vocabulary</td>
<td>8</td>
<td>Get Ready to Read Website-Specific Assessment (Vocabulary)</td>
</tr>
</tbody>
</table>

Researchers sought to determine whether the website content could help preschoolers generalize website-specific content learning to standardized measures of early literacy that are predictive of later reading success. The normative tasks were selected to evaluate the following literacy skills: Letter Knowledge, Rhyming, Alliteration, Phonemic Awareness, and combined early literacy skills. In addition, we developed measures to assess children’s letter sequencing and phonological awareness. Although we use PALS measures to assess

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2 Some Island games cover more than one skill, thus the total number of games in this table (38) is more than the total number of games on the site (32).
children’s knowledge of letter sounds and beginning sound awareness, this instrument does not assess children’s letter sequencing or ability to identify the letter when a specific sound is made. Finally, our research also attempted to determine if children learned website-specific vocabulary words as assessed by a researcher developed measure. Each of these measures is detailed below.

**Indicators of Letter Knowledge**

*Normative: PALS-PreK - Alphabet Knowledge.*

The PALS PreK Alphabet Knowledge Task (Invernizzi, Sullivan, & Meier, 2004) was used to assess children’s alphabet letter knowledge. This standardized measure can be used to evaluate both learning of letters due to the Island website as well as a more advanced measure of alphabet knowledge, such as fluency.

Since children’s ability to demonstrate their skills can be influenced by situational factors (e.g. distracting noises) and personal factors (e.g. child is tired/disinterested), it is important to use assessment tools that use multiple measures for each skill assessed. The PALS was developed to include three different tasks: 1) identification of the 26 Upper Case letters; 2) identification of the 26 Lower Case letters; and 3) identification of the sounds associated with 23 letters and 3 digraphs. This helps one more richly understand a child’s letter knowledge. To begin, children are shown all 26 Upper Case letters, in random order, and are asked to identify each, one by one. If the child correctly identifies 16 Upper Case letters, he/she is eligible to proceed to the Lower Case letters. If a child correctly identifies 9 Lower Case letters, they may proceed to the Letter Sounds. Each task was timed to assess fluency.

From the PALS-PreK-Alphabet Knowledge, we derived three types of scores:

- the number of letters or sounds a child could correctly identify;
- eligibility to complete task identifying any lower case names or letter sounds; and
- fluency scores (i.e., the number of seconds it took to identify one letter or sound).

Lowercase Letter and Letter Sound task scores were analyzed in two ways: 1) with only those children eligible to complete the tasks and 2) assigning those who were not eligible scores of 0. Analysis findings are presented for the overall sample because they did not differ using the two techniques.
**Number of Letters or Sounds Correctly Identified.**

The average child named 23 Upper Case letters at the pretest \((SD = 5.9)\). Kindergartners identified more letters on average \((25.5, SD = 1.0)\) than preschoolers \((21.9, SD = 6.7)\). If children correctly identified 16 or more Upper Case letters, they were eligible to take the Lower Case letter task. The average child (including those receiving a score of zero) identified 20.6 Lower Case letters at the pretest \((SD = 7.5)\) while the average child who was eligible for the task identified 22.4 Lower Case letters \((SD = 4.6)\). Kindergartners identified more lowercase letters on average \((24.7, SD = 1.5)\) than preschoolers at the pretest \((18.7, SD = 8.4)\).

If a child was able to accurately identify at least 9 Lower Case letters, he or she was eligible to take the Letter Sounds task. The number of sounds correctly identified by the average child (including those who were given a \((0)\) score) was 13.3 letter sounds \((SD = 9.3)\) while the average child who was eligible for the Letter Sounds task identified 15.3 letter sounds \((SD = 8.3)\) at the pretest. Kindergarteners identified more letter sounds on average \((21.4, SD = 4.7)\) than preschoolers at the pretest \((12.0, SD = 8.0)\).

The PALS PreK manual reports a Spring Developmental Range (similar to a benchmark) between 12 and 21 Upper Case letters, between 9 and 17 Lower Case letters and between 4 and 8 letter sounds for PreKindergarten (or approximately 4-year-old) children. The PALS Spring benchmark for kindergartners is 24 lowercase letters and 20 letter sounds. PALS psychometrics are adequate, with reliabilities ranging from .74 to .94.

**Eligibility to Identify Any Lower Case Names or Letter Sounds.**

Children were presented with these tasks if they were able to 1) identify 16 or more Upper Case letters and 2) 9 or more Lower Case letters. Using these criteria, all of the kindergarteners were eligible to try these tasks. Of the preschoolers, 88.3% were eligible to try the Lower Case task and 83.5% were eligible to try the Letter Sounds task. Overall, 91.9% of children were eligible to try the Lower Case task and 86.8% were eligible for the Letter Sounds task.

**Fluency Scores.**

Children’s performance on each of the 3 subscales (i.e., Upper Case, Lower Case, and Letter Sounds) was timed. Then, the number of letters or sounds accurately identified was divided by the number of seconds it took the child to complete each task, which provided us with a rate of letter or sound identification per second, or fluency. Since all children were administered the Upper Case task, all children had an Upper Case Letter Knowledge fluency score.
Overall, children took an average of 3.6 seconds to identify one Upper Case letter; 4.3 seconds to identify one Lower Case Letter (including those who were given a (0) score) and 13.7 seconds to identify one Letter Sound (including those who were given a (0) score). The average preschooler took 4.4 seconds to identify one Upper Case letter; 5.5 seconds to identify one Lower Case letter; and 18.0 seconds to identify one Letter Sound whereas the average kindergartener took 1.3 seconds to identify one Upper Case letter; 1.4 seconds to identify 1 Lower Case letter; and 4.0 seconds to identify one Letter Sound at the pre-test.

**Indicators of Phonological and Phonemic Awareness**

*Normative: PALS-PreK - Letter Sounds.*

A description of this task was detailed under Indicators of Letter Knowledge. Children’s initial letter sound ability is reiterated here because fluencies in sound identification are important precursors to the acquisition of phonological sensitivity. In brief, 86.5% of children at the pretest were eligible to try the Letter Sounds task. The number of sounds correctly identified by the average child (including those who were given a (0) score) was 13.3 letter sounds (SD = 9.3) and took 13.7 seconds to identify one Letter Sound. The PALS PreK manual reports a Spring Developmental Range (similar to a benchmark) between 4 and 8 letter sounds.

*Normative: PALS - Beginning Sound Awareness.*

The PALS Beginning Sound Awareness subtest asks children to identify the sound at the beginning of specific words. The children were shown small laminated cards with black and white line drawings on them. Four picture cards were used as samples, and each card on the measure had a word that began with the letters s, b, or m. As the beginning sounds were identified, cards were sorted into stacks together according to their beginning sounds. There were ten test items, each worth one point. The average preschooler identified 6.4 beginning sounds (SD = 3.6) and the average kindergartener identified 9.6 sounds (SD = 1.4) at the pretest. Overall, children identified 7.39 sounds at the pretest (SD=3.4). The spring developmental range for pre-k is 5 to 8 beginning sounds and the spring benchmark for kindergarten beginning sounds is 9 sounds.

*Normative: PALS-PreK - Rhyme Awareness.*

Phonological awareness is the ability to hear, identify, and manipulate the units of sound in language that make up words. Rhyme awareness is one important aspect of early phonological awareness (Invernizzi et al., 2004). The PALS PreK Rhyme Awareness tests asks children to identify, verbally or non-verbally, a picture that rhymed with a target word
when given three choices (e.g., “This is a mop. These pictures are top, bike, can. Find the picture that rhymes with mop.”). The pictures are simple black and white line drawings. This subtest has shown a strong predictive relationship with later reading achievement. Children were given a score of (1) for every correct answer provided and a (0) for every incorrect answer provided, with a maximum score of 10. Preschoolers correctly identified 6.3 rhymes (SD = 2.8) and kindergarteners correctly identified 8.0 rhymes (SD = 2.5) at the pretest. Overall, children correctly identified an average of 6.8 rhymes (SD=2.8) at the pretest. The PALS PreK manual reports a Spring Developmental Range between 5 and 7 rhymes. The PALS Spring benchmark for kindergartners is 9 rhymes.

**Researcher Developed: Phonological Awareness.**

This measure was designed based on an Island game in which a character guides children through spelling a word. In the study, children were asked to identify the letter that made a specific sound (e.g., “find the letter that makes the ‘buh’ sound”), going through each letter to spell a short, 3 or 4 letter word. Three words were spelled, thus children were asked to identify a total of 20 letters which were each worth one point.

The average preschooler identified 14.4 (SD = 6.0) phonemes and the average kindergartener identified 19.3 (SD = 2.1) phonemes at the pretest. Overall, children identified an average of 15.9 phonemes (SD=5.6) at the pretest.

**Combined Early Literacy Skills**

**Normative: Get Ready to Read! Screener.**

This screener, consisting of 25 items, assessed:
- Print knowledge (child's understanding of printed letters, words and how books work); book knowledge (book rules including how a book opens, print components and rules of print);
- Phonological awareness (i.e., the understanding that words are made up of discrete parts);
- Phonics (i.e., recognition of the relationship between written letters and spoken sounds); and
- Writing (i.e., knowing how text should look in print).

Each item required the child to select a response from a group of four pictures (or four letters, words, etc.). Example: “These are pictures of a cereal box. Find the one shows you the name of the cereal.” Children were given a score of a (1) for every correct answer provided and a (0) for every incorrect answer provided, with a maximum score of 25.
points. The average pretest score for preschoolers was 18.0 (SD = 4.42) and for kindergarteners was 21.9 (SD = 2.59). Scores greater than 11 are predictive of reading success by 2nd grade. Overall, children scored an average of 19.2 (SD = 4.3) at the pretest.

**Researcher Developed: Letter Sequencing**

Inspired by an Island game, this measure asked children to identify which letter came next in the alphabet sequence when the letter was replaced by a silly word, such as cheeseburger. Children were asked to identify four letters; they received 2 points if they identified it correctly on their first attempt, and one point if they identified it correctly on their second attempt (after hearing the researcher sing the alphabet song, replacing the silly word with their first, incorrect response). Thus, they could receive a total of eight points.

The average preschooler identified 5.5 (SD = 2.0) and the average kindergartener 7.2 (SD = 1.1) letters at the pretest. Overall, the average child identified 6.0 letters (SD = 1.1) at the pretest.

**Researcher Developed: Vocabulary Measure**

A researcher-developed vocabulary measure was administered at the pretest and posttest to document participants’ knowledge of 20 select target words. The test measured receptive vocabulary knowledge of website-specific vocabulary. The procedure for selecting the 20 target words included coding all of the target words introduced in 4 website games (Hopposites, Murray’s Word on the Street, Scrub-A-Pup and Switcheroo) for the grade level of the word, as indicated by the Living Word Vocabulary: The Words We Know: A National Vocabulary Inventory (Dale & O’Rourke, 1981). The words ranged from grade 2 to 16. When all of the words were coded, 20 words were randomly selected from grades 2 to 4 to reflect the overall population of target words likely to be accessible to preschool and kindergarten children. Furthermore, words were selected based on their ability to be pictorially represented.

The specific test was modeled after the Peabody Picture Vocabulary Test-4 (PPVT-4; Dunn & Dunn, 2007). As such, four choices were presented in the form of color photographs for each vocabulary word. The child was asked to point to the correct picture of a word (e.g., “Show me snoozing”, “Show me moustache”). There was one sample question and 20 test questions each worth one point.
The average preschooler identified 14.2 (SD = 3.0) and the average kindergartener 15.6 (SD = 2.8) words at the pretest. Overall, the average child identified 14.7 words (SD=3.0) at the pretest. Prior research has documented positive relationships between educational television viewing and vocabulary scores (Anderson, Huston, Schmitt, Linebarger, & Wright, 2001; Linebarger, Moses, and McMenamin, 2010; Wright et al., 2001), thus we sought to determine if educational games could have a similar impact.

**Procedure**

**Pre-Test**

Prior to using either website, all children were pre-tested on all researcher developed and normative indices. All of the researchers had prior experience administering assessments and were trained in the implementation of these specific measures by the principal investigator. After both school and parent consent were received, research assistants met individually with children at their school to complete the study instruments. Children were pulled from their classroom for approximately 30 minutes to administer assessments. If a child was unable to complete the assessments in one sitting, researchers returned to the school within a few days, depending on school schedules, to finish. First, the PALS name writing task was used as a warm up but was not included in the analysis because it does not pertain to use of the *Island*. Next, children were administered assessments pertaining to rhyme awareness, letter identification, letter sound identification, beginning sound awareness, print and book knowledge, vocabulary, phonics, and letter sequencing.

Immediately following the pre-test, researchers gave participating families a letter with their assigned website and called parents within a few days to ensure receipt of the letter and answer any questions they may have had about using the website. In all groups, children were encouraged to use the website 4 times a week for approximately one hour per week for at least 6 weeks (M = 6.8, SD = 1.17 weeks). Children in all groups participated in the same pre-test and post-test activities and website appeal assessments.

**Mid-Point Observations**

After a period of approximately 4 weeks, researchers conducted observations of 36 children from 6 schools using their assigned website. Research assistants pulled children from their classroom for approximately 20 minutes to use the website on a laptop in a quiet location. Children in all conditions were videotaped using Morae software while being asked to play their favorite game on the site. Researchers directed children in the experimental groups to specific games based on PBS tracking data of the child’s most frequently played games. Children were also asked to play their least favorite game, in an
attempt to gather information about what makes some games more or less appealing than others. Research assistants recorded observations based on usability, appeal, learning, strategy, frustration, excitement, ease of navigation, and understanding of leveling. Children were also asked specific questions about strategy and appeal. Observational data was compiled and used to ascertain general characteristics of favorite games as well as games that were less appealing.

**Post-Test**

After the 6-8 week intervention period, research assistants returned to participating schools to conduct post-tests. Researchers pulled children from their classrooms to administer the same assessments used at the pre-test. In addition, each child was interviewed regarding general appeal of the site, specific preferences such as favorite game, comprehension of the leveling system (i.e., how to earn new rides), and perceptions of learning. Images were used to support the appeal and comprehension questions. For example, children were shown a screenshot of the Island when they were asked, “What do you do when you go to the Island?” Additionally, children were shown an image with three smiley faces (happy, medium, and sad) and were asked if they liked the Island “a lot, a little bit, or not at all.” Even though most children answered the question verbally, the faces served as a visual representation of appeal as well as allowing for non-verbal responses.

**Parent Surveys**

The majority of parents completed an initial survey (Survey 1) concerning demographic information and media use prior to the start of the study. If the parent did not return the survey to the school or by mail, a researcher called to complete the survey via phone or sent an online survey. All participants were required to complete survey 1 in order to receive compensation for study participation.

Mid-point surveys were completed over the phone or online during weeks 2, 3, 5 and 6, with completion rates as follows: 89%, 79.4%, 87% and 81.7%. If parents repeatedly missed surveys and were unresponsive to calls and emails, they were dropped from the study. Finally, parents were required to complete the final survey (response rate: 100%) in order to receive their compensation.

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3 The intervention period varied because Chicago Public Schools closed for the summer, unlike the other schools, and also had more restrictions about when researchers could visit the schools due to testing and in-service days.
After completing the post-test assessments and appeal interview, children were given a book and stickers and parents were given additional compensation for their participation. Participating schools were also given a small monetary donation.

### Analytical Approach

#### Literacy Outcomes

Descriptive statistics were conducted to examine characteristics of the participants and their families as well as variables that might be important to include in further analyses. Literacy outcome analyses were completed using Analysis of Covariance (ANCOVA) models to evaluate differences between conditions. Children’s initial differences were controlled for by including their pre-test score for each outcome as a covariate. Next, because children in our sample attended either preschool or kindergarten, which have different pre-literacy curriculums, grade was included as a covariate. By doing so, we are able to see what effect our independent variable (i.e. study condition) had on our outcome variables (i.e. literacy outcomes) after the effect of grade. Further, to control for family differences, a composite measure was formed by z-score transforming and then summing adjusted income, mother’s age and mother’s education. For these analyses, only significant effects associated with Condition are reported in the text. During initial analyses, gender was also examined as a potential between-subjects grouping factor but was not included in final models because it was unrelated to any of the outcome variables and did not interact with condition.

