Using Computer Assistive Instruction for English Language Learners: A Case Study

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Abstract

The purpose of this study was to determine if the use of computer assistive instruction – and specifically tablets and their applications (apps) – is an effective intervention to help English Language Learners improve sight word acquisition. The participants were two Vietnamese siblings, a second grader Isabella and kindergartener Ian (both pseudonyms). The Dolch Sight Word Test was used as pretests and posttest to ascertain the number of Dolch sight words a student can read. The second data source was an iPod app entitled 22Learn's *Sight Words*. This app contains games utilizing sight words and is designed to be both educational and fun. Results indicated using assistive technology did improve both students' sight word knowledge. Isabella's scores on the two Dolch Sight Words Tests indicated that she improved 32 words; went from a First Reader Level to a Second Reader Level. Her score for the posttest was 198 words of the total 220 Dolch words. This level placed her higher than the average second grade student. She also improved at every level from PrePrimer through Third Grade. Ian's scores on the two Dolch Sight Words Tests indicate that he improved 20 words on the PrePrimer and Primer lists, which are the appropriate lists for a kindergartner. Although he did not improve his grade level according to the scale on the Dolch test, he did improve on both of these levels. His posttest was 30 words of the 102 sight words on these two lists.

Keywords: Sight words, computer assistive instruction, English language learners

Using Computer Assistive Instruction for English Language Learners: A Case Study

Two English Language Learner (ELL) siblings, Isabella and Ian (both pseudonyms) speak Vietnamese at home and were falling behind in their reading skills. Each of their classroom teachers recommended the researcher of the current study to tutor them. Isabella's teacher asked the researcher to assist this second grader with her spelling, reading fluency, and sight words. At the beginning of these tutoring sessions, the researcher noticed that she was stumbling on even some of the PrePrimer Dolch sight words, such as *away* and *where*. Ian's kindergarten teacher also requested the researcher to work with him on sight words. When the researcher first started tutoring him, he only knew the PrePrimer word *I*. The researcher's MacBook Air fascinated both of them, particularly Ian. He excitedly showed her his family's iPad. This experience sparked this research topic: Using Computer Assisted Instruction for English Language Learners.

The term English Language Learners is defined as students who speak another language at home and either are enrolled in or could benefit from language assistance programs in public schools (Zehler, Yin, Donovan, 2012). Isabella and Ian's parochial school did not offer this type of programs at the time the current study was conducted. Therefore, their teachers recommended the researcher to assist the students with their homework in place of their parents.

This is a common scenario in the United States. In the 2010-2011 school year the National Center of Education Statistics (2010) reported an estimated 4.7 million K-12 students or ten percent of all public school students were ELLs. Additionally, the 2011 gap between the average National Assessment of Educational Progress reading scores between non-ELL and ELL

students was 46 points in fourth grade, 36 points in the eighth grade, and 44 points in the senior year in high school (NCES, 2010).

Studies show one of the best ways to improve ELL students' reading skills is using vocabulary instruction, which is important for both oral and written language (Lei, Berger, Allen, Plummer, Rosenberg, 2010). One way to develop vocabulary is to focus on sight words, which are the most frequent words, found in reading text (Lei, et al., 2010). In fact, Tompkins (as cited in Cullen, Kessey, Alber-Morgan, & Wheaton, 2013) states that the Dolch sight words comprise more that half of the words students encounter while reading. Although computer assisted instruction (CAI) in education is not new, the advent of touch screens have brought new enthusiasm (Geist, 2011). Carly Shuler (2009) suggests that educators should consider apps to teach educational content to children as young as in preschool. Currently, there are not many studies about iPads and Kindle touchscreen devices, especially in elementary education and with English language learners (Geist, 2011).

The intent of the current case study was to fill this gap. The purpose of this study was to determine if the use of computer assistive instruction – and specifically tablets and their applications (apps) – is an effective intervention to help English Language Learners improve sight word acquisition. The participants were two ELLs, second grader Isabella and her kindergarten brother Ian (both pseudonyms), who were tutored by the researcher. Data was collected for six weeks at a parochial school in a rural town in the Midwest. The next section will provide a review of studies of sight words, computer assisted instruction, tablets, and mobile apps.

Sight Words, Computer Assisted Instruction, and Latest Educational Technology Trends

Sight Words

Vocabulary instruction, which is important for both oral and written language is one the best ways to improve ELL students' reading skills (Lei, Berger, Allen, Plummer, Rosenberg, 2010). One way to develop vocabulary is to focus on sight words, which are the most frequent words, found in reading text (Lei, et al., 2010). Also, Tompkins stated that Dolch sight words are more than fifty percent of the words in student reading text (as cited in Cullen, Kessey, Alber-Morgan, & Wheaton, 2013).

Barth, Tolar, Fletcher, and Francis (2013) found sight word acquisition is also a major influence on oral reading fluency. A study by Cullen et al. (2013) demonstrated the positive connection between sight words and oral reading fluency. Students with mild disabilities using computer software successfully completed three 10-14 word lists in two to seven interventions of about 20 minutes.

Computer Assisted Instruction (CAI)

Macaruso and Rodman described computer assistive instruction as:

> In general, CAI is well suited as a supplementary aid to direct reading instruction. Computers are capable of presenting activities that are interesting and motivating to children— including the use of pictorial displays and positive feedback. Children can work at their own pace and receive enough practice to support word recognition skills and eventually fluent text reading (Macaruso, & Rodman, 2008, p. 268).

Macaruso conducted three studies that have indicated that CAI is an effective intervention for reading skills among preschoolers, kindergartners, and English Language Learners (Macaruso, & Rodman, 2011a, 2011b; Marcuso & Walker, 2008).