Preliminary checks were conducted to ensure that there was no violation of the assumptions of normality, linearity, homogeneity of variances, homogeneity of regression slopes, and reliable measurement of the covariate. Outliers were removed when assumptions were violated. When pairwise comparisons were made, a modified Bonferroni correction procedure (Jaccard, 1998) to control for experiment-wise error associated with multiple comparisons was used. Relative to the control group, no significant differences were found between Island and Island Plus conditions.

#### Media Environment, Intervention Usage, Usability, and Appeal

Website usage was analyzed in the form of a manipulation check to make sure the intervention was adequately implemented. Media environment, website usability and Island appeal were also explored for statistically significant differences in the data. In these analyses of the data, descriptive statistics (e.g. means, standard deviations, percentages) were used to describe general patterns in the data and significance tests ($\chi^2$, t-tests or
ANOVA was used to evaluate whether these patterns differed by condition (Island, Island Plus), gender (male, female), and grade level (preschool, kindergarten). Only when significant differences by one of these 3 factors were found are they presented below; otherwise, results were aggregated across all participants. In addition, open-ended data is presented throughout the report. These findings are presented in terms of trends in the data with supporting verbatims.
Results: Home Multimedia Environment

Information regarding the home multimedia environment was collected via an initial parent survey concerning demographic information, the home media environment and media use. Results described below reflect responses from this survey.

Computer Use

Prior to the start of the study, nearly all child participants used their home computer to play games (94.9%). This is consistent with prior research indicating that game play is the most common computer-based activity among children (Calvert et al., 2005; Wartella, Lee & Caplovitz, 2002). They also watched online videos (27.9%), listened to or read online storybooks (6.6%) and used chat or Skype (1.5%). Of the 73.5% who regularly visit children’s websites, PBS Kids was the most frequent choice (65.4%), followed by Nick Jr. (59.6%) and Disney (53.7%). It is also worth noting that one-quarter (26.5%) watched videos on YouTube (see Figure 1).

Figure 1. Children’s Favorite Websites

<table>
<thead>
<tr>
<th>Website</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBS Kids</td>
<td>65.4</td>
</tr>
<tr>
<td>Nick Jr.</td>
<td>59.6</td>
</tr>
<tr>
<td>Disney</td>
<td>53.7</td>
</tr>
<tr>
<td>PBS Sprout</td>
<td>29.4</td>
</tr>
<tr>
<td>Cartoon Network</td>
<td>27.2</td>
</tr>
<tr>
<td>Noggin</td>
<td>27.2</td>
</tr>
<tr>
<td>Youtube</td>
<td>26.5</td>
</tr>
<tr>
<td>Starfall</td>
<td>25.7</td>
</tr>
<tr>
<td>Google</td>
<td>18.4</td>
</tr>
<tr>
<td>Toy Sites</td>
<td>9.6</td>
</tr>
</tbody>
</table>

Internet Use

All of the children in the study had some prior experience with computers at home, as this was a screening requirement. The amount of time children had been using the Internet was rated on a 5-point scale ranging from 1 = 1-3 months to 5 = more than two years. Not surprisingly, kindergarteners had been using the Internet longer than preschoolers, $\chi^2 =$
23.90, p < .001. As can be seen in Figure 2, four-fifths (81.0%) of kindergartners had used the Internet for one year or more, as compared to three-fifths (60.5%) of preschoolers. This is not surprising because the likelihood of ever having used a computer increases with age (Calvert et al., 2005).

Figure 2. History of Internet Use by Grade

Prior to the start of the study, reports of children’s Internet use ranged from 1 = once a month to 6 = More than 2 hours daily. More than half of the children (56.7%) were reported to use the Internet at least a couple of times a week. Children who used the Internet at least once a week were reported to go online an average of 3.34 times per week (SD = 1.82) for an average of 38.59 minutes (SD = 26.70). Further, nearly half of participating parents (45.59%) reported restricting their child’s computer use, suggesting that interest in using the computer is high enough to mediate use. The range of restricted use ranged from 10 to 150 minutes per day (Mean 48.31, SD = 34.13).

Mouse and Navigational Skills

Prior to the start of the study, parents were asked to rate “how easily would you say that your child can manipulate the mouse/touchpad to accomplish the things he/she wants to do on the computer?” on a 5-point scale, where 1 = Very Easily and 5= Not easily at all. The majority (97%) could use a mouse at least somewhat easily. Predictably, kindergartners had better mouse skills on average than preschoolers ($\chi^2(3) = 10.29, p < .05$), with 97.6% of kindergartners able to use a mouse “easily” or “very easily” as compared to 75.3% of
preschoolers. Because autonomous computer and mouse use amongst children with prior computer experience begins at around 3½ years of age (Calvert, Rideout, Woolard, Barr & Strouse, 2005), it is not surprising that preschoolers’ mouse skills are slightly less advanced than kindergarteners. Finally, children’s ability to navigate a website by him or herself ranged from very easily (26.7%) to not too easily (13.3%). The majority of children (86.7%) were able to navigate a website at least somewhat easily.

**Television Viewing**

On average, children watched 8.27 hours of television per week (SD = 6.85). Boys watched more television than girls, t (1, 131) = 2.90, p < .01 (M = 8.18 vs. 4.92 hrs).

Parents were presented with a list of shows, including 10 properties on the Island or Hit Entertainment websites, and asked which ones their child watched regularly. All but one of the Ready to Learn properties on the Island website emerged as more popular than Hit Entertainment shows. The most popular RTL shows were Word World, Super WHY!, and Martha Speaks, all with approximately half of children reported to watch them, followed closely by Sesame Street. In contrast, only 26.0% of children regularly watch the most popular Hit Entertainment show, Bob the Builder. As can be seen in Table 3, more girls watched Angelina Ballerina and more boys watched Roary the Racing Car.

**Table 3. Regularly Watched Television Shows by Property**

<table>
<thead>
<tr>
<th>Ready to Learn Shows</th>
<th>Overall</th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word World</td>
<td>53.1%</td>
<td>52.2%</td>
<td>54.1%</td>
</tr>
<tr>
<td>Super WHY!</td>
<td>51.9%</td>
<td>44.9%</td>
<td>59.7%</td>
</tr>
<tr>
<td>Martha Speaks</td>
<td>48.1%</td>
<td>46.4%</td>
<td>50.0%</td>
</tr>
<tr>
<td>Sesame Street</td>
<td>43.5%</td>
<td>43.5%</td>
<td>43.5%</td>
</tr>
<tr>
<td>Between the Lions</td>
<td>12.3%</td>
<td>8.8%</td>
<td>16.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hit Entertainment Shows</th>
<th>Overall</th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bob the Builder</td>
<td>26.0%</td>
<td>20.3%</td>
<td>32.3%</td>
</tr>
<tr>
<td>Barney</td>
<td>23.3%</td>
<td>25.0%</td>
<td>21.3%</td>
</tr>
<tr>
<td>Angelina Ballerina</td>
<td>21.4%</td>
<td>30.4%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Roary the Racing Car</td>
<td>9.9%</td>
<td>4.3%</td>
<td>16.1%</td>
</tr>
<tr>
<td>Pingu</td>
<td>6.9%</td>
<td>2.9%</td>
<td>11.3%</td>
</tr>
</tbody>
</table>

4 F (1, 129) = 7.42, p < .01  
5 F (1, 129) = 5.19, p < .05
Books and Print Media

Families had a variety of print media in their homes, with nearly all (99.2%) having children’s books. Many also reported having print materials such as magazines, newspapers, dictionaries, and religious texts (See Table 4). The number of children’s books in the home ranged from between 3 and 300+ books, with 47% having 40 or fewer books. Girls (M = 84.44) tended to have more books in the home than boys (M = 59.87).

Table 4. Mean Print Materials in the Home

<table>
<thead>
<tr>
<th>Print Material</th>
<th>Overall</th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Children’s Books⁶</td>
<td>76.27 (SD=66.94)</td>
<td>84.44** (SD=72.03)</td>
<td>59.87** (SD=52.89)</td>
</tr>
<tr>
<td>Dictionaries⁷</td>
<td>0.82 (SD=0.39)</td>
<td>0.84 (SD=0.37)</td>
<td>0.79 (SD=0.41)</td>
</tr>
<tr>
<td>Other Books⁸</td>
<td>0.80 (SD=0.40)</td>
<td>0.75 (SD=0.44)</td>
<td>0.87 (SD=0.34)</td>
</tr>
<tr>
<td>Religious Texts⁷</td>
<td>0.71 (SD=0.45)</td>
<td>0.71 (SD=0.46)</td>
<td>0.71 (SD=0.46)</td>
</tr>
<tr>
<td>Catalogues⁹</td>
<td>0.66 (SD=0.48)</td>
<td>0.58* (SD=0.50)</td>
<td>0.75* (SD=0.43)</td>
</tr>
<tr>
<td>Children’s Magazines⁸</td>
<td>0.59 (SD=0.49)</td>
<td>0.62 (SD=0.49)</td>
<td>0.56 (SD=0.50)</td>
</tr>
<tr>
<td>Adult Magazines⁷</td>
<td>0.54 (SD=0.50)</td>
<td>0.51 (SD=0.50)</td>
<td>0.56 (SD=0.50)</td>
</tr>
<tr>
<td>Newspaper¹⁰</td>
<td>0.46 (SD=0.50)</td>
<td>0.46 (SD=0.50)</td>
<td>0.46 (SD=0.50)</td>
</tr>
<tr>
<td>Comic Books⁸</td>
<td>0.34 (SD=0.48)</td>
<td>0.16*** (SD=0.37)</td>
<td>0.55*** (SD=0.50)</td>
</tr>
<tr>
<td>Kindle/Electronic Book Reader⁸</td>
<td>0.17 (SD=0.38)</td>
<td>0.08** (SD=0.28)</td>
<td>0.27** (SD=0.45)</td>
</tr>
</tbody>
</table>

⁶ N= 99 overall; 49 girls and 50 boys
⁷ N= 132 overall; 70 girls and 62 boys
⁸ N= 133 overall; 71 girls and 62 boys
⁹ N= 130 overall; 69 girls and 61 boys
¹⁰ N= 131 overall; 70 girls and 61 boys
*p < .06 , ** p < .05, *** p < .001
In terms of book reading behavior, nearly three-quarters (70.1%) of parents began reading to their child before 1 year of age. The remainder started reading to their child between 1 and 1.5 years of age (15.9%), 1.5 and 2 years of age (6.7%) and after age 2 (8.2%). Approximately two-thirds of parents (69.4%) report spending approximately ½ or 1 hour reading to their child per day. Parents of kindergarteners spent more time reading to their children than parents of preschoolers, $\chi^2 (5) = 13.70, p < .05$. Nonetheless, half of the parents (51.5%) report reading only five or fewer different stories per week to their child. By contrast, less than one-sixth of parents (14.9%) read 11 or more different stories to their child per week.
Results: Intervention Use

Prior to conducting study analyses, it was important to ensure that the study manipulation did in fact occur. Fidelity of implementation in this evaluation concerned use of the website, children's responsivity to the Island, and the use of support materials (Island Plus condition only). Children's website use was assessed via weekly parent surveys as well as via PBS tracking data.

Website Use

Children's website use was assessed via weekly parent surveys. In addition, for children in the experimental conditions, PBS tracking data was explored as it provided additional information about how the site was used. Finally, several factors that may have reduced play are discussed.

Self Reports of Website Use

Parents filled out weekly surveys, either over the phone or online, which contained questions on their child's use of various children's websites and their perceptions of the assigned study site. Specifically, parents were asked how long their child spent using the study site, as well as five other sites, in the week or two prior to each survey. Responses were compiled and averaged across time to determine mean time using each of the websites per week.

As can be seen in Table 5, children in each condition used their assigned website for an average of 40 minutes per week. This degree of compliance is consistent with previous children's television evaluation research (e.g., Linebarger & Piotrowski, 2009). Further, children spent very little time using their non-assigned site: Control group children spent an average of 2.71 minutes (SD=8.4 min) a week on the Island, and Island and Island Plus children spent an average of .89 (SD=2.5) and 1.37 (SD=6.0) minutes a week on the Hit Entertainment site. Thus, consistent with the intervention requirements, children's use of the Hit Entertainment website and Island website significantly differed by condition.

Use of the PBS Kids website was also surveyed, as many of the Island games are also present on that site. As can be seen below, children in the Island conditions used the combination of the Island and PBS Kids much more than children in the control group.
Table 5. Average Time Using Website Per Week

<table>
<thead>
<tr>
<th></th>
<th>Condition 1 (Hit)</th>
<th>Condition 2 (Island)</th>
<th>Condition 3 (Island Plus)</th>
<th>F (2, 133)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Island</td>
<td>2.71 (SD=8.36)</td>
<td>39.46 (SD=17.45)</td>
<td>38.70 (SD=19.94)</td>
<td>74.51***</td>
</tr>
<tr>
<td>Island &amp; PBS Kids</td>
<td>14.93 (SD=21.26)</td>
<td>49.74 (SD=19.58)</td>
<td>57.90 (SD=30.40)</td>
<td>39.14***</td>
</tr>
<tr>
<td>Hit Entertainment</td>
<td>42.44 (SD=21.03)</td>
<td>0.89 (SD=2.52)</td>
<td>1.37(SD=5.97)</td>
<td>163.33***</td>
</tr>
</tbody>
</table>

***Significantly different by condition, p < .001

Island Tracking Data

In addition to parents’ reports of website use, tracking data from PBS was available for participants assigned to the experimental conditions. The Hit Entertainment website does not require participants to log in, so comparable information was not available for the control group. Participants’ email addresses, which were used to login to the Island, were provided to PBS so they could track Island use by these children. Daily tracking information provided by PBS included date of last log in, level reached, total number of games played, number of plays for each game, tickets earned, tickets redeemed, prizes bought, and rides built. These data were used to confirm the continued participation of children in the study. Furthermore, these data were used to assist with technical problems. For example, if researchers noticed that a child had been on the same level for several weeks, or had neglected to play the 4th game on a level.

Tracking data were available for 91 participants from the experimental conditions; this information is presented below. We were unable to obtain tracking data for two of the study participants as PBS was unable to track their emails during the course of the intervention. For one of the two excluded participants, researchers were able to login to the account to confirm continued usage of the site. That child reached level 8 on the Island, but more detailed information about usage was not available. For the second child, the family started using the site with the login information provided to them, but created their own log in and password after experiencing numerous technical problems with the Island. Thus, we were unable to log into their account and confirm usage with tracking data (weekly survey data were used instead).

Use of the Site. One measure of children’s use of the site is how often they logged into the site. Overall, children logged into the site an average of 22.70 times (SD=12.14) over the course of 6.8 weeks (SD = 1.17). Thus, children logged into the site an average of 3.44 times per week (SD = 1.91). Each time they logged in, children played an average of 4.76 games (SD=2.72). Each week, children played an average of 14.40 games (SD = 12.46).
Level Reached. As can be seen in Table 6, all children reached at least level 3. At the start of the study, researchers explained to parents that the Island was designed with progressive levels, but that children were not required to complete all 8 levels to participate. Nonetheless, nearly two-thirds of children (64.84%) reached level 8, the highest on the Island website. Level reached did not differ significantly by grade (preschool, kindergarten).

Children who reached level 8 on the Island played significantly more games per week (M = 16.45, SD = 8.33) than children who did not reach level 8 (M = 10.64, SD = 7.24), t (1, 89) = 3.32, p < .01. Those who reached level 8 also played more games per login (M = 5.63, SD = 2.85) as compared to children who did not reach level 8 (M = 3.16, SD = 1.47), t (1, 89) = 4.56, p < .001. It may be that these children spent more time on the site in general, as they were also reported to be more attracted to the Treehouse, t (1, 90) = 2.51, p < .05. That is, when parents were asked whether their child was “attracted to the Treehouse or not interested in visiting the Treehouse,” those parents whose children had reached level 8 were more likely (83.1%) to agree with the first statement than parents whose children had not reached level 8 (57.6%).

Table 6. Level Reached on PBS Kids Island Website

<table>
<thead>
<tr>
<th>Level</th>
<th>Number of kids</th>
<th>Percent of Kids</th>
<th>Number stopped at this level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>91 (All)</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>91 (All)</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>91 (All)</td>
<td>100%</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>88</td>
<td>96.70%</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>82</td>
<td>90.11%</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>73</td>
<td>80.22%</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>63</td>
<td>69.23%</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>59</td>
<td>64.84%</td>
<td>59</td>
</tr>
</tbody>
</table>

Games. The number of times each individual game was played was also examined. Average plays per game were calculated based on the number of children who reached that level. The number of times games were played ranged from an average of 1.8 to 7.19 plays per child. As can be seen in Table 7, six of the most frequently played games were on levels 1 and 2, which all children had access to throughout the duration of the intervention. All but one of these games contained an activity (e.g., putting together a puzzle, taking pictures, washing a dog, creating a book) that went beyond simply teaching literacy skills (the remaining game made a word after children found letters). It is worth noting that all three
Martha Speaks’ games on the site were popular despite being ‘earned’ later in the intervention. Finally, Sky Riding (level 4) was a short Between the Lions game which allowed children to demonstrate mastery of letter recognition skills by using their mouse to fly around and collect letters of different shapes and sizes.

Table 7. Top Ten Most Frequently Played PBS Kids Island Games

<table>
<thead>
<tr>
<th>Rank</th>
<th>Game</th>
<th>Level</th>
<th>Number of Children who reached level</th>
<th>Mean # Plays/Child (Children at that level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Martha’s Scrub-a-Pup</td>
<td>7</td>
<td>63</td>
<td>7.19</td>
</tr>
<tr>
<td>2</td>
<td>Martha’s Funny Photos</td>
<td>5</td>
<td>82</td>
<td>6.90</td>
</tr>
<tr>
<td>3</td>
<td>Theo’s Puzzles (1)</td>
<td>1</td>
<td>91</td>
<td>6.80</td>
</tr>
<tr>
<td>4</td>
<td>Martha’s Switcheroo</td>
<td>6</td>
<td>73</td>
<td>5.99</td>
</tr>
<tr>
<td>5</td>
<td>Murray’s Word on the Street</td>
<td>2</td>
<td>91</td>
<td>5.90</td>
</tr>
<tr>
<td>6</td>
<td>Messy Attic</td>
<td>2</td>
<td>91</td>
<td>5.22</td>
</tr>
<tr>
<td>7</td>
<td>Theo’s Puzzles (2)</td>
<td>2</td>
<td>91</td>
<td>4.47</td>
</tr>
<tr>
<td>8</td>
<td>Sky Riding</td>
<td>4</td>
<td>88</td>
<td>3.92</td>
</tr>
<tr>
<td>9</td>
<td>Alphabet Challenge</td>
<td>1</td>
<td>91</td>
<td>3.68</td>
</tr>
<tr>
<td>9</td>
<td>Elmo’s World Book</td>
<td>1</td>
<td>91</td>
<td>3.68</td>
</tr>
</tbody>
</table>

Tickets. In addition to playing games on the Island, children spent time doing other things such as purchasing prizes and watching videos. One indicator of the amount of time they spent doing these activities is the number of tickets redeemed for prizes. Overall, children in the study earned an average of 152.65 tickets (SD = 68.81) and redeemed 100.88 (SD=71.24) of them.

Because children who reached level 8 played more games, it is not surprising that they also earned (M = 183.32; SD=60.88; t (1, 91) = 7.24, p < .001) and redeemed (M = 123.65; SD = 69.00; t (1, 91) =4.59, p < .001) significantly more tickets than children who did not reach level 8 (M = 96.88, SD = 42.54 tickets earned and M = 59.48, SD = 55.43 tickets redeemed).

Issues That May Have Reduced Play

Some families in the study reported experiencing problems with their computer or with the Island itself. These technical issues may have affected the degree of exposure to the website, as these issues were often discouraging for both parents and children. Issues included computer problems, a slow Internet connection, confusion related to the structure of the Island, and technical problems specific to the Island. These will be reported more fully later in the report, but they were important to note now as they all had an impact on children’s frequency of play and/or engagement with the site.
Responsiveness to the Island

Parents’ reports of children's responsiveness provide additional information about how the website was used and whether or not it was difficult to get children to go online. Parents were presented with two paired statements, and were asked their opinion of the statements. For example, they were given the two statements “My child asked to use the site” and “I suggested we visit the website” and were asked which statement they agreed with (somewhat more or significantly more, or if they agreed with the two statements equally). As can be seen in Figure 3, parents report that more than half (57%) of children asked to use the Island, compared with one-third (32.2%) who needed encouragement. Despite the need for some parental encouragement, three-quarters (76.4%) of parents agreed with the statement “My child looked forward to using the site” (See Figure 4). Thus, it appears children in the study generally enjoyed using the site: most looked forward to using it on their own and slightly more than half initiated Island usage. These levels of responsivity are comparable to those found with the Hit Entertainment control website (where 73.8% looked forward to using the site and 29.2% needed encouragement).

Figure 3. Degree of Child vs. Parent Initiation of Island Use
Island Plus Group: Support Materials

Parents in the “Island Plus” condition were asked about use and perceived usefulness of the support materials. These included pre-literacy games, books, magnetic letters, and activities focusing on rhyming, letter identification, phonemic awareness, phonics, alliteration, and concepts of print. Additionally, the packet contained a step-by-step guide to using the Island including instructions on how to earn new rides and other troubleshooting materials.

Participants reported looking at the Island support materials between one and 21 times (M = 5.45, SD = 4.66) and using the activities an average of 32.19 minutes a week (Range = 5 to 120 min). In addition, most caregivers (84.1%) considered the support materials “very” or “somewhat useful.” The seven families who did not consider the materials useful had children who had high level pre-literacy skills and had already mastered the skills represented in the materials. In terms of the Island Support Materials and activities they consider useful, ratings were similar for each type: Letter Identification (72.7%), Rhyming Skills (72.7%), Letter Sounds (72.7%), and Book and Print Awareness (68.2%). The most common reason for the identification of the materials as useful was that they met their child’s skill level and/or reinforced what they were learning in school. Activities that were not considered useful were those that were too easy (“These are skills that [child] mastered a few years ago”), too hard (“It was not her level, I guess it was hard for her so it did not interest her”), or were not applicable to the child’s needs.
Additionally, parents in the *Island* Plus condition were provided with a packet of *Island* support materials with step-by-step information on how to add new levels and other troubleshooting materials. Just over half (55%) considered this section of the Support Materials to be useful. As one parent of a kindergarten girl explained, “I needed to find out something on the website and couldn’t find it on my own so the booklet helped me to locate it.” Since many participants reported that the structure of the *Island* was confusing or challenging, this packet may have provided the support they needed to figure out how to earn a new ride without requesting help from researchers. In fact, *Island* Plus participants had fewer problems adding a level or figuring out which game to play, $\chi^2(2) = 8.22, p < .05$, which suggests that the support packet helped them understand the leveling system.
Results: Learning

The main purpose of this study was to evaluate children’s learning from the website, primarily through the use of standardized assessments. Researchers chose measures to assess learning in each of the seven skill areas addressed on the Island. In particular, this study sought to determine whether website content produced specific changes on standardized measures of early literacy that are predictive of later reading success. Further, website-specific measures were developed when standardized assessments were not available or were not considered adequate to assess learning on the site. Finally, children’s perceptions of learning from the website and parents perceptions of their child’s learning are also described below.

Indicators of Letter Knowledge

Alphabet Knowledge

Alphabet Knowledge was composed of three scores: how many of the 26 Upper Case letters children identified; how many of the 26 Lower Case letters children identified; and percentage of children in each group who were eligible to try the Lower Case assessment.

Upper Case Knowledge (out of 26): performance did not significantly increase over time. At the post-test, the Control, Island and Island Plus groups correctly identified 23.32, 24.63 and 23.42 Upper Case letters; F (2, 130) = 1.21, n.s.

Lower Case Knowledge (out of 26): performance did not significantly increase over time. At the post test, the Control, Island, and Island Plus groups correctly identified 20.98, 22.77, and 21.13 Lower Case letters; F (2, 130) = .65, n.s.

Eligibility to Identify Any Lower Case Names or Letter Sounds

Eligibility for the lowercase letter and letter sound tasks did not vary by condition. For the lowercase letter task: 93.0% of Control, 93.8% of Island, and 88.9% of Island Plus children were eligible to take the Lower Case Letter Knowledge task at the post test (χ² (2) = .84, n.s.). Further, eligibility for the letter sound task did not vary by condition: 86.0% of Control, 89.6% of Island, and 84.4% of Island Plus were eligible to take the Letter Sound task at the post test, χ² (2) = .56, n.s.
Alphabet Letter Naming Fluency

Alphabet Naming Fluency was examined by timing the administration of both the Upper Case and Lower Case letter knowledge subscales of the PALS PreK Alphabet Knowledge task.

**Upper Case Fluency:** performance did not significantly increase over time. At the post test, the Control, Island, and Island Plus groups named Upper Case letters in 1.7, 1.5 and 1.6 seconds per letter, F (2, 130) = .52, n.s.

**Lower Case Fluency:** performance did not significantly increase over time. At the post test, the Control, Island, and Island Plus groups named lowercase letters in 3.30, 2.28, and 3.51 seconds per letter, F (2, 128) = .36, n.s.

Indicators of Phonological and Phonemic Awareness

Letter Sounds Knowledge (Out of 26)

Letter Sounds Knowledge was measured using the PALS Pre-K standardized letter sounds measure. Performance significantly increased over time, resulting in higher scores at the post-test for the two experimental groups when compared with Control group performance over time; F (2, 130) = 3.51, p < .05. At the post-test, participants in the Island and Island Plus groups correctly identified 18.06 and 16.58 sounds compared with 14.05 sounds for the Control Group. See Figure 5. Overall, Island and Island Plus viewers scored 23.42% higher than their Control viewing peers and grew 24.12% from pretest to post-test while Control viewers grew just 18.67%.

Figure 5. Number of Letter Sounds by Condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>PreTest</th>
<th>Post Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>11.84</td>
<td>14.05</td>
</tr>
<tr>
<td>Island</td>
<td>14.64</td>
<td>18.06</td>
</tr>
<tr>
<td>Island Plus</td>
<td>13.24</td>
<td>16.58</td>
</tr>
</tbody>
</table>
**Letter Sounds Fluency**

Children in the Island and Island Plus groups identified letter sounds more rapidly than children in the Control Group, $F(2, 130) = 3.65, p < .05$. As can be seen in Figure 6, at the post-test, children speed of naming letter sounds improved across groups, but more so for children in the Island and Island Plus groups (5.0 and 5.5 seconds per letter sound) compared with the Control group (7.7 seconds).

**Figure 6. Average Time (Seconds) to Identify One Letter Sound by Condition**

![Graph showing average time (seconds) to identify one letter sound by condition.](image)

**Beginning Sound Awareness**

Beginning Sound Awareness was measured using the PALS Pre-K standardized measure. Children in the Island and Island Plus groups identified more beginning sounds than children in the Control Group. As can be seen in Figure 7, at the post-test Island and Island Plus correctly identified 8.81 and 8.31 beginning letter sounds compared with 7.45 beginning sounds for the Control Group; $F(2, 130) = 5.55, p < .001$.

**Figure 7. Beginning Sound Awareness by Condition**

![Graph showing beginning sound awareness by condition.](image)
Rhyming Awareness

Children’s rhyming awareness was measured using the PALS PreK standardized rhyming task. Rhyming performance did not differ by Condition; F (2, 130) = 1.929, n.s. Out of 10 rhymes, children in the Island and Island Plus groups identified 7.81 and 8.13 rhymes at the post-test compared with 6.98 rhymes in the Control group.

Phonological Awareness

Children’s phonological awareness was measured using a researcher-developed measure modeled after an Island game that directs children to find a letter based on the sound. To adjust for missing data, the total raw scores at pretest and posttest were converted to reflect a percentage correct score. There was a trend toward children in the experimental conditions identifying more letters; F (2, 130) = 2.57, p < .10. Children in the Island and Island Plus groups scored 91.54% and 87.56% compared with 84.53% correct in the Control group (see Figure 8).

Figure 8. Phonological Awareness (Percent) by Condition

Combined Early Literacy Skills

Get Ready to Read Screener

Children’s print knowledge, emergent writing, and linguistic awareness skills as measured by the Get Ready to Read screener did not differ by condition; F (2, 130) = 1.99, n.s. Island and Island Plus participants identified 21.56 and 21.31 items and Control participants identified 20.02 items.
Letter Sequencing

Letter Sequencing was evaluated using a researcher-developed measure modeled after the Island game ABCD Watermelon. As can be seen in Figure 9, performance significantly increased, $F(2, 130) = 3.53, p < .05$, with Island and Island Plus groups scoring 6.94 and 6.82 and Control scoring 6.12 out of 8 points.

Figure 9. Letter Sequencing by Condition

Vocabulary Measure

Vocabulary was evaluated using a researcher-developed measure modeled after the Peabody Picture Vocabulary Test 4. As can be seen in Figure 10, there was a trend toward scores improving, $F(2, 130) = 2.62, p < .10$. Children in the Island and Island Plus groups correctly identified 16.23 and 16.49 words as compared with 15.09 words in the Control group.
Because there was a trend toward increasing vocabulary scores, we examined each of the 20 words comprising the Vocabulary Task using paired-sample t-tests to determine significant improvement from pre-test to post-test in the experimental groups. This procedure does not examine differences by condition and is only presented as an indicator of trends in the data. Further, it is helpful to examine which words were successfully taught in order to better understand what worked in teaching vocabulary words via online games. Significant growth was found for 9 of the 20 individual words (see Table 8). These words were: snoozing, fix, enormous, chilly, curly, moustache, cactus, spray and outfit. Significant changes were not found in the following games: Scrub-a-Pup (odor, smell, pick, and shower), Murray's Word on the Street (ballet), and Hopposites (narrow, weep, boring, cheerful, delicious, exciting, and weep).
Table 8. *Island* Participants’ Change in Individual Word Analysis

<table>
<thead>
<tr>
<th>Target Word</th>
<th><em>Island Game</em></th>
<th>Pre-Test Mean(^\text{11})</th>
<th>Post-Test Mean(^\text{11})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snoozing</td>
<td>Hopposites</td>
<td>0.65</td>
<td>0.75</td>
</tr>
<tr>
<td>Fix</td>
<td>Hopposites</td>
<td>0.67</td>
<td>0.87</td>
</tr>
<tr>
<td>Enormous</td>
<td>Hopposites</td>
<td>0.50</td>
<td>0.79</td>
</tr>
<tr>
<td>Chilly</td>
<td>Hopposites</td>
<td>0.75</td>
<td>0.86</td>
</tr>
<tr>
<td>Curly</td>
<td>Murray’s Word on the Street</td>
<td>0.79</td>
<td>0.89</td>
</tr>
<tr>
<td>Moustache</td>
<td>Murray’s Word on the Street</td>
<td>0.96</td>
<td>1.0</td>
</tr>
<tr>
<td>Cactus</td>
<td>Murray’s Word on the Street</td>
<td>0.87</td>
<td>0.96</td>
</tr>
<tr>
<td>Spray</td>
<td>Scrub-a-Pup</td>
<td>0.88</td>
<td>0.97</td>
</tr>
<tr>
<td>Outfit</td>
<td>Switcheroo</td>
<td>0.84</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Murray’s Word on the Street was successful at teaching vocabulary words, with three of the four assessed words showing statistically significant changes at post-test. This game involves a video with images and a definition of the vocabulary word such as “lip whiskers” for the word moustache. Similarly, Hopposites, with four out of ten words showing statistically significant changes, includes descriptions of words such as “to change something so that it works” for the word fix. Additionally, although only one word was used from Switcheroo, there was a significant change at post-testing for this word and the game did include a definition (“a complete costume” for the word outfit).

In contrast, only one of the five Scrub-a-Pup vocabulary words included in our assessment demonstrated statistically significant improvements. In Scrub-a-Pup, words are not specifically defined but rather are used in a sentence such as “what’s that odor? Smells like a dirty dog.” Thus it appears that the games where words were overtly defined helped children develop a better understanding of the meaning of the word.