The participants in the Marcuso and Walker (2008) study were kindergarten students from six classes. The classes comprised of the morning and the afternoon class of three teachers. Each teacher had a treatment class and a control one. All students received the general reading instruction. However, the treatment classes of 47 students received additional instruction on phonological awareness skills using *Early Reading*, a software program from Lexia Learning Systems. Also, the data of the four lowest level students in each class was analyzed to determine if CAI is effective for struggling readers. The researchers used the Dynamic Indicators of Basic Early Literary Skills (DIEBELS) pretests and postests and the criterion-referenced *Gates-MacGinitie Reading Test, Level PR (Pre-Reading)* after the study. The analysis of the DIEBELS pre and posttests showed no significant differences between the treatment and control groups for either all the students or for the low level learners. However, the mean score and the *Gates-MacGinitie Reading Test* scores for the oral language subtest were significantly higher for the treatment group (Macaruso & Walker, 2008).

Next Macaruso and Rodman (2011a) conducted two studies similar to the kindergarten study. Comparable to the Macaruso and Walker (2008) study, the first study included both morning and afternoon preschool classes of seven teachers. The *Group Reading Assessment and Diagnostic Evaluation Level* (GRADE) were given as a pre and posttest. The gains between GRADE pre and posttests showed a significant difference favoring the treatment group over the control group.

The second study conducted by Macaruso and Rodman (2011a) used larger samples of kindergarten participants with more low performers. Analysis of the GRADE scores showed a significance gain for the treatment group but no gain for the control group. Both treatment and control groups for low performers showed posttest gains in Letter Naming.

In another similar study, Macaruso's participants were kindergarten English Language Learners from Ennis, Texas who were enrolled in a bi-lingual program with English the prominent language spoken for language arts instruction. This study had a unique component. While the treatment group was receiving additional instruction on phonological awareness skills using *Early Reading*, the control group was independently using a computer software program entitled *Key Skills*, which was a combination of math and reading activities. This change in the structure of the study which no longer studied the effectiveness of CAI, but the effectiveness of computer instruction with structured support versus no structured support. The mean gain score for the treatment was significantly higher while the control group improvement was not significant (Macaruso & Rodman, 2011b).

In addition to Macaruso's and his colleagues' studies, benefits of supplemental CAI have been shown with African American students (Cullen, Keesey, Alber-Morgan, & Wheaton, 2013; Gibson, Carttledge, & Keyes, 2011). The study was conducted on eight African American first-graders whose DIEBEL pretest scores showed "some risk" or "at risk" for the possibility of reading failure. Five students' scores placed them in the "some risk" range and three were in "at risk". All eight students participated in the supplemented CAI intervention using Read Naturally. Results showed that all participants made improvement in their oral reading fluency with five of the eight improving their risk factor by one level.

Lastly, the software program Kurweil 3000 was utilized as a practice intervention for improving sight word acquisition for four African American fourth graders with mild disabilities. The sight words to include in the practice sessions were first determined by a Dolch sight list and their reading level on the Terra Nova assessment. Three word lists of 10-14 sight words were created for each student with a ratio of 50 percent known words to 50 percent unknown words. After a practice session, each student was assessed by reading aloud the words on a Power Point presentation set to change slides every three seconds. Three of the students successfully completed their three word lists and also read up to 80 percent of these sight words up to four months later (Cullen et al., 2013).

Latest Educational Technology Trends

The internationally recognized New Media Consortium (NMC) Horizon Report – 2012 Higher Education Edition, created by an advisory board of international education and technology, identifies emerging trends that they believe will have a great impact on education throughout the world within the next five years (Johnson, Adams, Cummins, New Media & EDUCAUSE, 2012). Two of the four trends are predicted to be adopted within three years are tablet computing and mobile applications.

Tablet computing. Fender and Wolfey (2014) describe tablets as smartphones with a larger screen without the calling capabilities. The screen sizes vary from 7 to 14 inches and all have a touch screen interface that makes a finger the input device. They continue to describe other characteristics of a tablet including, 1) smaller than a laptop; 2) instant-on without booting time; 3) no external keyboard or mouse; and 4) WIFI and /or cellular connection for data transfer.

The Horizon Report stated: "Because of their portability, large display, and touchscreen tablets are ideal devices for one-to-one learning, as well as fieldwork" (Johnson, et al., 2012). It further described tablets as not derivatives of the desktop computer or laptop but based more on the mobile phone. In fact, until this 2012 Horizon Report, tablets were grouped with mobile phones. The iPad's interface allows users to swipe, tap, or pinch to access its various features, making a keyboard unnecessary (Johnson, et al., 2012). However, a stylus can be bought to replace the finger touch and Bluetooth keyboards are also recognizable by tablets (Fender & Wolfey, 2014). Because tablet computing and mobile applications are so cohesively entwined, the studies about the two technologies will be cited in the next section.

Mobile applications (apps). Developers had to rethink software design after Apple, Inc. started making mobile applications (apps) available in 2008. Instead of having an application designed for any computer, mobile apps are simpler, usually have one purpose and very inexpensive with most free or up to $2.99 (Johnson, et al., 2012). One purpose that is very promising is use for education. All levels of education are examining how to utilize apps. Some common mobile app usage in education includes

- digital textbooks (Geist, 2011, Johnson, et al., 2012);
- audio textbooks (Demski, 2011);
- e-book with audio (McClanahan, et al., 2012);
- course readings (Geist, 2011);
- journals (Geist, 2011, Patton& Craig, 2007);
- course management system (Geist, 2011);
- videos (Geist, 2011);
- voice memo app to record themselves reading aloud (Demski, 2011);

- and access to English movies and music (Demski, 2011).

Educational institutions are both writing their own apps and using commercial apps Higher education institutions are beginning to create their own apps, which range from simple maps and directories to quizzes for a specific class (Johnson, et al., 2012). Examples of commercial apps are Dictionary.com, translators, Kindle's e-Reader, Smart Note, i-Book, PhotoPad, and StoryKit (Demski, 2011); FlashCards+, Vocabulary Builder, and ABC Alphabet Phonics (McClanahan, et al., 2012).

A large trend among these articles is the varying types and uses of an e-Reader and/or audio. E-book features were used to

- read (Demski, 2011, Geist, 2011);
- listen (Demski, 2011);
- and record (Demski, 2011, McClanahan, et al., 2012).

Geist (2011) also found that one of his students' favorite features of the iPad was its e-book capability for their textbooks. He made iPads available to his teacher education students in senior level curriculum development classes and asked them to experiment with them for possible uses in their classes and during their field experiences in elementary schools. These students loved using the digital textbooks on their iPads because this option was cheaper and much lighter than regular textbooks. Furthermore, they were more engaged in class discussions because they could use the readily available iPad to look up quotes and other information to support their opinions (Geist, 2011).

Thirty English Language Learners in an ELL classroom in a middle school in Texas used both the iPod Touch embedded voice memo app and an e-Reader with audio. These students listened to the audio as many times as needed to understand the text. They were required to take

their iPod home and record themselves reading aloud using the voice memo app, which was exclusively available for iPhones and iPods at the beginning of this study. The next day the teacher would synch each student's recording to her iTunes library. Sandra Shelton, executive director of technology of this Texas middle school, believes that an important aspect of the program was the availability of the iPod outside of class (Demski, 2011). ELL students are not just learning English in the classroom but at after-school activities and home (Demski, 2011).

Although the other program Demiski (2011) described later also wanted a mobile device that the students could have possession of all the time, the Newcomer Center alternative school in Arlington Heights, Illinois chose the iPad for ELL support. Norman Kane, director of the Newcomer Center explained the program planning committee liked the iPod Touch but wanted a larger screen. Again, the e-reader was a favorite of the 30 students using the iPads. However, instead of iPad's e-Reader, they preferred the Kindle e-Reader available as an app for iPads because of its dictionary feature that allows you to touch on a word within the text and a definition appears (Demski, 2011).

A pre-service teacher used an e-book that allowed her student Josh (a pseudonym) to record his voice. This feature was very powerful for this fifth-grader with attention deficit hyperactive disorder (ADHD). Josh ascertained that he was reading too fast and his words did not make sense and then asked if he could read it again. The pre-service teacher was pleased with this example of metacognitive thinking. When the book he read was not available with the record device, she used a tape recorder. Furthermore, during the six-week case study, Josh improved one grade level in word recognition and comprehension and gained a more favorable attitude towards reading (McClanahan, Williams, & Tate, 2012).

Methodology

This case study was conducted with two children whose parents are immigrants. It was conducted for five weeks at a parochial school in a rural town in the Midwest. This case study was conducted in spring 2014 for the student researcher's action research project.

Participants

During parent-teacher conferences Isabella's and Ian's parents requested names for tutors. The family speaks Vietnamese at home and the parents were having difficulty helping the siblings with their homework due to their English limitations. Both of the students' classroom teachers recommended the researcher of the current study to help the students with reading skills. Both teachers coordinated directly with the researcher providing materials and homework assignments to either show the students' progress and/or to request her assistance to help the students complete them.

At the time of the study, Isabella was a seven year, five month old second grader. She spoke English but often did not understand common English words and syntax. Her teacher requested that her tutoring time be spent on spelling, reading fluency, and sight words.

Five years, ten months old Ian's kindergarten teacher asked the researcher to work with him on phonics and sight words. Before his tutoring sessions, even his classroom teacher had problems getting him to talk to her. His English was less developed than his sister's but the researcher was able to communicate with him. Until the researcher gained his trust, he would not always read for her. However, by the beginning of this study, Ian would become excited when he saw a word he could read.

Setting

This case study was conducted in spring 2014 for the student researcher's action research project. The researcher met Isabella and Ian at their parochial school in either the library or computer room. The school located in a rural Midwest town had 115 students with an average student to teacher ratio of 11.4. The percentage of minority students was 5.2%. (LocalSchoolDirectory.com, 2014).

Data Sources

Data was collected over a five-week period using two data sources. The first data source was the Dolch Sight Word Test to determine what sight words the students knew. The second data source was an iPad app called *Sight Words* from 22Learn (www.22learn.com), which consists of six games designed to be fun as the student learns new sight words.

Sight words pretest and posttest. E. W. Dolch created the Dolch sight word lists in 1936. The pre-primer through third grade lists contain the 220 most frequently used words that are found in children's reading materials. The Dolch Sight Word Test was used to ascertain the number of Dolch sight words a student can read. Each student's score was determined by counting the number of words correctly read. Also a scale was provided in the test to denote an approximate grade level. This instrument was used in this current study as a pretest and posttest.

App scores. The second data source is an iPod app entitled *Sight Words*. It was created by 22Learn (www.22learn.com). *Sight Words* contains games that are designed to be both educational and fun. This app allowed the researcher to choose 17 or more Dolch sight words from one of the grade level lists to use in the games (Figure 1). As the student played a game the researcher recorded both correct and incorrect readings of each word. The words from each session were analyzed beside the pretest to create new lists for the next game session.

Figure 1. Sight Word Selection in 22Learn *Sight Words*

Five of the games within the *Sight Words* were used in this study. Below are the descriptions of these games.

Word Machine: The instructions of the Word Machine tell the student to control the word machine. This game pronounces a word and the student selects a word from a group of three words in the first level and five words in the second level (Figure 2). The game can be replayed and the app selects different words.

Figure 2. Word Machine

Spelling: The backdrop of Spelling is a dog food factory (Figure 3). The student creates a can of dog food each time he/she succeeds at the task. The sight word is displayed for a short time then scrambled letters are shown. The student needs to put the letters in the correct order to spell the

word. When this game is first introduced the student will be encouraged to spell the words letter by letter in the correct order.

Figure 3. Spelling

Bingo: The display is a four by four bingo card, which is comprised of sixteen sight words (Figure 4). As sight words are called, the student looks at the words and taps the word he/she believes to be the same word. There is no time limit between words so the student is able to work at his/her own pace. The student also does not have to determine if he/she has a bingo; the app yells bingo for him/her.