**Children’s Perceived Learning**

In order to assess whether children believed they learned from playing on the site, they were asked “Did the website teach you anything new?” and “Did the website help you with learning how to read?” In answer to the first question, nearly two-thirds of children (64.10%) who answered the question said that they had, in fact, learned something new from playing on the *Island* website. More than half (52%) of these children reported literacy-related learning. Children most frequently reported learning letters ("It taught me the letters and when I don't get any wrong it's because I know stuff"), spelling ("I learned

\(^{11}\) 0=incorrect and 1=correct
how to spell 'duck' and 'wolf'”) and reading skills (“It taught me to read because all of the reading games. Like the game where you put words together with football people”). A few children also reported learning vocabulary words or rhyming. Besides pre-literacy learning, children reported learning how to play games or game specific skills (50%), computer skills (4%) or coloring (2%).

Children who thought the Island helped them learn to read (65.88%) frequently named specific characters or games on the Island that helped with their reading skills. For example, one preschool girl said, “I learned how to read the sentences in the Super WHY! games like "Humpty Dumpty sat on a wall." They also frequently reported learning words (e.g., “I don’t know how to read but I do know how to sound words out and the Island helped me learn more about that”) and learning about books on the site (e.g. “It did a little because there are stories”). Some children also said that the focus on letters and letter sounds helped them learn to read. As one preschool boy said, “[Wonder] Red helped me learn how to read, too, because she shows letter sounds.” Another child, a kindergarten girl, noted, “I went and learned how to read from Alpha Pig-the letters.”

**Parents’ Perceptions of Children’s Learning**

Additional evidence for children’s learning from the Island comes from parents’ reports. Because parents have repeated opportunities to observe their children, gathering descriptions can provide ecological validity (Damon & Lerner, 2006). During the mid-point surveys, parents were asked whether they observed their child doing anything related to the site such as using rhyming skills. Finally, during the Survey 6, parents were asked a series of questions to assess their child’s learning from the site.

One of the key appealing factors of the Island to parents was its unique combination of educational content and entertainment. This factor, which will be explored more fully in the appeal section, was also evident in parental reports of learning. As one parent said, “My child found trying to read words boring up until he was introduced to the Island. It has really made a difference in the way he looks at words.” The appealing nature of the Island made learning a more enjoyable experience for some children. Another parent said, “The storytelling and videos were very helpful but the best was the Super WHY! games when the children have to read the words to complete the game. (Child) really loved playing and picked up his reading skills from playing on the games. They were really great in helping him to learn to read.” While many parents also reported that the Island supported what their child was learning in school, the fact that the site was enjoyable made the experience more positive and helped to integrate their learning. This integration of learning was
evident in other parental reports. The parent of a preschool girl said, “She has learned to spell words- for example, we will ask her to spell a word and she will write it down. She can also identify what words rhyme with that particular word she spelled.” The Island’s presentation of multiple different skills in one cohesive site may have contributed to cross-type learning.

Most parental reports’ of children’s learning during the mid-point surveys included observing their child practicing rhyming (e.g. “He’s rhyming-a little poet now!”) and letter recognition skills (e.g. “Perhaps letter recognition of a couple more letters and the sounds of the alphabet.”) We did not find significant improvements in these skill areas, but parental reports indicate that children were taking away something from these aspects of the site. Some parents also said that their child practiced letter sounds and putting letters together to make words. For example, one parent said, “Since she started using the website, I have noticed that she is writing three letter words everywhere!” Finally, several parents noted that they observed their child using the computer more proficiently since playing on the website. For example, one parent of a kindergarten girl noted, “I watched her as she helped her little brother learn to play some of the games on the website and I was impressed with how much she has retained!”

At the end of the study (survey 6), parents were asked about their child’s learning in four ways. First, they were asked to rank the educational value of the Island. Second, they were asked open-ended questions gauging 1) what, if anything, their child learned from using the site, 2) which parts of the site were most effective in building skills and 3) which games were most beneficial for their child. Finally, they were asked to rank how much the Island impacted their child’s skills in 17 possible domains.

Most parents considered the Island to have “excellent” (68.5%) or “good” (26.1%) educational value. Of the remaining five parents who considered the education value to be “average,” four felt their child had already mastered the skills being taught and one felt the educational value would be greater if additional skills were included (e.g., math and science).

When asked during Survey 6, “Did your child learn anything by using the PBS Kids Island website?” 89.25% responded in the affirmative and were able to provide specific examples. Nearly two-thirds of these responses (67.74%) concerned pre-literacy skills. The most frequent observations were 1) putting letters together to make words or recognizing words, 2) rhyming, 3) spelling, 4) letter sounds, 5) phonics and 6) letter recognition. Some parents felt the Island helped their child develop additional skills whereas others felt it
reinforced skills that were already present. For example, one mother of a kindergarten girl said, “She knew a lot of the skills already but it was good to practice skills and gave her more experience with the computer.”

A similar pattern of results was found when parents were asked to evaluate the impact of the Island on various skills. Parents were asked whether the Island increased their child’s skills a lot, increased them a little, decreased, or did not have an impact on their child’s skills. As can be seen in Figure 11, almost all (97.8%) of the parents felt their child showed learning gains in recognizing familiar words. As one parent of a kindergarten girl noted, “She learned to spell more words and read them.” Most parents (93.4%) also noted increases in their child’s rhyming skills. More kindergartners had already mastered rhyming or spent more time working on rhyme skills in school, whereas this was a newer activity for many preschoolers. As one mother of a preschool girl said, “She learned more about rhyming and sounding out letters which overall I think will improve her reading and spelling.” Some also felt learning rhyming skills helped to develop other pre-literacy skills (e.g., “She further developed her phonemic awareness through all the rhyming activities”).

Some parents (87.9%) also noted that their child had further developed letter sounds/alliteration skills. As one mother of a preschool girl explained, “Yes, I’ve noticed she knows more letters and letter sounds now. She always rhymes words now. She is trying to read things. I feel her confidence and interest in letters and sounds is higher now.”

Attributions to learning the letters in their child’s own name was lower than the other measures, most likely because the Island does not specifically address this skill. Nonetheless, more than half of parents felt the Island helped their child identify the letters in their own name. These findings provide additional support for the learning assessment gains noted in the previous section.
As can be seen in Figure 12, parents also perceived their children to learn other cognitive skills from the Island including matching, the ability to do puzzles, problem solving, math skills and spatial relations. Some grade and gender differences were observed in learning of math and spatial relations. In terms of math, 43.3% of parents of kindergartners, compared with 29.5% of parents of preschoolers, observed increases in this area ($F(1, 89) = 5.88, p < .05$). Further, parents of boys (56.5%) were more likely than parents of girls (34.9%) to report learning in the domain of spatial relations ($F(1, 87) = 4.36, p < .05$). This was to be expected, as boys often perform better on spatial-relations tasks (Voyer, 2003). This performance may be related to parental gender perceptions and their subsequent encouragement of gendered activities, as well as a true innate preference for activities that encourage spatial skills.
Over 80% of parents also reported increases in their child’s computer skills after using the Island. As one parent of a preschool girl explained, “She was able to use the computer that much more than if we were not in this study, which in turn gave her more practice using the mouse, finding letters on the keyboard and knowing what types of things that she could click on.” Interestingly, parents also frequently attributed children’s increases in following directions (90.2%), focus (83.6%) and self-esteem (79.1%) to the use of the Island.

Parents were also asked, “What parts of the Island do you think were most effective in building children’s reading skills?” Nearly half of the parents who answered this question named specific games. For example, one parent of a kindergarten boy said [the most effective were] “games that you could read along with...It was helpful to hear the words and the sounds at the skateboard park.”

When asked which games were most beneficial, just over half (54.8%) considered Super WHY! games to be the most beneficial, followed by Word World (45.2%), Sesame Street (26.9%), Between the Lions (23.7%) and Martha Speaks (20.4%).
Beneficial games by property:

- Parents appreciated the educational value coupled with fun activities in Super WHY! games. As one parent of a preschool girl explained regarding the Super WHY! games, “they were a bit more challenging than the rest and she enjoyed the rhyming and creating her Super Heroes.” It may be that Super WHY! games were more memorable or salient because half of the games on the site were from that property.
- Parents appreciated Word World’s focus on pre-literacy skills. For example, one mother of a preschool girl noted, “[The] Word World games are interesting, challenging and built upon her reading skills.” It is worth noting that these games may have been even more popular if technical issues with Pig’s Perfect Pizza and Bear’s Skateboard Park could have been averted. Nonetheless, nearly half of parents named a Word World game as one of the most beneficial, which is worth noting given that less than 10% of the games on the Island were Word World games.
- Sesame Street games were also mentioned relatively frequently considering there were only two games on the site. Parents most often appreciated the ease of use and familiar characters. As one parent explained, “You can’t go wrong with Sesame Street…my children watch it every day.”

Thinking about the games in general, the vast majority of parents said those that were most beneficial also contained high educational value. Some also noted the importance of keeping their child entertained or they noted that these games were more of a challenge, teaching at or slightly above their level. For example one mother of a preschool boy noted, “These games are above the level that he is currently on so it was more of a challenge. We are currently working on vocabulary and these games showed more of the skills we are working on at home.”

Finally, some parents also found games that were user-friendly and that their child could play independently to be beneficial for their children. One parent of a kindergarten boy said of a Sesame Street game, “I thought it was very beneficial to get a visual with the word in order for him to make a connection. Sesame Street is very user-friendly and inviting.”

Parents were least likely to consider Martha Speaks games “beneficial.” Although they appreciated that their children enjoy these games and find them easy to use (e.g., “With Martha Speaks...they have silly title names, plus the game is fun. We love being silly so that makes it more enjoyable”), these games were less frequently recognized as being “educational.” Nonetheless, some saw the value in introducing new words (e.g., “Martha Speaks game does a very good job of introducing and then explicitly modeling the
vocabulary words they introduce. I thought it was very beneficial to get a visual with the word in order for him to make a connection").
Results: Usability

Usability in this evaluation concerned the ease of using the Island website. In particular, we were interested in participants’ relative ease of using the website, as well as the degree to which learning can proceed without obstacles (Kukulska-Hulme, 2007). This is important because usability can substantially impact motivation and subsequent learning. All parents were interviewed about their child’s and their own experiences using the site.

Most parents (93.5%) believed their child mastered the rules of the website, suggesting that children were quickly able to learn how to use the site. As the parent of one kindergarten girl said, “I liked that [child] could navigate the site herself, [and] that there was a progression in skills represented.” Nonetheless, there were a variety of usability challenges reported by both parents and children. Some of these problems are inherent to the structure and set up of the Island, others are simply technical. These factors are important to note, as they had an impact on appeal and the degree to which families complied with the intervention. The degree to which these issues posed a problem for children was related to age, gender, pre-existing literacy skills, quality of computer and speed of Internet, and level of parent involvement, among other things. Challenges inherent to the structure of the Island will be discussed first.

Structural Challenges

The structure of the Island is progressive, where children start with one ride and “earn” more rides as they play all four games on a level. Thus, when they begin playing on the Island, only the Carousel ride is available for play and the other 7 rides have ‘under construction’ signs. After playing all 4 games on the Carousel and then each ride following, they continue to earn rides, until they complete all 8 levels. Parents’ main challenges with the structure concerned: 1) keeping their child motivated due to perceived lack of variety upon first use of the site, 2) figuring out how to earn a new ride and figuring out which games needed to be played in order to earn a new ride and 3) keeping their child motivated to play the educational games frequently enough to result in mastery of pre-literacy skills. Each of these will be discussed below.

Keeping their child motivated due to perceived lack of variety upon first use of the site.

Although parents generally liked the progressive nature of earning levels (“I liked that you had to win the rides by playing the different games, and that you could see the progress that was being made”) the execution was such that it was unclear that there was the possibility to open new levels later. In fact, parents often reported that the initial Island
appeared boring to their child, which inhibited their desire to play. One parent explained at the end of the study, “It took her a while to get into it. She was bored at first but once she realized that more games would open, she was hooked. So it was slow to catch her attention.” This confusion and subsequent inhibited desire to play can be problematic because without playing, children cannot learn new skills from the website.

**Figuring out how to earn a new ride and figuring out which games needed to be played in order to earn a new ride.**

Once the structure of the site was made clear to parents, some still experienced challenges with the Island. Over one-third of parents (36.6%) reported problems with adding new levels or figuring out which games needed to be played, suggesting that this system is not conceptually or visually apparent. Furthermore, at the end of the study, two-thirds of parents (67%) believed the website would be improved if there was a better way of showing which games still needed to be played.

**Keeping their child motivated to play the educational games frequently enough to result in mastery of pre-literacy skills**

Finally, parents felt it was difficult to keep their child motivated to continue playing on the Island once they had completed levels and games. In particular, once all 8 levels were complete there was a sense that it was “done.” As one mother said, “I didn’t like the fact that it ends. They need to have more rides that they can earn and further develop skills. [Child] would have played longer and more [often] and want to continue if it didn’t just end after 8 levels.” The structure of the Island gives children a sense that they are completing games solely to reach a goal (earning a new ride) until the Island is complete. This appears to have limited the number of times children re-played prior games, thus potentially inhibiting their ability to learn from the site.

**Technical Issues Specific to the Island**

Approximately two-thirds of parents (69.9%) reported experiencing issues specific to the Island that posed at least a minor problem for their child. Parents reported a variety of technical issues, including getting stuck on a level (often due to not being able to play games), problems with videos freezing, and issues logging into the Island.

Approximately 40% of parents said that their child experienced at least minor technical problems with getting stuck on a level at some point during the study. This was different from families who got stuck on a level due to not understanding the leveling system, in that some parents experienced technical problems that led to them getting stuck. A few specific
games (Elmo’s World Book; Bear’s Skateboard Park) were problematic in that they would freeze or were “glitchy,” prompting families to request that we override the game for them so they could continue with this study. Statistical analyses adjusted for these over‐rides. Approximately one‐quarter (28%) of families also experienced challenges with playing games in general. Games containing videos appeared to be particularly problematic for some families. As one parent of a kindergarten girl said, “Early on, we had technical problems with a few of the more video‐dependent games, and had a hard time completing them so we could move to the next level.” Because researchers were able to log on to the account of participants experiencing problems and play the games for the child so that a new ride could be earned, these technical problems were likely a result of a slower Internet connection or computer speed.

In addition to technical difficulties with games that were more video‐oriented, approximately 30% of parents reported technical problems with the videos in the Treehouse. As the parent of a kindergarten girl explained, “The audio doesn’t always correspond to the picture.” Further, child participants were observed to quickly exit the Treehouse after a video began playing. This is worth noting because study participants do enjoy watching videos online (approximately one‐quarter reported regularly using YouTube) and nearly one‐quarter (21.18%) of the first or second prize chosen were videos, suggesting they would enjoy watching videos that worked properly.

16.1% of parents also expressed frustration with having to log their child in to the Island. For some parents, this requirement was an extra step before their child could play, while other parents experienced technical difficulties with this process. One parent of a preschool girl noted, “I had trouble with login. On many occasions I needed to enter login p information several times before it would register and open the site.”

One‐third of parents said that they would have liked a step‐by‐step guide to navigation (33.3%) and just over half (52%) of participants indicated that they would have benefited from a list of FAQs on the website. It is worth noting that there is a FAQ on the site, but it is located under a tab called “PBS Kids Raising Readers,” so parents may not have known where to find it. Further, participants in the Island Plus condition were less likely to want a FAQ (39.5%) than Island only participants (64.6%), χ² (1) = 5.71, p < .05. This suggests that providing more direction and explanation about the goals of the Island would maximize use of the website.
Level of Assistance over Time

The design of the Island was such that most parents needed to provide some assistance to their children while using the site (i.e., logging in, figuring out which games need to be played to earn new levels, navigational support, and completing games). This is not specific to the Island, as children often need assistance with websites and educational games. As can be seen in Figure 13, there was a decrease after approximately one month of using the Island in the amount of support parents needed to provide to children, $F(3, 50) = 4.81, p < .01$. This demonstrates that with increased time on the site, children became more proficient. As the mother of one kindergarten girl said, “She didn't need help at all like she does with other sites.”