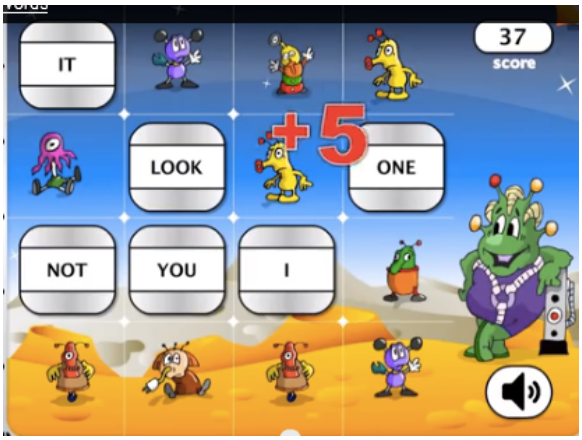


Figure 4. Bingo

Gears: The background of the gears shows a variable number of speakers in gear shades (Figure 5). The student taps one of the speakers, hears the sight word and moves the gear with the

corresponding sight word from the bottom of the screen to the speaker. This creates a moving gear. The student continues with this procedure until all the gears are hooked together.

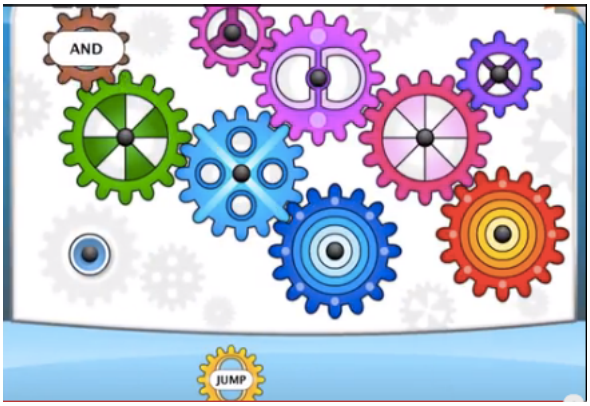


Figure 5. Gears

Flash Cards: The flash cards game is electronic flash cards (Figure 6). The student will see a word on a card and try to read it. If he/she cannot read it or after an attempt to do so, the student will tap on the card to hear the word pronounced. The researcher is surprised that this is called a game and used it for instruction for both students.

Figure 6. Flash Cards

Data Collection Procedure

Data collection procedure: Isabella. The data collection from Isabella began on February 11, 2014 with the administration of the Dolch Sight Word pretest. She met with the researcher for fifteen-minute game sessions on Tuesdays and Thursdays from February 13 to March 18. The posttests were then administered on March 20.

The second grader knew sight words on all five grade level lists. The pretest scores were analyzed to select 17 or 18 words for lists from two or three of the following categories: Pre-K (which corresponds to the Dolch PrePrimer), Grade K (which corresponds to the Dolch Primer), 1st Grade, 2nd Grade, and 3rd Grade. When possible the researcher chose 50 percent correctly read words and 50 percent incorrectly read words from the Isabella's pretest for each list. For each game the researcher recorded the correct and incorrect words. The researcher analyzed the data in between the fifteen- minute sessions, replacing new words for words on the list that she consistently read correctly.

The researcher began each of Isabella's session with the Flash Cards game. The first word on her list of words appears on the screen of the iPad. The researcher instructed her to read the word then tap on the card to hear the word. She also repeated the word whether their call was correct or incorrect. If she misread many words, the researcher would have her play Flash Cards once again.

The researcher chose the next game(s) for her according to her abilities and interest. After Isabella looked over the words using the Flash Cards, the researcher initially chose Bingo as her second game. Isabella enjoyed the paper-based Bingo games she played during her regular tutoring sessions so this game was a natural choice for her. Another choice for her was often Gears, which utilized more of the selected sight words per game. She was interested in the

game Word Machine so the researcher made this game a choice sometimes. During weeks four through six, the researcher gave her the choice of playing Gears or Spelling. The number of correct words was recorded for each *Sight Words* game. Also her scores for the Dolch Sight Word pretests and posttests were determined by counting the number of words correctly read.

Data collection procedure: Ian. The data collection from Ian began on February 11, 2014 with the administration of the Dolch Sight Word pretest. He met with the researcher for fifteen-minute game sessions on Tuesdays and Thursdays from February 13 to March 18. He was absent on March 11 but he made up that session on March 20. The posttest was administered on March 21.

The kindergartener knew sight words on the PrePrimer and Primer level lists. The pretest scores were analyzed to select 17 or 18 words for his list. When possible the researcher chose 50 percent correctly read words and 50 percent incorrectly read words from the Ian's pretest for each list. For each game the researcher recorded the correct and incorrect words. The researcher analyzed the data in between the fifteen- minute sessions, replacing new words for words on the list that he consistently read correctly. However, the ratio of 50 percent correctly read words and 50 percent misread words within each list was maintained as often as possible.

The researcher began each of Ian's session with the Flash Cards game. The first word on his list of words appears on the screen of the iPad. The researcher instructed him to read the word then tap on the card to hear the word. He also repeated the word whether their call was correct or incorrect. If he misread many words, the researcher would have him play Flash Cards once again.

Initially, the researcher chose the Word Machine for Ian's second game. Ian would choose a word from three choices in the first level and five choices in the second level.

Although Word Machine was played throughout the data collection period, Ian also played Bingo weeks two and three and Gears weeks two through six. The number of correct words was recorded for each *Sight Words* game. His scores for the Dolch Sight Word pretests and posttests were determined by counting the number of words correctly read.

Data Analysis and Results

Data Analysis

Scores from Dolch Sight Words pretest and posttest and scores from games were analyzed descriptively to answer the research question is to determine if the use of computer assistive instruction – and specifically tablets and their applications (apps) – is an effective intervention to help English Language Learners improve sight word acquisition.

For Isabella there were two sets of data from pre and post of Dolch Sight Words Test and five sets of data from games. The possible total sight words for the Dolch test for Isabella was 220. For Ian there were also two sets of data from pre and post of Dolch Sight Words Test and four sets of data from games. The possible total sight words for the Dolch test for Ian was 102.

Results

This study looked at the effectiveness of using computer assistive instruction (CUI) with two English Language Learners siblings to acquire sight words. The CUI consisted of an iPad and an app called *Sight Words* by 22Learn. The Dolch Sight Word Test was used as a pretest to determine the number of sight words each student already knew. Then using the iPad, the students played one or more of the games found in the app. After a six-week data collection, the Dolch test was again used as a posttest to determine any improvement of each student's sight word acquisition.

Data from the Dolch pretest and posttest did show improved sight word acquisition. Data from the games of the *Sight Words* app indicated that using the assistive technology also improved each student's sight word knowledge. Below are the results of the data based on scores of Isabella and Ian.

Results for Isabella

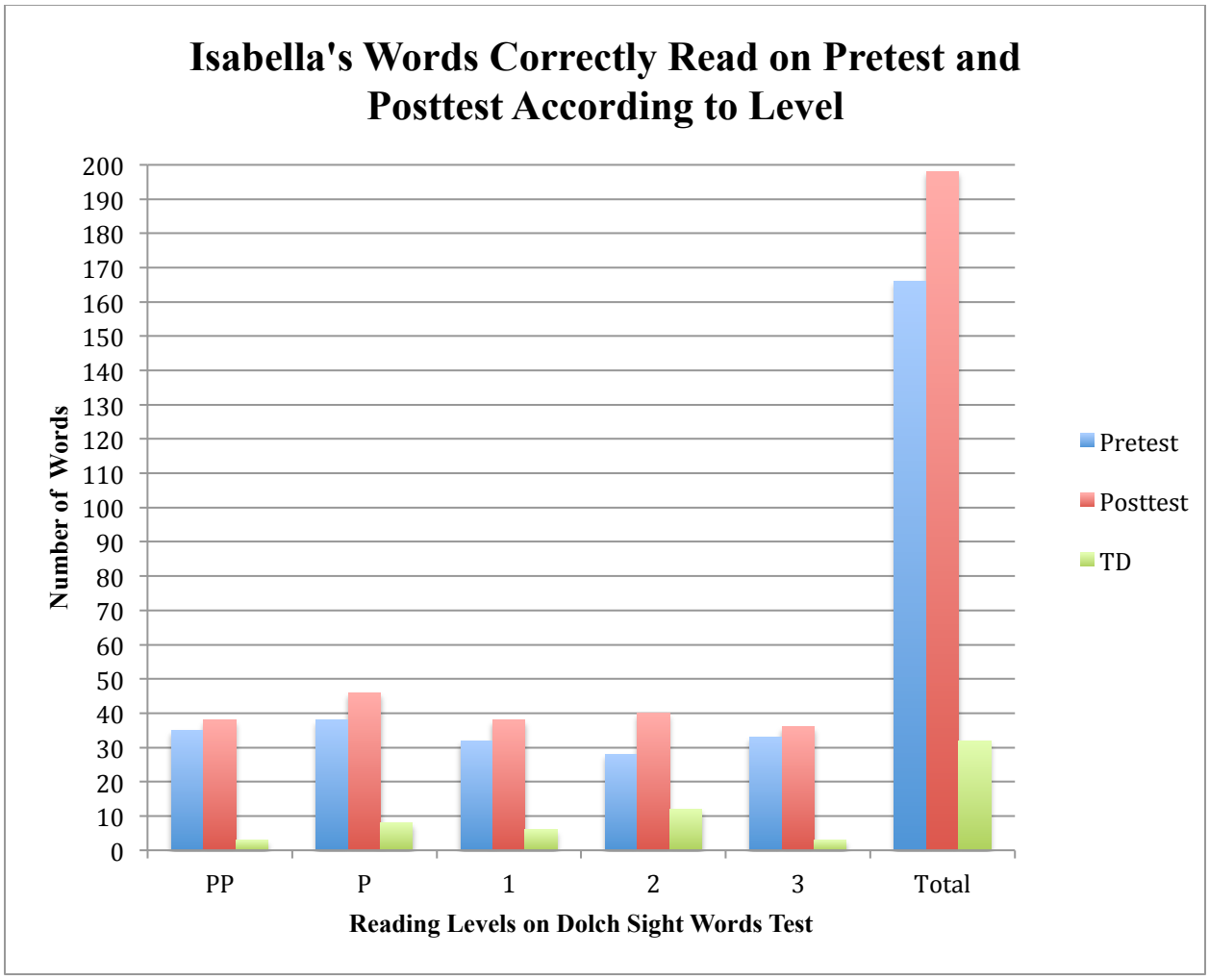
Data from the Dolch pretest and posttest did show improved sight word acquisition. Data from the games of the *Sight Words* app indicated that using the assistive technology also improved her sight word knowledge. Isabella's total score on the two Dolch Sight Words Tests indicate that she improved 32 words. According to the scale on the Dolch test, she went from a First Reader Level to a Second Reader Level and placed her at a level higher than the average second grade student. She also improved at every level from PrePrimer through Third Grade. Her score for the posttest was 198 words of the total 220 Dolch words. Table 1 and Figure 7 illustrate Isabella's scores from pre and post scores.

Table 1

Isabella's Dolch Sight Words Correctly Read on Pretest and Posttest According to Level

Word List Test	PP	P	1	2	3	Total
Pretest	35	38	32	28	33	166
Posttest	38	46	38	40	36	198
TD	3	8	6	12	3	32

Note: PP: PrePrimer, P:Primer, 1:First Grade, 2:Second Grade; 3:Third Grade, TD: Total Difference



Note: PP: PrePrimer, P:Primer, 1:First Grade, 2:Second Grade; 3:Third Grade, TD: Total Difference

Figure 7. Isabella's Dolch Sight Words Correctly Read on Pretest and Posttest According to Level