Figure 13. Level of Support Needed Over Time

Because the majority of the children are not yet reading, it is not surprising that the most frequently provided assistance (60.2% of parents) involved helping children read text. Although the Island does not require a lot of reading, especially when compared to other children's websites, there are some words children needed to become familiar with on the site (e.g., “Play,” “Under Construction: Play more games to get this ride”) and were initially dependent on adult help to engage with the site in a more meaningful manner as opposed to randomly clicking.

Nearly half of parents (45.2%) reported providing assistance with navigation at some point during the intervention (see Figure 14). Such assistance decreased after the first mid-point
survey, F (3, 50) = 3.10, p < .05. The overall decrease in navigational assistance shows that with continued use of the site, children learned how the system worked and were able to find games and earn new levels on their own. As one parent said, “The site was very easy to navigate for the child.” The increase in navigational assistance reported in Survey 4 may have been related to having many more levels (rides) and games present on their personal Island, as some parents reported that it was hard to remember where certain games were stored. Thus, despite some navigational issues, it appears that many children played on the Island consistently on their own with little assistance required once they understood the way the Island works.

**Figure 14. Parents’ Reports of Need for Assistance with Island Navigation**

Finally, 41.8% of parents reported needing to help their child with finding or completing games during one of the mid-point surveys. Assistance with finding games is likely related to helping their child complete levels. Assistance with games appeared to vary, but was slightly more frequent during later surveys, suggesting that as the games became harder, children needed increased support with finishing the game.
Results: Appeal

Appeal is an important factor in children’s media, as it helps to attract children and ensure that they remain engaged over time (Fisch, 2004; Linebarger, McMenamin, & Moses, 2010). In this study, children were interviewed about website appeal during the post-test interview (see Appendix E for additional answers to child interview questions). Further, since parents are typically the gatekeepers and boundary setters of children’s media use (Jordan, 1992); they were asked about website appeal in surveys 2, 3, 4, 5, and 6.

Overall Website Appeal

To assess appeal of the website, parents were asked whether their child liked the Island a lot, a little, did not like it very much, or did not like it at all. Overall, parents reported that the Island website was appealing to their child with 78.0% liking it “a lot” and 20.9% “a little.” Although overall appeal was high, there were variations over the course of the intervention with high initial appeal (98.8%), a drop in appeal after using the site for approximately one month (87.75%), followed by a rise in appeal near the end of the intervention (93.4%). Drops in appeal after one month can largely be attributed to children’s declining interest in using the site. The main reasons for declining interest were general boredom or having completed all the games on the site. Despite challenges with maintaining children’s interest throughout the study, the high appeal at the end of the study suggests that parents considered the site appealing overall.

Children’s reports during the post-test interview were similar to parents, with 73.1% liking the Island “a whole lot” and 24.7% “a little bit.” Only two children, both boys, said that they did not like the Island, which is a high degree of appeal.

Strengths

When asked what they liked best about the Island website, both parents and children mentioned the games. Next, approximately one-third of the children liked the Island simply because “it’s fun.” The next most frequent responses for both parents and children concerned the prizes and tickets, followed by the structure of the Island, ability to play independently and the Treehouse. These trends are discussed in more detail below:

1. Appealing games to play

More than half of children stated that they liked playing the games (e.g. “I love to go and play on the games and have fun”). In each of the mid-point surveys, more than three-quarters of parents also mentioned the games as their child’s favorite part of playing on the
Island. This often included reference to the games’ characters and affiliated shows (e.g. “She loves the Super WHY! games!”), plot (e.g. “[Child] thinks it’s funny to make up your own story”), content (e.g. “The games where he had to match or identify letters”) and the variety of games available to play. Favorite games are discussed in more detail in the Game Appeal section.

2. Appealing to earn tickets and buy prizes

Following games, earning tickets and buying prizes were frequently noted as appealing features of the Island. In terms of what they like about the tickets, one parent of a preschool girl explained that she liked “the challenge of getting to each level and adding up tickets.” Other parents specifically mentioned buying prizes, suggesting that this aspect of the Island was appealing in different ways to different children, with some preferring to “save” tickets and other preferring to spend them. As the parent of a preschool boy said, “My child liked the incentive system that was used. He loved to get tickets even though he never actually cashed them in.”

It is worth noting that in Surveys 2 and 3, earning tickets and buying prizes was mentioned by approximately two-fifths of parents, but by the final interview only one-fifth of parents and children mentioned this aspect of the Island as being what they or their child liked most. Tickets and prizes appear to be an important factor in initial appeal but interest appeared to decline after playing on the site for one month. Thus, the idea of the tickets and prizes may be more appealing in theory than in practice. As one child said, “I don’t like some of the ticket prizes because they don’t do anything and just sit there.”

3. Earning new levels

Children were less motivated by the goal-based environment of earning levels than by the games themselves; nonetheless, nearly one-fifth of children noted that they enjoyed opening new rides or completing all of the rides on the Island. As one preschool girl said, “I like it because the more games you play the more games you get!” Parents also appreciated having their child work toward a goal and noticed their children enjoying this as well. As one mother said, “I liked the different levels...it gave my child something to strive for.” In fact, when asked, “Was there anything you would add to the website to make it more enjoyable for your child?” most parents said that the website would be more enjoyable if there were more rides available for their children with more games to play. As one parent said, “Our son got bored after he finished building all the rides. [It] would be nice if there was a way to play again and create something different.” Particularly for children with higher skill sets, more rides would contribute to more long-term appeal.
Thus, it seems that the progressive nature of the rides was considered appealing by many parents and children.

4. Treehouse

One-tenth of children mentioned that they liked the Treehouse, and a few parents mentioned this as well. As one child said, “The Treehouse is the best! I like to play with the prizes.” Another child noted, “I like the Treehouse the best because I can play with my toys and color it.” Children appeared to enjoy the Treehouse because of their ability to personalize it and because it is a way for them to keep track of their personal accomplishments through their accumulation of prizes. One child stated, “Got to make my own carnival, own Treehouse, own tickets- all yours!”

Others, however, were less enthused about the Treehouse. As one mother stated, “I'm not sure I got the whole Treehouse thing or what to do with the prizes that you won.” Similarly, one child noted, “I buy stuff and put it in the Treehouse, but the Treehouse was boring.”

5. Ability to play independently

Finally, the fact that the website was age-appropriate and that children could play on it independently was mentioned by a few parents and children. For example, one parent of a preschool girl said, “She likes the fact that she can quickly learn how to do everything herself.” Similarly, one preschool girl said of her favorite games, “They are fun because they are funny and easy for me to finish.” The ability to play on the website independently was new to some families and sometimes played an important role in their perceptions of the appeal of the site. One parent explained, “[Child] likes the fact that she is an independent user of the mouse and is free to pick and choose the games she wants to play. She loves to receive tickets once she’s accomplished a game and the fact that she can win prizes and add more games.”

Challenges

Although appeal was very high, in each survey at least two-thirds of parents provided valid responses to something their child disliked about the Island. Likewise, more than half of the children (N=59) reported something they did not like about the Island in the post-test interview.
1. **Particular Games or Characters**

Approximately half of children who reported something they did not like about the Island noted particular games or rides that they did not like. This was also parents’ most frequent comment. However, parents and children often did not like certain games because they did not match the child’s ability level and were either too hard or too easy (see 5 and 6 below).

The other half of participants who disliked particular games or characters talked about specific shows or characters. For example, one parent of a kindergarten boy noted, “The characters in the Island are a bit on the childish side. If the characters were more appealing to a little bit older age, it would be perfect!” This was mentioned by a couple of parents who felt the Island would be more appealing if it included a wider variety of characters and/or characters geared towards older children. One parent explained that a greater variety of characters would make the site more appealing (e.g., “[We] would like to have more of the PBS characters involved in the games!”) Further, recent research suggests that children are more likely to replay the games on a website if they are also watching the programs on which the games were based (Fisch et al., 2010). Although properties on the site were appealing, parents frequently expressed a desire for more variety and the inclusion of favorite characters such as is available on PBSKids.com (e.g., “My child would appreciate the incorporation of Dinosaur Train”).

2. **Repeat Play Awarded Less Tickets**

The Island provides tickets to children as a reward for finishing a game. Although children earn 2 to 5 tickets after the first time playing a game, repeat plays are only awarded one ticket. Some parents believed this reduction in tickets contributed to their child’s loss of interest in the site. As one mother stated, “[My son] became discouraged when the games all dropped from 3 to 5 tickets to only 1 ticket per ride. After all the rides were open and down to 1 ticket, he didn’t want to play as much.” Further, one parent of a preschool girl explained, “[She is less interested] now that she can only accrue one ticket per game for all of them. She might still like to try for some of the remaining prizes, but there is less incentive since it will take so long for her to save up to get any of the big ticket items.” This factor may inhibit longer-term play for children.

3. **Reduced Motivation after Completing All 8 Levels**

Parents also reported that their child became less motivated to play on the Island once all of the levels were complete, as they had nothing left to work for. As one parent of a preschool girl explained, her daughter didn’t want to go back to play the earlier games because “once there is a sense of completion of having done ‘all the parts’ there may be a
quick loss of interest.” Although children were allowed to go back and continue playing games they had played previously, children’s interest frequently waned once all the levels were open.

4. Technical Issues

As was discussed earlier in the report, one-fifth of children and one-quarter of parents reported that they became frustrated with technical problems they faced while playing on the Island (e.g. “[The] glitches are really bad. [Audio] repeated, echoed, overlapped and never logged out. [We] had lots of technical problems”).

5. Too Hard

In the open-ended question, “What, if anything, doesn’t your child like about the Island?” a few parents mentioned that their child became frustrated with parts of the Island that were too difficult (e.g. “Recent games require my assistance on sound recognition and [he] sometimes gets impatient and frustrated when he gets something wrong”) or that required reading (e.g., “It requires adult supervision since some of the reading activities are too advanced”). Further, 23.9% of parents agreed with the statement “Some games were too hard for my child.” Likewise, one-fourth of the children who disliked something about the Island specified games that were too hard. As one preschool boy commented, “I don’t like the game where you have to read - Super WHY!’s Reading Game and it’s too hard for me to read” and a preschool girl said, “My dad had to help me with the Elmo and I don’t want help.” For preschool-age children who are attempting to master the age-appropriate task of independence (Erikson, 1950) this need for assistance can inhibit appeal.

6. Too Easy or Boring

Some children were less engaged with games that were too easy for them. As one kindergarten girl noted about her least favorite game, “The hot air balloon one because all you got to do is find the right letters... it was hard with the mouse and I already knew my letters.” Similarly, one preschool girl said, “The worst part is that the first games are too easy and boring.” In addition, 43.1% of parents agreed with the statement “some games were too easy for my child.” As one mother explained, “[My least favorite part is] having to start at a skill level that may not match where your child is at currently, that is working through ‘too easy/boring’ things required to get to things that are comfortable or challenging.” Parents of girls (51.1%) were more likely than parents of boys (34.8%) to report games being too easy for their child, $\chi^2 (2) = 7.03, p < .05$. 
Further, nearly one-fourth of children who reported something they disliked said the Island was “boring”. For some children, games were considered “boring” if they were not congruent with their skill level. As one parent said, “[He] didn’t like some of the games as they were a little boring for him—Didn’t like Alpha Pig and building the wall—too easy.” However, for other children, games were considered boring if the activity itself was not interesting to them. As one child said, “Monkey Match [is my least favorite]. It’s not fun because you have to match the coconut...boring.” This is likely related to individual children’s personal preferences.

**Game Appeal**

**Favorite Games**

During post-testing, children were asked, “What was your favorite game on the Island?” Of the 19 games mentioned, the only ones consistently named were Scrub- A- Pup (12.22%) and Elmo’s World Book (10%). Next, researchers showed each child pictures of the character logo for the five properties featured on the Island and asked them to choose their favorite game by property. Approximately half chose Martha Speaks games, one-third chose Super WHY!, one-sixth chose Word World, followed by Sesame Street and Between the Lions. This is notable because the games were not equally present on the site (the majority of the games were developed by Super WHY! or Between the Lions). In addition, children were asked to play their favorite games during the mid-point observations. Trends discussed below are based on children’s responses, observations of game play and answers to questions about the games.

**Fun or Humorous Activities**

Approximately half of the children explained that the games they found most appealing were those that were “fun” or “funny.” Although some children were not able to express themselves with detail besides saying the games were “fun,” others specifically described the activities in certain games that they enjoyed. For example, one kindergarten girl said that she most liked Scrub-a-Pup because “It’s super duper fun...because puppies are so cute and you dress them up!” One kindergarten girl said of Martha Speaks, “They’re the coolest games and the most fun. I love Funny Photos!” These games were often reported to be more appealing than games that contained less “fun” activities and more “academics” such as only identifying letters.

One-quarter of parents also talked about the importance of games being “fun” and keeping their child motivated. One parent of a preschool boy explained of her son’s play on the Island, “It was educational, yet fun...it motivated him to try all of the games and not just the
ones he was good at.” Many parents indicated that the games were beneficial because they made learning fun instead of a chore or task.

In addition to games that were “fun,” children also enjoyed games that they perceived to be “funny” or humorous. Many children suggested that they most liked games that are silly or that have the characters acting silly. For example, one preschool boy said that he likes Dog’s Letter Pit the best when Dog does silly things. He said, “He makes a bed and it’s so funny when he makes a spider web!” Further, humorous content such as that found in *Martha Speaks’* Funny Photos appeals to young children. As one preschool boy said, “It’s funny to see the silly pictures!”

**Familiar/Likeable Characters**

Approximately one-third of parents and one-quarter of children referred to favorite characters when explaining what they (or their child) liked about their favorite games. For example one preschool girl said, “I like Princess Pea the best so I love to play her games and color all those coloring pages.” Some children also noted a preference for games whose characters they knew from watching on television. One preschool girl pointed to the *Sesame Street* characters and simply stated, “I like them all because I watch them on T.V.”

Similarly, many children also indicated enjoyment of games with characters they can relate to. For example, one preschool girl explained that she most liked princesses and then pointed to Princess Presto and said, “See that’s me.” Some children also related to characters they perceived to be more like themselves (e.g. “He’s my favorite because he’s for boys”). Among children in the study, favorite characters were most commonly mentioned when asked about favorite games and favorite property (e.g., *Martha Speaks* or *Word World*), indicating that the familiarity and likeability of characters plays an important role in the appeal of games for children.

**Clear Goals**

Children were observed to enjoy games with clear goals where the directions are simple to understand. *Martha Speaks* games, and specifically Scrub-A-Pup, were very popular among children in the study and many were able to clearly explain the simple goals of the game. As one preschool boy said, “You just have to clean the dog!” A kindergarten boy said, “Scrub-a-pup makes the dog smell good and I wash him and put lotion on him, spray the thing that comes out.” Because the directions in the *Martha Speaks* games were clearly explained and the goals were easy to understand, some children seemed to feel increased independence. This added to their enjoyment of these games. As one preschool girl
explained about the *Martha Speaks* games, “They are fun because they are funny and easy for me to finish.” Children very commonly noted that the *Martha Speaks* games were both easy and fun which seems to suggest that when the goals of games are clear to children, they derive more enjoyment from playing them.

**Relatable**

Further, games that children can relate to their own life were also mentioned in the appeal interviews and mid-point observations. For example, one preschool girl said that her favorite game is Scrub-a-Pup because “it’s like when me and daddy go to the car wash.” Another child, a kindergarten boy, said that he most likes the *Martha Speaks* games because he’s “really into dogs.”

**Rewards**

Games that provide awards and positive praise were also mentioned in the appeal interviews and mid-point observations. As one kindergarten girl explained about her favorite game, "Make your own Superhero and it prints out! You can make your own hero. When you get the words right you can get a superhero thing!" Similar to how prizes and tickets were recognized as one aspect of the *Island* that appeals to children, games that provided videos and activities at the end (e.g., picking out a bone for the dog) excited children, motivated children and made the games more “fun” to play. For example, one mother of a preschool girl noted that her daughter most enjoys Theo’s Puzzles. She explained, “She enjoys doing puzzles...watching the video was fun for her!” That the video ‘reward’ after creating the puzzle was so appealing suggests that positive reinforcement also plays a significant role in the appeal of certain games for many children.

**Autonomy and Opportunities to Create**

Finally, games that allowed children to personalize their play with their artistic abilities or create their own stories were found to be desirable among children. For example, children enjoyed making their own book in Elmo’s World Book because of the creative freedom it allowed. A preschool girl said Elmo’s World Book was her favorite because, “He wants me to draw whatever I want, color whatever I want and I want to use stickers!” Preschool children may be particularly attracted to games that allow them some degree of autonomy, as this is an age-appropriate desire. Some children also reported that they liked directing some of the stories in the *Super WHY!* games. Create Your Own Superhero was also popular among children in the study who often mentioned the colors and details of the superheroes
they would make. One preschool girl said of her favorite game, "Super WHY! because you can play and make your own poster bookmark!"

Approximately one-tenth of parents also reported that their child’s favorite games were those that involved creating. One parent said of her daughter’s favorite game, “Elmo’s coloring game helped her control the mouse and gave her different options to use to color.” Another parent said of her son’s experience, “He was able to color, named and picked out outfits to put [on]. He loved being in control!”

**Educational**

Approximately one-fifth of parents reported that their child’s favorite games had at least some educational value. As one parent said, “Sesame Street helps her to make her own book. Super WHY! helps her to fill in blanks in a sentence. Word World helps her spell words.” As this quote illustrates, some parents pointed out the educational value of some of their child’s favorite games. On the other hand, some parents indicated that their child found certain games appealing because of the learning opportunities they provided. For example, one mother explained about her daughter’s reaction to learning skills while playing, “They got her excited when playing the games mentioned. She will also say they were fun and educational.” Similarly, another parent said, “He liked all of them, and he liked to learn how to read.”

**Sources of Frustration/ Less Appealing Games**

Sources of frustration in games tended to fall into four general categories: games that were too hard, games that were too easy or boring, games or activities that required sophisticated mouse skills, or games with unclear goals. Previously, we discussed the issues some families had with the Island being too hard or too easy. It is worth briefly noting these issues again as having specific games that are incongruent with children’s ability level may inhibit their desire to complete the game, which would lead to an inability to complete the level and earn a new ride. Specifically, when games are too hard, some children resort to random clicking in order to finish the game, which means they are not gaining new skills from the game. Games that are too easy may pose less of a problem in terms of frustration and usability, but could also inhibit children’s desire to play when they are first getting familiar with the site.

During mid-point observations, researchers noticed that some children experienced difficulty moving the mouse. Some games require children to perform precise movements
using the mouse, which children often found challenging. For example, when playing Theo’s Puzzles, one child had a hard time moving the pieces and reported, “They keep going back.” Similarly, when playing Murray’s Word on the Street, another child reported, “It’s hard to move [the mouse].” With these frustrations, children may quit before the game is complete or may choose not to play it more than once, inhibiting their ability to learn new skills from the game.

Finally, games where the goal is clearly stated can be very successful because they make it easy for children to understand what they are expected to do. However, some of the other Island games do not have a clearly explained goal, which made them challenging for some children. For example, Dog’s Letter Pit instructs children to “build a word,” and children were able to explain the general strategy that you are supposed to “spell stuff,” however the game does not explicitly instruct children to click on the letters or roll over them to hear their sounds. Similarly, while playing Red’s Rhyme ‘n Roll, one child explained that the goal was to “find the word that rhymes” but proceeded to click randomly on all the word choices. This may be because Red instructs the children to find the words that rhyme with the given word, without explaining what rhyming is or how to recognize words that rhyme. Without such explicit instructions, children were sometimes unclear as to the goal of the game, and were not able to complete the game in a way that supports their developing skills.

**Comparison to Other Websites**

**Favorite Websites**

Another indicator of the appeal of the Island and the PBS brand is demonstrated by reports of favorite websites. At the post-test, children were asked, “What is your favorite website on the computer?” PBS Kids Island (27.6%) and PBS Kids (27.6%) were the overwhelming favorites among child study participants. One child commented about the Island, “The games and all the rides. I can learn how to read and make superheroes!” Another said, “Got to make my own carnival, own Treehouse, own tickets- all yours!” Additionally, several children (8.1%) reported specific PBS shows or characters as their favorite website (e.g. “Super WHY!” or “Elmo”). The remainder of study participants reported Nick Jr. (6.9%), various super hero sites (6.9%), and educational sites such as Starfall or Jumpstart (4.6%) as their favorites.

When asked what makes their favorite website the best, approximately 40% commented about specific Island related features and games. For example, one preschool girl said, “It is the only site I like. I like the Treehouse the best because I can play with my toys and color it.” Another preschool girl commented, “PBS Island is my favorite- I love to play the Martha
Speaks Scrub-a-Pup. I also love Alpha Pig Pizza cuz its fun to make pizza.” In addition, four-tenths of the children noted that the best part of their favorite website was the games. Some noted the content of games; for example, a preschool boy said, “Dog's letter pit- he makes a bed! It's so funny when he makes a spider web!” Others described a game’s plot. As one kindergarten boy said, “Mario Brothers is most fun because you can jump on people and grow big and win coins.”

**Island Engagement Relative to other Websites**

To assess relative appeal of the website, parents were asked whether their child was very, somewhat, a little, or not very engaged with the Island compared to other websites they visited. Most (95.7%) reported that their child was very or somewhat engaged with the site.

When asked to indicate what specifically was more appealing about the Island website compared to other children’s websites, parents most often appreciated the educational value it provided for their child. Approximately 40% of parents found this characteristic appealing and noted that their child enjoyed learning specific skills through play. As one parent of a kindergarten girl noted, “(It) was fun. Letter recognition and spelling she liked and the games made it easy for her to learn.” Just over one-quarter of parents felt that the Island website was more appealing than other websites because of the progressive learning and leveled play. As one mother of a preschool girl noted, “Every game almost seems it teaches about letters or reading etc. Also the fact they have to complete games in order to move on to the next level was different than what I have seen on other sites. That is kind of a game itself.” The ability to earn tickets and prizes was found to be one of the most appealing aspects of the Island for approximately one-quarter of parents. One parent of a kindergarten girl explained, “The gaming structure and ability to win prizes was a great motivator in the beginning.” Following the appeal of the tickets and prizes, approximately one-fifth of parents said that the Island website was appealing because it is fun and has the ability to hold their child’s attention. Finally, approximately one-sixth of parents found the Island website appealing because it provides the opportunity for their child to play independently. One mother of a kindergarten girl explained, “She didn't need help at all like she does with other sites!”

Similarly, children were asked, “How does the Island compare to your favorite website?” Two-thirds of children who answered this question (67.1%) reported liking the Island as much as or more than other websites. For example, one preschool boy said, “My favorite is PBS Island and I don't like the others.” Of those children who prefer other sites, half indicated that their favorite site is “cooler” or more exciting than the Island. Some of these
children preferred *PBS Kids* because of the variety, ability to play creative/artistic activities, and lack of technical problems. Others talked about specific sites they liked such as *Jump Start* (“you can go wherever you want”) and *Super Mario Brothers* (“you can play with other people at the same time”). One-third of the children who prefer other sites simply prefer different characters (e.g. “I like iCarly because I love the characters”). The remainder of the children gave a variety of reasons for preferring other sites, including preferring sites that are more educational, gender specific, have more fighting, more videos, less technical problems or because a parent or sibling thinks that it is better.

**Reasons for Recommending the Island Website**

Finally, all but one parent (98.9%) would recommend the *Island* website to other parents. Half of the parents noted that the reason they would recommend the website to other parents was because of the educational value. These parents observed noticeable educational gains in their children and, therefore, felt the site was worthy of recommendation. One parent of a kindergarten girl said she would recommend it, “because it’s educational and [children] can learn a lot from it--spelling, reading, and matching. I already told a friend with a 4 year old to use it.”

Approximately one-third of the parents stated that they would recommend the *Island* website because it is educational and engaging for children in the targeted age group. These parents said that this combination of play and education is what drives them to recommend the website to other parents. For example, one parent of a kindergarten girl explained, “It is an educational site for children that allows them to play and learn at the same time. By having different levels of games it allows children to work their way up to the harder games instead of choosing a game that is above their level of knowledge and then getting frustrated with it.”

Further support for the *Island* being perceived as playful education comes from parents’ ratings of paired statements. Interestingly, parents perceived the *Island* much more as a learning tool than as a game (see Figure 15), whereas their children viewed the site more as a game than as homework (see Figure 16). This may have directly contributed to the overall appeal of the *Island*, because it offers a unique blend of educational content and entertaining games which pleases both parents and children. These perceptions were also reflected in parental responses to some of the appeal questions.
Even though most liked the site and would recommend it to others, five parents gave reasons why they might not recommend it. Some parents mentioned technical problems their child experienced while using the site, which have been previously discussed. Other parents, even parents who would recommend the site, would not consider it for children older than preschool and “would suggest that PBS Island create something similar for
kindergarteners.” This is a key factor, as parents of older children often felt that the Island was too easy, and our literacy assessments scores at the pre-test showed that kindergartners in the study had high initial abilities in skill areas the Island focuses on.

**Perceptions of the Internet in General**

More parents view the Internet as a source of education and entertainment than as purely a source of entertainment (See Figure 17). This perception of the purpose of the Internet may have also contributed to the appeal of the Island, because many parents viewed it as simultaneously educational and entertaining. As one mother of a preschool boy said, “It is an educational site for children that allows them to play and learn at the same time.”

We were also interested in learning whether parents’ perceptions of the computer or Internet changed over the course of the study. Approximately one-quarter of parents (26.88%) indicated that their opinions had in fact changed. Nearly three-quarters of those whose opinions had changed stated that they now believe that even young children can learn while using the computer. For example, one parent of a preschool boy said, “It made me realize that the computer can be a great learning tool in addition to books and school.” Further, one-fifth of parents whose perceptions changed mentioned that they now realize there are websites targeted to young children. They particularly appreciated that “navigation can be easy for kids” and that “there are safe sites like PBS Kids.” Most of those whose opinions had not changed already felt positively about the Internet. For example, one parent said, “I always believed that the Internet can be a great educational tool if used properly.”
Figure 17. Parents’ Perceptions of the Internet

The Internet is a source of entertainment for my child
- Agree somewhat: 12.9%
- Agree significantly: 6.5%

The Internet is a place for my child to learn while having fun
- Agree somewhat: 33.3%
- Agree significantly: 38.7%
- Agree significantly: 72.0%

- Agree somewhat with this statement
- Agree significantly with this statement
Discussion

As measured by normative and website-specific early literacy tests, did children learn the actual content presented on the Island website?

Results suggest that the website succeeded for some, but not all, of the measured literacy outcomes purported to be addressed by the Island. Children showed improvements in the areas of alliteration, letter sounds, letter sound fluency, and letter sequencing that were found to be significantly influenced by the use of the Island. Further, there were trends suggesting that phonological awareness and vocabulary were influenced by the Island. Each of these will be discussed in more detail below.

On the other hand, rhyming, alphabet knowledge and general early literacy skills were not significantly influenced by use of the Island. This may be because there was not much room to improve, with less than 10% of the children in our sample beginning the study with below average alphabet knowledge skills. There was more room for improvement in terms of general literacy skills (with approximately one-quarter of participants scoring below average for their age) and rhyming (with more than one-third scoring below the benchmarks at pre-testing). One reason may be that the intervention length (6- to 8-weeks) may not have been long enough to show a significant change in general literacy skills. Significant growth in general early literacy skills have been observed during television studies with a much longer intervention (Linebarger & McMenamin, 2010) and dosage (Linebarger, McMenamin & Wainwright, 2009). With respect to rhyming, although increases were observed, they did not vary significantly by condition. Rhyming is a skill that is frequently emphasized in preschool and kindergarten; thus, it appears that the learning of rhyming from the Island did not go significantly beyond that being taught in their daily lives, at least not during the course of the intervention.

Phonics and Phonemic Awareness

It is significant that children learned letter sounds, letter sound fluency, alliteration and phonological awareness from the Island, as these have consistently been identified as important in the development of children’s reading skills. Acquisition of phonemic awareness, or understanding that words are made up of sounds, allows children to begin manipulating the sounds of language, which supports their ability to read and spell. In fact, correlational studies have identified phonemic awareness and letter knowledge as the two best predictors at school-entry of children’s reading abilities during the first two years of instruction (National Institute of Child Health and Human Development, 2000). Previous
research indicates that when children are more comfortable with and adept at naming letters and sounds, and when they have enhanced phonological and phonemic sensitivity, they obtain better reading and spelling success (Burgess & Lonigan, 1998; Foulin, 2005). The Island appears to have facilitated this learning by presenting a task, such as saying a letter sound, and asking the child to identify letters or words that start with a given sound (e.g., “The first pizza is a letter R pizza. Find toppings that start with the letter R. R makes the Ruh sound”). The computer then provides instant feedback as to whether or not the response was correct, in a way that is non-judgmental and motivating.

Parents in the Island Plus condition noted that they used the phonics and phonemic awareness support materials less than the other materials because their children found them too hard. It seems logical, then, that these assessments would see the most improvement as it appears that children were just beginning to grasp these concepts. Parents may also find it challenging to teach phonics and phonemic awareness as they are less concrete than rhyming and letter recognition (and require knowledge of letter sounds). Further, although kindergarten teachers would like students to enter school knowing some letters, numbers, shapes and colors, they do not expect letter sounds to be taught at home. Thus, it appears that the Island can be a useful supplemental tool that complements literacy skills children are already learning in kindergarten and academic preschools, in particular phonics and phonemic awareness.

**Vocabulary**

Results on the vocabulary measure suggest that the Island website taught children new words. This is significant as vocabulary knowledge has long been recognized as important to the development of reading skills. In their seminal study of children’s exposure to language in the home, Hart & Risley (2003) found that low-income children hear one-half to one-third fewer spoken words on a day-to-day basis than children in more affluent households. Thus, it is particularly important to identify interventions that support the pre-literacy skills of children from low-income communities. Previous research indicates that educational television can improve literacy skills and academic achievement with this population (Anderson et al., 2001; Linebarger et al., 2004; Linebarger, Moses & McMenamin, 2010). This study of the Island suggests that other forms of multi-media may also be useful in helping to promote young children’s vocabulary learning.

Because this assessment used vocabulary words on the website (as opposed to using a normative vocabulary test), we are able to draw conclusions about game effectiveness. Games that most effectively taught vocabulary words included visual images of the words.
along with their definitions. On the other hand, vocabulary words drawn from games where the words were used in sentences but were not specifically defined or visually depicted failed to show significant improvement. This information can be used to facilitate the future development of children’s educational media.

**Letter Sequencing**

Significant growth was also observed on a researcher-developed assessment of letter sequencing, which asked children to identify which letter comes next in the letter song. Learning the letter song is often included in pre-literacy instruction as a means to help improve letter naming and alphabetizing skills. This is an important foundational skill because children who experience reading difficulties in first grade and beyond are commonly found to lack secure skills with letter naming and alphabetizing (Hall, 2006). Thus, it stands to reason that supporting this skill, in combination with a variety of literacy skills, would help to promote reading abilities in young children. Further, alphabetizing is an essential skill that will help children in many day-to-day tasks both at home and at school (Rippel, 2007).

**Throughout the course of the intervention, did parents observe pre-literacy and other learning from the site?**

Parents frequently observed their children learning from the site: some felt the *Island* helped their child develop additional skills whereas others, particularly parents of older children, felt it reinforced skills that were already present. Parents attributed learning from the *Island* to growths in their child’s ability to recognize familiar words, identify letters or understand letter sounds, recognize letters in their name, rhyme, and spell. It is interesting that some of these observations (e.g., rhyming, letter recognition) were not found to be significant via standardized measures. This is important to note because parents have the opportunity to observe their children in multiple settings, and have a broader understanding of their child’s skills and how they have changed over time. Further, parents may be providing additional scaffolding (Vygotsky, 1978) that aids the display of knowledge, such as modeling rhyming words for their child and asking the child to also come up with a rhyme. Standardized tests are important because they are the result of a professional assessment with reliable and valid measures, and allow researchers to compare children in groups and across time. However, they only provide information on what the child can do independently in a testing situation on a given day, and do not allow for scaffolding or the display of skills which may be on the verge of mastery. Given the relatively short duration of this evaluation, it is possible that learning in other skill areas
could be demonstrated with children who continue to use the Island for more than 6 - 8 weeks.