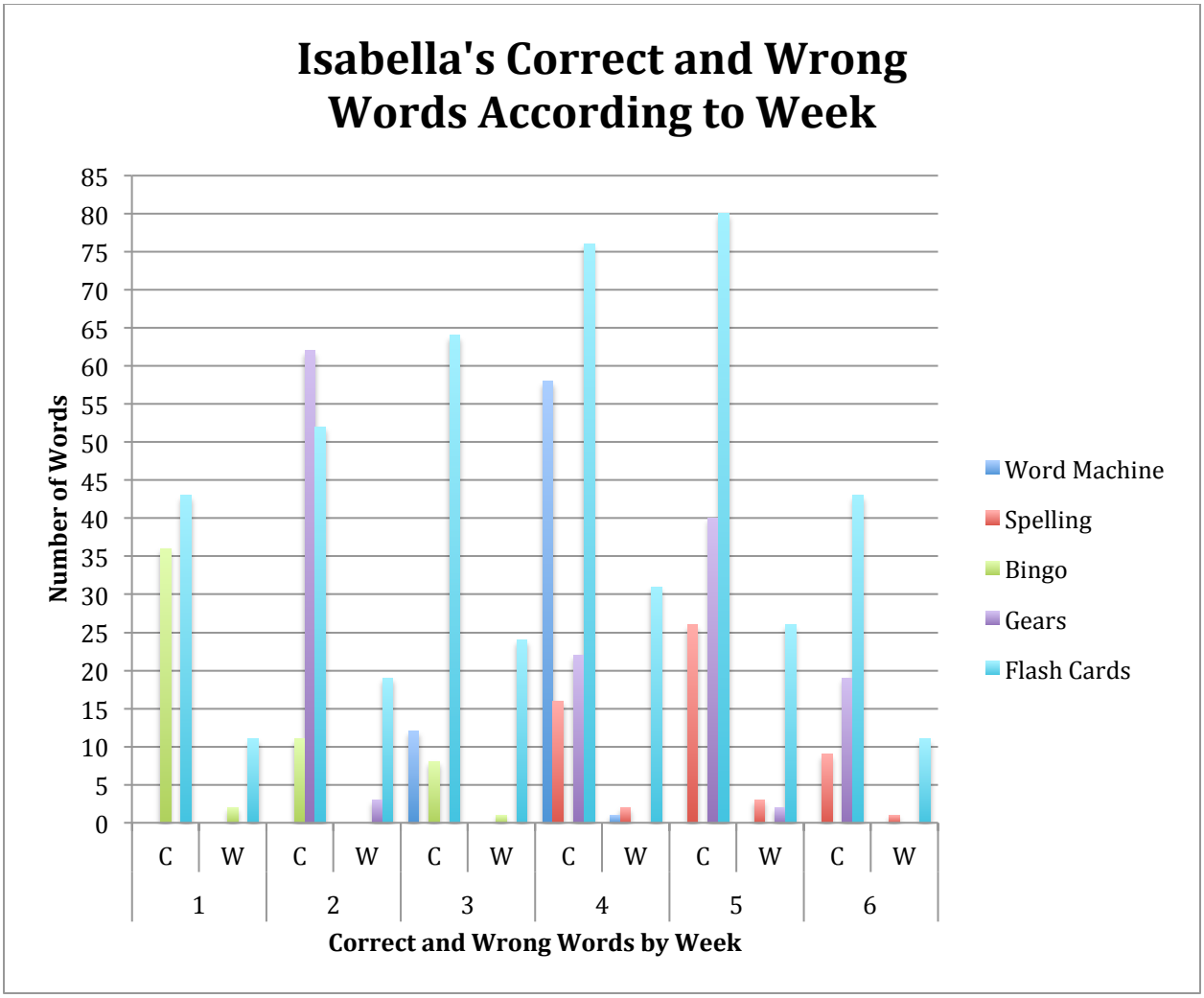
Isabella played five games within the *Sight Words* app. Table 2 and Figure 8 depict the number of correctly and wrong words for each game by week. Any game could be played more than one time in a session and a week period.

Table 2

Isabella's Correct and Wrong Words for All Games

Week	1		2		3		4		5		6	
	C	W	C	W	C	W	C	W	C	W	C	W
Game												
Word Machine	n/a	n/a	n/a	n/a	12	0	58	1	n/a	n/a	n/a	n/a
Spelling	n/a	n/a	n/a	n/a	n/a	n/a	16	2	26	3	9	1
Bingo	36	2	11	0	8	1	n/a	n/a	n/a	n/a	n/a	n/a
Gears	n/a	n/a	62	3	n/a	n/a	22	0	40	2	19	0
Flash Cards	43	11	52	19	64	24	76	31	80	26	43	11

Note: n/a: the game was not played that week so no scores were recorded.
C: Correct, W: Wrong



Note: Game(s) was not played all weeks so no scores were recorded.
C: Correct, W: Wrong