In addition, more than 80% of parents reported non-literacy learning from the Island. Along with a variety of cognitive skills, parents' noted increases in their child’s ability to follow directions and focus, which are essential for developing language and literacy skills and for succeeding in school (Damon & Lerner, 2006). Further, many parents attributed increases in computer skills to use of the Island. Because we are now living in a “digital world,” many parents perceive this to be a positive attribute as it will help prepare their child to use a computer in school and later in life.

**Do children perform better on early literacy tests when provided with additional literacy materials?**

In this study, using additional support activities did not have a significant impact on children’s learning outcomes. This is similar to other interventions which rely on parents or teachers to implement material they may not be comfortable with or may not feel they need (e.g., Garrity, Piotrowski, McMenamin & Linebarger, 2010). Nearly one-quarter (22.5%) of parents reported they never used the support materials or only used them once, and 34.9% of parents used them less than 10 minutes per week.

Thus, the lack of a significant difference between the Island and Island Plus groups may have been due to the large variations in how much parents used the materials. We did not require them to use these materials for a specified time as we wanted to allow flexibility in choosing materials that best complemented their child’s current skill level. Further, we did not require a particular order of using the outreach activities; it is likely that the materials would be more effective if they complemented the skills of the particular Island games children were playing in a given week (which parents may not know). Finally, time constraints may have limited the time parents had to engage in these exercises, as most worked full time and had children in school full time. These constraints often led to challenges even in terms of finding enough time to play on the Island each week.

**Are there barriers to usability? How easy is it to use and play on the Island?**

Most parents appreciated that the website was easy for children to use. At this stage of development, children desire opportunities for independence and to be able to accomplish tasks on their own (Erikson, 1950). Parents also wish to foster these skills and prefer
websites that allow their child to work on his or her own, with minimal assistance on their part, as they keep their child more engaged and less frustrated. Thus, the ability for children to play independently within a few weeks was an important aspect of Island appeal.

Parents and children did, however, encounter some challenges when playing on the Island. In terms of structural issues, they often had difficulty figuring out how to earn a new ride and figuring out which games needed to be played in order to earn a new ride. It is worth noting, however, that Island Plus participants had fewer problems adding a level or figuring out which game to play, which suggests that the support packet helped some parents understand the leveling system. Finally, there were also technical issues specific to the Island. Although some of the technical problems were related to participants’ computers or Internet connections, it is a drawback that use of the Island requires high-speed Internet or a new computer because many low income families do not have access to them. This should be kept in mind when developing games and websites intended to be used by all children.

**What was the overall appeal of the Island’s content, games, and design? Was the site sufficiently engaging and appealing to motivate learning?**

Overall, 98.9% of parents and 97.8% of children who rated the Island reported liking it. Parents especially appreciated the combination of play and education. Overwhelmingly, games were most frequently mentioned by children as the “best” part of the Island. Favorite games contained fun or humorous characters, familiar characters, relatability, clear goals and opportunities to create. Participants also appreciated rewards at the end of games.

According to parent reports and our observations, it is important for the website to address the skills of children’s current academic level. When games were too hard or too easy, when children found it challenging to move the mouse, or when the goal of the game was unclear, children got frustrated or lost interest.

Research indicates that children will attend to content that is of moderate complexity and that is integratable into one’s existing knowledge (Rice, Huston, & Wright, 1982). As a result, for participants who played games on the Island that were not developmentally appropriate for them, the site may not have been sufficiently engaging enough to promote learning. Children were observed playing games that were too hard by randomly clicking
and not considering the answer choices, which would not serve as a means to developing new skills.

Our participants also found the ability to earn tickets, buy prizes, earn new rides and play in the Treehouse appealing. Game factors such as these are typically motivating among 6- to 11-year-olds (e.g. Club Penguin, Webkinz), as children in this age group are working to achieve mastery (Erikson, 1950) and prizes and tickets support their feelings of success. However, as the children in our sample were younger, 4- to 6-years-old, they were less motivated by these factors. Nonetheless, parents appreciated the leveled system that encouraged children to work toward a goal. Further, these features added to children’s engagement with the Island because they served as a way for participants to personalize their experience. This personalization helps make play more meaningful and engaging. Research also suggests that frequent positive reinforcement is especially important during the skill acquisition phase. Positive feedback for even partially correct responses or good efforts may be especially important for maintaining the motivation and attention of children, particularly if they struggle with some of the activities (Phillips, Clancy-Menchetti, & Lonigan, 2008). Tickets and prizes on the Island, which were awarded even for incorrect responses, provided children in this evaluation with feelings of success, which helped sustain their motivation.

Finally, parents had difficulty keeping their children motivated when the Island ended after 8 levels and when the number of awarded tickets was reduced after repeat play. Some children played the Island straight through, playing to earn new rides, which meant they experienced a sense of accomplishment when they finished the Island and had little desire to go back and re-play games. Further, the ticketing system was designed to motivate children, but when the number of tickets is reduced for repeat play, children are more motivated to play new games instead of re-playing old games which would give them fewer tickets. One wonders if more positive changes would have been evident at the post-test if more children in the study re-played games, as practicing skills is necessary for mastery.

Study Limitations

There are several methodological limitations to consider when interpreting the research reported here. First, although website usage was adequate, it was less than the intended hour per week. As mentioned previously there were several structural and technical issues that may have limited weekly use of the site. Further, parents reported that their child lost interest in using the site after reaching level 8. It is likely that the results seen here would
have been strengthened had children spent more time on the site. That being said, participants spent an average of 45 minutes a week on the site, which is high given families’ busy schedules and young children’s limited experience using computers.

Second, participants often experienced technical problems that were beyond their control. To a certain degree, because this is a study involving the Internet and low-income families that did not always have optimal equipment or Internet access, this is not surprising. However, issues with getting stuck on levels and not understanding the system were particular to the Island website. Because these families were participating in a study to assess learning (which we could do not do if participants could not play on the site), researchers helped them overcome technical challenges. However, it is not clear that parents and children would be able to overcome these challenges on their own, limiting our interpretations of usability of the site. In order to optimize the likelihood of users who are not participating in a study continuing to use the site, we urge PBS to consider making the leveling system more visually explicit, optimizing the star system in size and location so that users can clearly see which games have been completed in each level, and providing a listing of which games have been completed or that still need to be completed in the Progress Tracker.

Third, parents attributed use of the Island to some pre-literacy skills we did not measure in this study, including sight word recognition, spelling, and putting letters together to make words. Although we developed measures to assess these skills prior to the ethnographic home study, our pilot testing with 4-year-olds suggested that these tasks would be too difficult. Further, we had concerns that having too many instruments would lead to participant fatigue. Thus, we excluded these measures in favor of having more standardized, normative tests to address the skills specifically addressed on the Island (see Table 2) as opposed to having more tests addressing website-specific content. Nevertheless, given the positive parental reports in these areas, future evaluations should explore these areas.

Finally, this study only included low-income families who had computers with Internet access at home. Thus, the findings may not be representative of low income families in general, but rather low income families with computers and Internet access at home. Children who have computers with Internet access at home may also differ in other ways. For example, families with computers and Internet access at home are more likely to be highly educated (Calvert et al, 2005) and may also place a higher value on electronics for children. Additionally, between 10 and 50% of the participants scored at or near the benchmarks on the standardized literacy measures. This may be related to the fact that we
recruited at schools that serve low-income families. Schools that contain Head Start, Preschool for All or State Pre-k programs are constrained by a degree of accountability to their funding sources, which may result in a higher-quality program. Not all low-income families, particularly those in rural areas, have access to these programs and their children may not have as high of literacy skills. In fact, children in the ethnographic home study, who generally attended community-based daycares or local park district preschool programs, performed slightly lower overall at their pre-test than the children in this study, who were recruited through schools.

**Future Research**

Although this study provides useful information about children’s learning from an educational website, it presents us with further questions. Given the progressive nature of the *Island* website, future research should explore learning from educational websites with different formats: for example, to determine whether a leveled structure or an open access structure is more beneficial to learning and motivation. While the leveled structure was thought to be appealing and motivating, it did not encourage repeated play of games, and children may not have had as much opportunity to practice skills. Additionally, since parents reported issues with the academic level of the games on the *Island*, it may be worthwhile to examine sites that take a different approach. Some websites allow for individualized learning by assessing children’s skills and having them play games that are specific to their skill level and/or not allowing them to move to the next level until competency is demonstrated. Future studies could examine this structure as it is inherent to some sites, or the *Island* could be manipulated in a study to provide children only with the games that match their developmental level. Different site structures will be appealing to different children, and it is worthwhile to further explore the educational potential of different website formats.

**Conclusion**

This study provides evidence that an educational website, *PBS Kids Island*, can impact the pre-literacy skills of low income 4- to 6-year-olds, especially in the domain of phonics and phonemic awareness. Given these documented effects on learning in an experimental research design, the increasing availability and use of computers with Internet access among children of this age group, and the high appeal of the *Island* website, this study provides encouraging news about the potential for educational technology to effect low-income children’s learning. Children from low-income homes with fewer high quality educational materials and experiences are at significant risk for later reading failure, and
may benefit even more from such interventions (e.g., Wright et al., 2001). Finally, although this study is unique in its evaluation of preschoolers’ and kindergarteners’ learning from a website at home, it adds to the growing body of literature that children can and do learn from media in the home (e.g., Hofferth, 2010).
References


Appendix A: Description of Island Games by Level

This section provides a description of the 32 games present on the PBS Kids Island website during the course of the intervention. Game descriptions were obtained from the Island website, along with the Super WHY!, Martha Speaks, and Sesame Street websites, and were edited for length and clarity.

<table>
<thead>
<tr>
<th>LEVEL ONE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Super Reader Alphabet Challenge</strong></td>
<td>Your child can practice her alphabet, rhyming, spelling and reading comprehension skills by taking this Super Readers challenge with a focus on the alphabet.</td>
</tr>
<tr>
<td><strong>Elmo’s World Book</strong></td>
<td>Elmo is thinking about books! Choose, color, and decorate your very own story book with Elmo.</td>
</tr>
<tr>
<td><strong>Alpha Pig’s Lickety Letter Bingo</strong></td>
<td>Your child can practice identifying letters in the alphabet in this Super Why themed game! As correct Bingo tiles are selected by your child, the tiles will disappear from the board to reveal a fun picture that your child can print.</td>
</tr>
<tr>
<td><strong>Theo’s Puzzles (1)</strong></td>
<td>Choose a letter, then put together a jigsaw puzzle featuring that letter. Then watch a video clip all about the letter you chose!</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LEVEL TWO</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alpha Pig’s Alphabet Challenge</strong></td>
<td>Your child can practice her letter skills by taking the Super Readers challenge! Using the voices of the Super Readers, this games focuses on specific literacy skills.</td>
</tr>
<tr>
<td><strong>Messy Attic</strong></td>
<td>The toys are all over the attic. Help put them away in the right order! This game encourages young kids to listen closely and follow instructions.</td>
</tr>
<tr>
<td><strong>Theo’s Puzzles (2)</strong></td>
<td>Choose a letter, then put together a jigsaw puzzle featuring that letter. Then watch a video clip all about the letter you chose.</td>
</tr>
<tr>
<td><strong>Murray’s Word on the Street</strong></td>
<td>Robots, brushes, and mustaches - oh my! Take pictures of all the things on Sesame Street that match Murray’s word of the day. After you find them all, make a photo collage!</td>
</tr>
</tbody>
</table>
## LEVEL THREE

<table>
<thead>
<tr>
<th>Game</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alpha Pig’s Bricks</strong></td>
<td>Your child can practice her alphabet skills while helping Alpha Pig protect his house from the Big Bad Wolf! With each letter of the alphabet your child correctly finds, an alpha-brick fills the hole in the house. When your child chooses the wrong letter, the Big Bad Wolf gets closer to the house, in a comical way!</td>
</tr>
<tr>
<td><strong>Bear's Skateboard Park</strong></td>
<td>You child uses Bear and her skateboard to pick out individual letters that make up a bigger word. This is also teaching your child beginning spelling skills.</td>
</tr>
<tr>
<td><strong>A.B.C.D. Watermelon</strong></td>
<td>Leona sings the alphabet song, but keeps adding in silly words. It's your job to fill in the correct missing letters. It's a fun way to learn the alphabet song, and to learn to identify letters.</td>
</tr>
<tr>
<td><strong>Monkey Match</strong></td>
<td>In this game of concentration, you can find three different kinds of matches: upper- and lowercase letters; beginning sounds; and rhymes. Flip over the coconuts and find all the matching pairs to clear the board.</td>
</tr>
</tbody>
</table>

## LEVEL FOUR

<table>
<thead>
<tr>
<th>Game</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Red’s Freeze Dance</strong></td>
<td>Your child can sing and dance along with Wonder Red while practicing common word families. Click on the words that belong to the target word family and watch Wonder Red spin and strike a pose.</td>
</tr>
<tr>
<td><strong>Sky Riding</strong></td>
<td>Guide Leona’s hot-air balloon as she floats around the sky. Help her sort through the letters of different styles and sizes to collect only the ones she's looking for.</td>
</tr>
<tr>
<td><strong>Dog’s Letter Pit</strong></td>
<td>This game teaches the sounds that each letter makes and beginning spelling skills. Dog jumps in the letter pit to toss up a jumble of letters. Your child then has to build a word by picking out letters with certain sounds.</td>
</tr>
<tr>
<td><strong>Red’s Rhyme N’ Roll</strong></td>
<td>Your child can help Wonder Red skate through the woods to Grandma’s house while rhyming with common word families along the way. Using the mouse, your child controls where Red skates on the path to collect all of the rhyming words.</td>
</tr>
</tbody>
</table>
LEVEL FIVE

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectacular Sounds Bingo</td>
<td>Your child can practice common letter sounds with Princess Presto in this game. As correct Bingo tiles are selected by your child, the tiles will disappear from the board to reveal a fun picture that your child can print.</td>
</tr>
<tr>
<td>Wonder Red’s Rhyming Challenge</td>
<td>Your child can practice her rhyming skills by taking the Super Readers challenge! Discover words that sound alike, like “sun” and “bun.” After completing a challenge, your child will earn a super letter.</td>
</tr>
<tr>
<td>Blending Bowl</td>
<td>Words are made up of different sounds, and putting those sounds together to make a word is called blending. Blend different sounds like “wr” and “ap” together to make a new word of their two sounds, like “wrap.”</td>
</tr>
<tr>
<td>Funny Photos</td>
<td>This silly what’s-wrong-with-this-picture game introduces kids to words that are related by theme. They’ll hear camping words, swimming pool words and words about farms. Help your kids listen for words like agriculture or sweltering as they play.</td>
</tr>
</tbody>
</table>

LEVEL SIX

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red’s Rhyming Bingo</td>
<td>Your child can practice rhyming words in games with over twenty different word families. As correct bingo tiles are selected by your child, the tiles will disappear from the board to reveal a fun picture that your child can print.</td>
</tr>
<tr>
<td>Pig’s Perfect Pizza</td>
<td>This game teaches about alliteration and initial consonant sounds, or words that start with the same letter by asking your child to choose words like “bike” and “book” to put on Pig’s pizza!</td>
</tr>
<tr>
<td>Princess Presto’s Create Your Own Superhero</td>
<td>Listen to the common letter sound said by Princess Presto and then click on the letter to spell a word and choose an item for her superhero. Each time she plays, your child will spell four words to earn a total of four items, including a costume, a cape, mask, and a super chest icon.</td>
</tr>
<tr>
<td>Switcheroo</td>
<td>This card game of mixed up pieces introduces words like swap, switch and mix. Can your kids put these costumed kids back together? Or make sure the licky ends of these dogs match the waggy ends? Keep playing and you’ll find the game gets pretty tricky!</td>
</tr>
</tbody>
</table>
LEVEL SEVEN

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Princess Presto's Spelling Challenge</td>
<td>Practice spelling skills by taking the Super Readers challenge! Click on the letters to spell a word, as directed by Princess Presto. After completing a challenge, your child will get to see a fun picture showing the word she spelled.</td>
</tr>
<tr>
<td>Super Why to the Rescue</td>
<td>Help Super Why rescue Rapunzel from her tower while practicing reading comprehension skills. Control Super Why as he flies through the sky to all of the words to fill in blanks in the sentence and see an animation of the sentence he has created.</td>
</tr>
<tr>
<td>Scrub-a-Pup</td>
<td>Kids will turn the muckiest dogs in town to the cutest hounds around as they spray, shower, and spritz away. They even get to reward good dogs with silly treats at the end.</td>
</tr>
<tr>
<td>Super Why's Opposites Bingo</td>
<td>Practice identifying opposite words in this Super Why game. As the correct tiles of the Bingo board are selected by your child, the disappear from the board to reveal a fun picture that your child can print.</td>
</tr>
</tbody>
</table>

LEVEL EIGHT

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Why’s Reading Challenge</td>
<td>Practice reading comprehension skills by taking the Super Readers challenge! Read the silly sentences and click on the one the correctly matches the picture on the screen.</td>
</tr>
<tr>
<td>Hopposites</td>
<td>Opposite Bunny is hopping from each word to its opposite. Pick the right vocabulary words and help him reach his favorite carrot-y treats!</td>
</tr>
<tr>
<td>Super Why’s Storybook Creator</td>
<td>Your child can choose one of four classic fairytales and make it her own by replacing the blanks with silly words in order to learn about sentences and what words mean.</td>
</tr>
<tr>
<td>Flood</td>
<td>Help organize Leona’s bookshelf by grouping certain books together in this reading game. Look for books that have similar or related topics, like &quot;breakfast,&quot; &quot;lunch,&quot; and &quot;dinner,&quot; which are all about meals.</td>
</tr>
</tbody>
</table>
Appendix B: Island Plus Pre-Literacy Support Materials

In the weekly surveys, parents were asked about the specific activities in the packet of support materials they received. Specifically, they were asked about which materials they used and which were most/least useful.

Sample Page – Table of Contents
Letter Identification: Most of the participants who considered these activities to be the “most useful” were parents of preschool children, most likely because their child was still developing letter identification skills. In particular, the letter magnets were considered very enjoyable. As one parent of a preschool boy said, “He was more interested in using them - so made it a better choice for us.” Another parent of a preschool boy noted, “Our son enjoyed making a game of finding words around the house that start with the letters that we would select.”
Rhyming Activities: Several parents who selected the rhyming materials as most useful noted that they supplemented what their child was learning at school (e.g. “These activities were more in line with what [child] is doing at school”). Similarly, some parents indicated that the rhyming activities were timely tools to supplement their child’s learning. As one parent of a kindergarten boy stated, “They just addressed the needs of my child at the time.” Further, the rhyming activities were least likely to be selected among parents as “least useful.” As one parent of a preschool boy said of using these materials, “He likes to rhyme everything now!”
Sample Page – Book and Print Awareness

Book and Print Awareness

"Exactly the Opposite" – by Tara Hoban

A picture book can tell many great stories! Use the book provided "Exactly the Opposite" to create stories and practice vocabulary with your child.

Practicing Vocabulary
Together with your child, choose a photograph from the book that he/she is interested in. Talk with your child about all the objects in the photo. Talk about the colors, what the people are doing, how the pictures are the same and how they are different. This book is wordless; so let your child use his/her imagination to interpret the photographs as he/she understands them!

Creating Stories
Once you and your child have become familiar with the photographs, ask your child to tell you what he/she thinks is happening in the photo. Write down everything your child tells you and read the new story together when your child is finished. You can create many different stories together as your child grows older and has more vocabulary to use!

Book and Print awareness: Many participants who considered these materials “most useful” specifically identified the books *Sheep in a Jeep, Opposites* as being particularly enjoyable. One mother of a preschool girl explained, “She loves the *Sheep in a Jeep* book and we have found it useful when learning rhyming and spelling. We made a rhyme chart using new rhyming words as well as some from the book...it peaked her interest and kept her intrigued.” Some also mentioned their child learning concepts of print, such as the parent of a preschool boy who said, “Book and Print awareness was very good and he now looks at where the author is and LOVES the book with the pictures instead of words - he thinks he's reading!”
Letter Sounds/Sounding Out/Phonics: Participants who found the letter sounds activities useful appreciated activities that made learning fun. As a parent of a kindergarten boy said, “It’s a fun way to learn the new words.” Another mother of a kindergarten boy said, “He enjoyed them and came up with more words then he was able to before.” Although several parents of kindergarten children identified the Phonics materials as being helpful, these activities were also considered “least useful” by many because they were too difficult for their children. As one parent said, “Letter phonemic awareness seemed like it was too advanced. She had a difficult time associating letters with objects.”
Appendix C: *Island* Plus Support Materials

Sample Page – Getting Started

![Image of Island Plus Support Materials](image.png)
Sample Page – Getting Started

Getting Started

You will be able to see other rides on the island, but those rides will not be “open” yet. Your child needs to complete level 1 (the Carousel) in order to make the other rides available.

The rides with the gray construction cranes or yellow and gray go-karts are not open for play yet. Your child needs to finish all 4 games on the Carousel to earn a new ride.

Sample Page – Levels
Levels

The Carousel contains four games for your child to play.

These stars indicate how many games on the level your child has played. When all 4 stars are filled in, the level is complete.

Your child needs to play each of these 4 games at least once in order to finish the level.

This number indicates the level of the game.
Sample Page – Levels

Levels

If your child tries to play on one of the other rides, this screen will pop up prompting him/her to play more games first.
Sample Page – Earning New Rides

Earning New Rides

After your child plays all four Carousel games at least once, it’s time to choose a new “ride” (like the Roller Coaster or Bumper Cars) with four new games. This screen will pop up, prompting your child to choose his or her new ride. Once your child plays the four games on his/her new ride, this screen will pop up again, prompting them to choose another ride. This will continue to happen until they earn all 8 rides.

Each level gets progressively harder and works on different pre-literacy skills. Many preschoolers will not ‘complete’ the island. Don’t worry if your child remains at one level for a while, it may mean that they are at the level that is appropriate for them developmentally.

Your child needs to play all four games on a ride in order to earn a new ride. If your child has been on the same level for quite a while and is wondering why they haven’t gotten any new games, they may not have played all 4 games on their most recent ride, or they may have started a game but exited it before earning tickets.

Remember, you can check here when a ride is open to see if your child has played all 4 games. If the stars aren’t all filled in, they need to finish one or more games on the ride.
Sample Page – Exiting When Finished

This screen will pop up, prompting them to choose “quit” or “keep playing.” When you exit, the Island will save your progress, including new rides, purchased prizes, and number of tickets.

What do you want to do?

- Quit
- Keep Playing

When your child is done playing, he/she can click on the Exit door to leave the Island.
Appendix D: Child Measures

PALS-PreK - Alphabet Knowledge

Upper Case Letters – Sample test page and response form:

<table>
<thead>
<tr>
<th>M</th>
<th>G</th>
<th>S</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>X</td>
<td>L</td>
<td>Q</td>
</tr>
<tr>
<td>H</td>
<td>W</td>
<td>T</td>
<td>R</td>
</tr>
<tr>
<td>J</td>
<td>C</td>
<td>O</td>
<td>V</td>
</tr>
<tr>
<td>P</td>
<td>F</td>
<td>D</td>
<td>U</td>
</tr>
<tr>
<td>A</td>
<td>Y</td>
<td>N</td>
<td>Z</td>
</tr>
<tr>
<td>K</td>
<td>E</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Upper Case Score: 

\[
\square / 26
\]

Time: 

\[
\square \text{ seconds}
\]
Lower Case Letters – Sample test page and response form:

```
s g m l
b r l f
h w t q
j c o v
p x d u
a y n z
k e
```

Lower-Case Score:

[ ] / 26

Time:

[ ] (seconds)

Letters Sounds – Sample test page and response form:

```
B S R F W
T O J A H
K Sh V l P
Z L C Th U
E D Y G N
Ch
```

Pronunciation Guide:
A as in apple not ago
E as in etch not each
I as in eye not ice
O as in goose not go
e as in yes not you
U as in yes not you

Letter Sounds Score:

[ ] / 26

Time:

[ ] (seconds)
Normative: PALS - Beginning Sound Awareness

Sample test page:

Sample response form:

**ASSESSMENT ITEMS**

1. Say, “This is picture of milk. Say the word milk. What sound do you feel on your lips when you start to say the word milk? What sound does milk start with?” Score the child’s first oral response. “Milk begins with a /m/ sound. So I’ll put it with the picture of the man. Man and milk both start with the /m/ sound.”

   Score (0 / 1)

2. Say, “This is picture of a ball. Say the word ball. What sound do you feel on your lips when you start to say the word ball? What sound does ball start with?” Score the child’s first oral response. “Ball begins with a /b/ sound. So I’ll put it with the picture of the bag. Bag and ball both start with the /b/ sound.”

   Score (0 / 1)

3. Say, “This is picture of the number six. Say the word six. What sound do you feel in your mouth when you start to say the word six? What sound does six start with?” Score the child’s first oral response. “Six starts with a /s/ sound, so I’ll put it with the picture of the cat. Cat and six both start with the /s/ sound.”

   Score (0 / 1)

4. Say, “This is picture of a bird. Say the word bird. What sound do you feel on your lips when you start to say the word bird? What sound does bird start with?” Score the child’s first oral response. “Bird begins with a /b/ sound. So I’ll put it with the picture of the ball. Ball and bird both start with the /b/ sound.”

   Score (0 / 1)
Normative: PALS-PreK - Rhyme Awareness

Sample test page:

Rhyme Awareness Item 1

Sample response form:

<table>
<thead>
<tr>
<th>Target Word</th>
<th>Score (0/1)</th>
<th>&quot;I Don't Know&quot;</th>
<th>No Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mop</td>
<td>Top</td>
<td>Bike</td>
<td>Can</td>
</tr>
<tr>
<td>2. Sled</td>
<td>Kite</td>
<td>Bed</td>
<td>Fruit</td>
</tr>
<tr>
<td>3. Bee</td>
<td>Flag</td>
<td>Tree</td>
<td>Cup</td>
</tr>
<tr>
<td>4. Cake</td>
<td>Bell</td>
<td>Fruit</td>
<td>Snake</td>
</tr>
<tr>
<td>5. Moon</td>
<td>Spoon</td>
<td>Cat</td>
<td>Sock</td>
</tr>
<tr>
<td>6. Fox</td>
<td>Wall</td>
<td>Rain</td>
<td>Box</td>
</tr>
<tr>
<td>7. Man</td>
<td>Book</td>
<td>Can</td>
<td>Pig</td>
</tr>
<tr>
<td>8. Ring</td>
<td>Swing</td>
<td>Bed</td>
<td>Mop</td>
</tr>
<tr>
<td>9. Clock</td>
<td>Road</td>
<td>Pen</td>
<td>Sock</td>
</tr>
<tr>
<td>10. Rain</td>
<td>Bell</td>
<td>Train</td>
<td>Box</td>
</tr>
</tbody>
</table>

Total Rhyme Awareness Score:
Normative: Get Ready to Read! Screener

Sample test page:

Item 1: These are pictures of a book. Find the one that shows the back of the book.

Sample response form:

Item Sample: These pictures are boy, fish, apple, car. Which one is car? Find car. If child answers incorrectly. That was a good try, but this is car, let’s try again. Which one is car?

Item 1: These are pictures of a book. Find the one that shows the back of the book.

Item 2: Find the picture that has letters in it.

Item 3: Find the picture that has letters in it.
Researcher Developed: Phonological Awareness

Sample test page:

Phonics Item 1, Letter 1

I T G A D

Item 1, Letter 2

P L O B D

Item 1, Letter 3

I T G A D

Sample response form:

1. Dog
With my magic spelling wand we can spell the word dog.
- Point to the letter that makes the sound /d/, dog.
- Point to the letter that makes the sound /o/, octopus.
- Point to the letter that makes the sound /g/, goose.
D, O, G, Presto! We spelled the word dog. Spectacular spelling!

Total: ______ (6 possible)

<table>
<thead>
<tr>
<th></th>
<th>NR/DK</th>
<th>Incorrect (or &gt; 2 tries)</th>
<th>Correct on Second Try</th>
<th>Correct on First Try</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Researcher Developed: Letter Sequencing

Sample test page:

Letter Sequencing Letters and Pictures
Cover the letters with a sheet of paper, reveal them one-by-one.

Item 1

A B C D E F G

Item 1 Choices

H S V

Sample response form:

<table>
<thead>
<tr>
<th>Question</th>
<th>Initial Answer Choice</th>
<th>Score (0/1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attempt 2: H S V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attempt 2: P Q N</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attempt 2: W S U</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attempt 2: Y W V</td>
<td></td>
</tr>
<tr>
<td>TOTAL SCORE</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>
Researcher Developed: Vocabulary Measure

Sample test page:

Sample response form:

<table>
<thead>
<tr>
<th>ITEM #</th>
<th>STIMULUS QUESTION</th>
<th>RESPONSE</th>
<th>SCORE</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>Show me bell.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Show me snoozing.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Show me shower.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Show me fix.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Show me odor.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Show me cheerful.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Show me smell</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Show me pick.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Show me moustache.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Show me outfit.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Show me cactus.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Show me chilly.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Show me enormous.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Show me spray.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Show me curly.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Show me narrow.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Show me delicious.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Show me exciting.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Show me weep.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Show me bolt.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Show me boring.</td>
<td>1 2 3 4 E</td>
<td>0 1</td>
<td></td>
</tr>
</tbody>
</table>
Appendix E: Children's Perceptions of the Island

Children’s Perceptions of the Island

At post-testing, children were asked specifically about their perceptions of the Island and their understanding of how the leveling system works. Responses were coded for content and are presented here.

First, children were asked, “What do you do when you go to the Island?” Children talked about: 1) games, 2) rides, 3) prizes/tickets, 4) Treehouse, and 5) specific characters or properties. When children spoke about the games (approximately 60%), some responded generally (“I play games”) whereas others were more specific and described where the games were located or which were their favorites to play. For example, one preschool girl said, “I like to play all the games on the Island but I like to go to the Teacups because it has Scrub-a-Pup and the Rollercoaster has Murray’s Word on the Street.” Similarly, some children preferred certain rides and talked about the games that were within (“I like the Airplanes because there is my favorite games… Red Riding bingo!”) whereas other children talked about building the rides (nearly half). As one preschool boy said, “I do Planes, Rollercoasters, but I didn’t fix the Ferris Wheels or Bumper Cars.”

In addition to games and rides, about two fifths of children commented about the prize system including the tickets, prizes and the prize booth. For example, one kindergarten boy explained, “I like the prize booth so I can pick out prizes. I also like all the games to play and winning tickets.” About two-fifths of children referenced the Treehouse when they were asked to describe the Island and they often discussed it along with buying prizes and earning tickets. For example, one preschool boy said, “I like to go to [the] Prize Booth and to go and see my prizes and stuff in the Treehouse.”

Some children, about one tenth, also explained how the Island works when describing what they do on the Island. For example, one kindergarten girl said, “You play all the games and earn tickets, then you can get a new ride.” Finally, some children mentioned specific characters and shows featured on the Island when describing the site. For example, “I like to play the reading games from Super WHY! because they're really fun and I like that I can do them.”

Children’s Perceptions of How to earn New Rides

Participating children were also asked, “How do you get more rides?” Although all participants had earned at least two new rides by the end of the study, only one-third of
children answered this question correctly (e.g., “You have to finish all the games on each ride to open a new ride”). On the other hand, over half of children incorrectly said that they earned new rides by earning a lot of tickets or playing a lot of games. Children earn tickets by playing games, but there is not a direct connection between earning tickets and earning a new ride. Some children also stated that when they want more rides, they could control when they got them. As one preschool boy said, “You just click on the ride you want.” Finally, a few children indicated that they didn’t know how to open a new ride, that the new rides “magically” appear, or that their parents helped them to get new rides. Preschool children sometimes have difficulty expressing themselves verbally (which is why the majority of the interview allowed them to answer non-verbally), nonetheless, this information along with parents’ reports suggests that despite general usability, the structure of the Island provided some challenges to 4- to 6-year-olds.
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