Figure 8. Isabella's Correct and Wrong Words for All Games

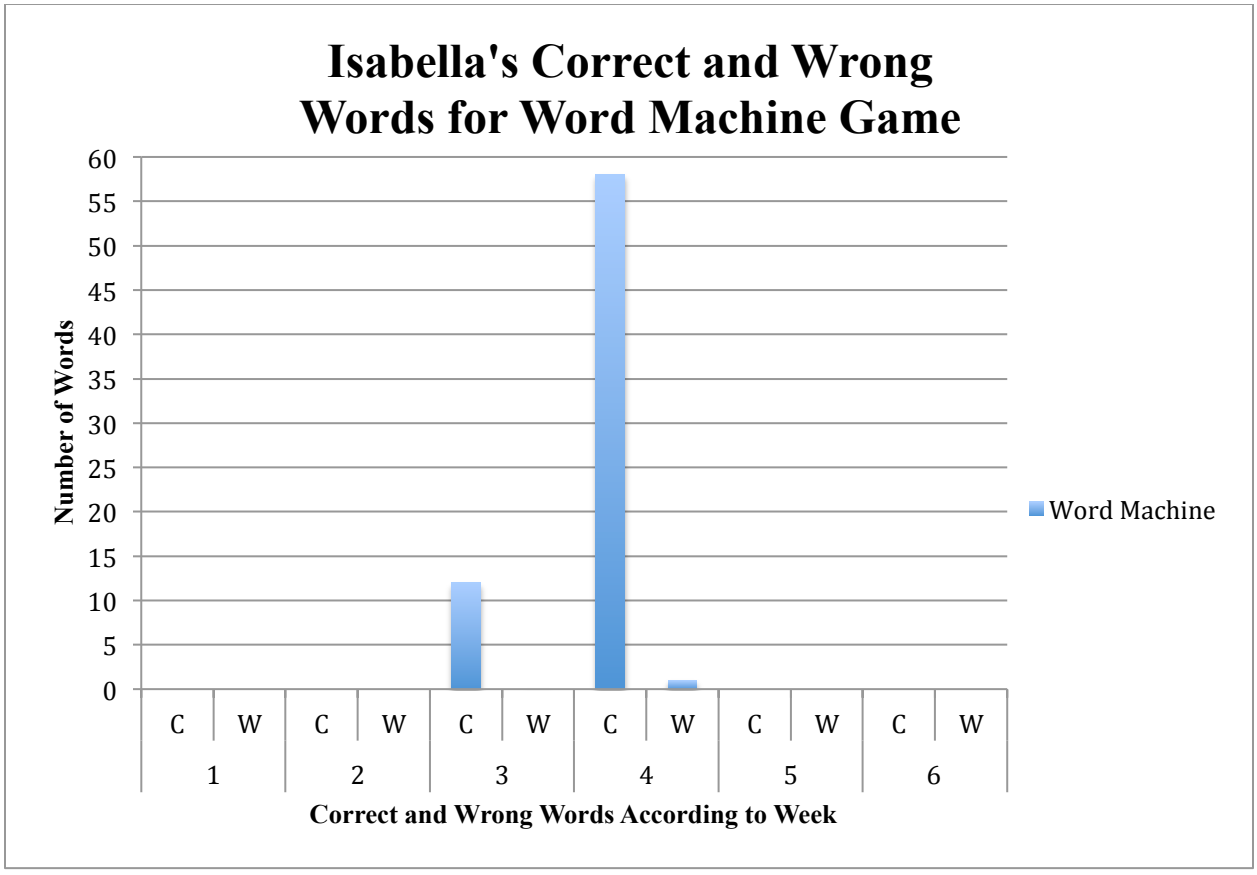
Word Machine: This game pronounces a word and the student selects a word from a group of three words in the first level and five words in the second level. This word recognition game is the least challenging. Isabella played Word Machine six times and only made one error. Table 3 and Figure 9 illustrate Isabella's scores for the Word Machine game by week.

Table 3

Isabella's Correct and Wrong Words for Word Machine Game

Week	1		2		3		4		5		6	
	C	W	C	W	C	W	C	W	C	W	C	W
Game												
Word Machine	n/a	n/a	n/a	n/a	12	0	58	1	n/a	n/a	n/a	n/a

Note: n/a: the game was not played that week so no scores were recorded.
WM: Word Machine, C: Correct, W: Wrong



Note: The game was not played all weeks; no scores were recorded those weeks.
WM: Word Machine, C: Correct, W: Wrong

Figure 9. Isabella's Correct and Wrong Words for Word Machine Game

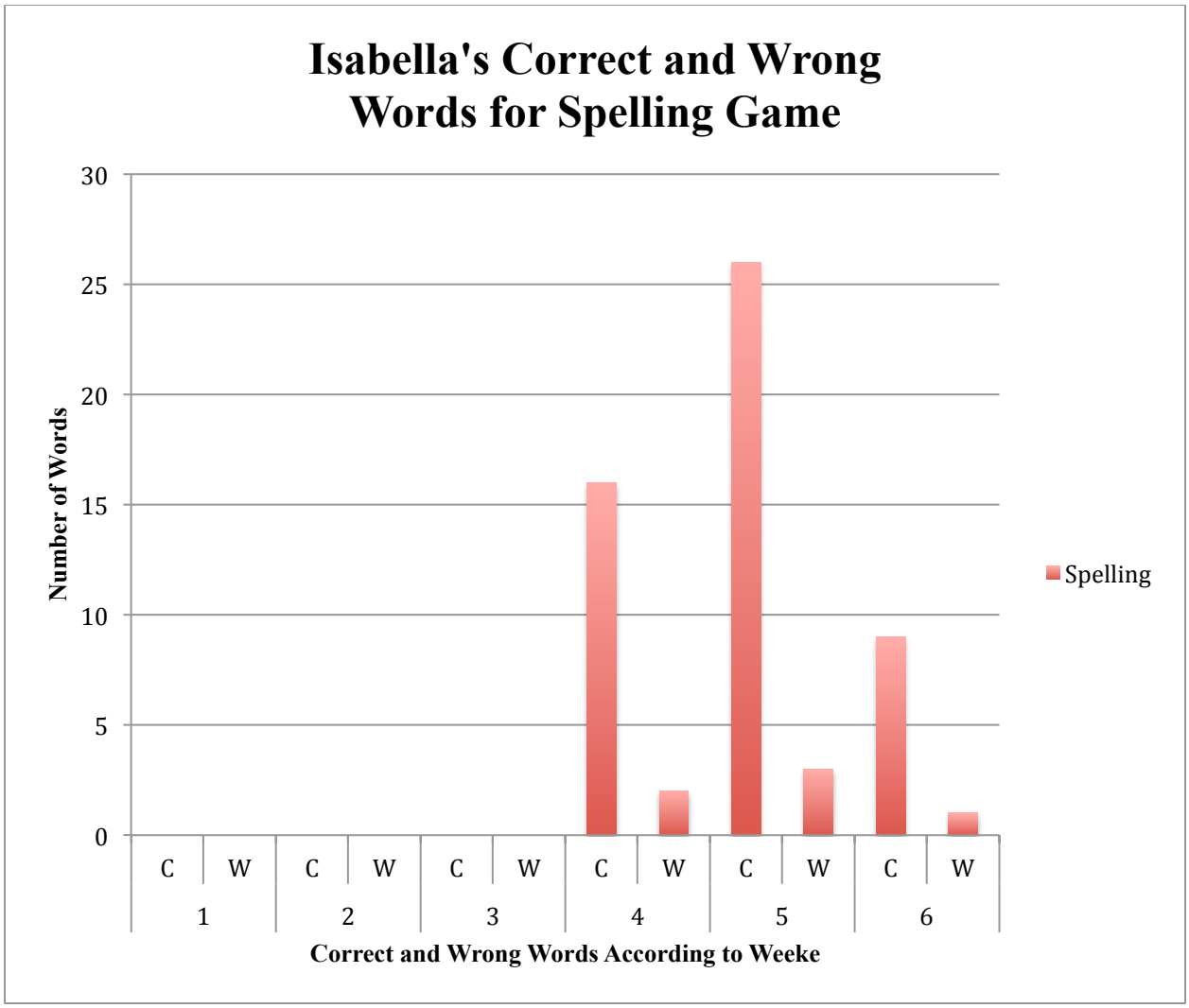
Spelling: Isabella began playing Spelling in Week 4 and continued playing it through Week 6. A sight word is shown for about three seconds then the letters of the word is shown scrambled. The student must place the letters in the correct order to spell the word. Isabella played Spelling six times and made six errors. Table 4 and Figure 10 illustrate Isabella's scores for the Spelling Game by week.

Table 4

Isabella's – Spelling Correct Words and Errors for Spelling Game

Week	1		2		3		4		5		6	
	C	W	C	W	C	W	C	W	C	W	C	W
Game												
Spelling	n/a	n/a	n/a	n/a	n/a	n/a	16	2	26	3	9	1

Note: n/a: the game was not played that week so no scores were recorded.
C: Correct, W: Wrong



Note: The game was not played all weeks; no scores were recorded those weeks
C: Correct, W: Wrong

Figure10. Isabella's Correct and Wrong Words for Spelling Game

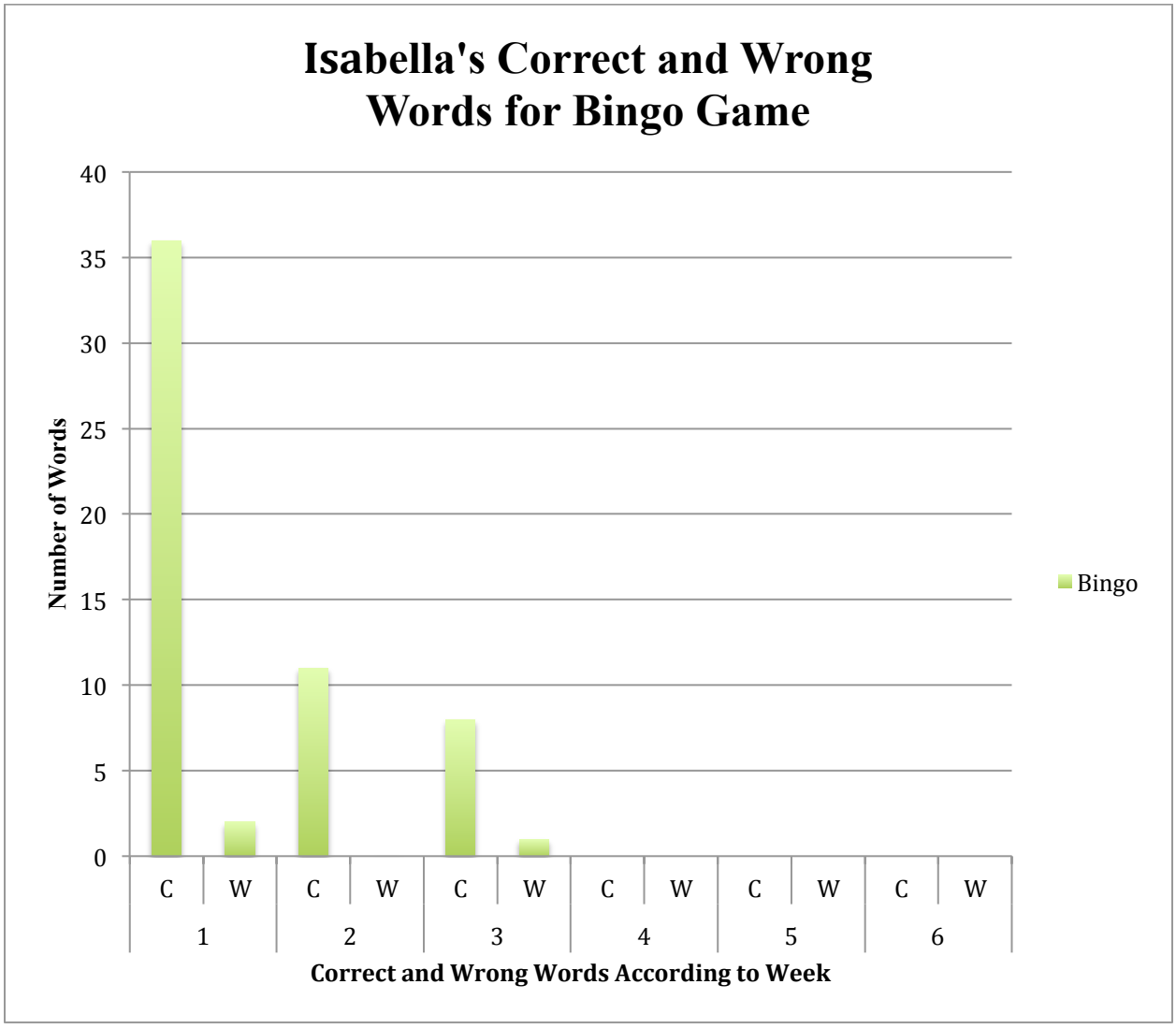
Bingo: At the beginning of data collection the researcher chose Bingo as Isabella's second game. She enjoyed the paper-based Bingo phonics games she was playing in her tutoring sessions so the researcher thought Bingo would be a natural choice. However, she used more than one card in the paper games so did not find the *Sight Words* Bingo game as challenging. She played six Bingo games in Week 1 through Week 3 with three errors. Table 5 and Figure 11 illustrate Isabella's scores for the Bingo game by week.

Table 5

Isabella's Correct and Wrong Words for Bingo

Week	1		2		3		4		5		6	
	C	W	C	W	C	W	C	W	C	W	C	W
Game												
Bingo	36	2	11	0	8	1	n/a	n/a	n/a	n/a	n/a	n/a

Note: n/a: the game was not played that week so no scores were recorded.
C: Correct, W: Wrong



Note: The game was not played all weeks; no scores were recorded those weeks.
C: Correct, W: Wrong

Figure 11. Isabella's Correct and Wrong Words for Bingo

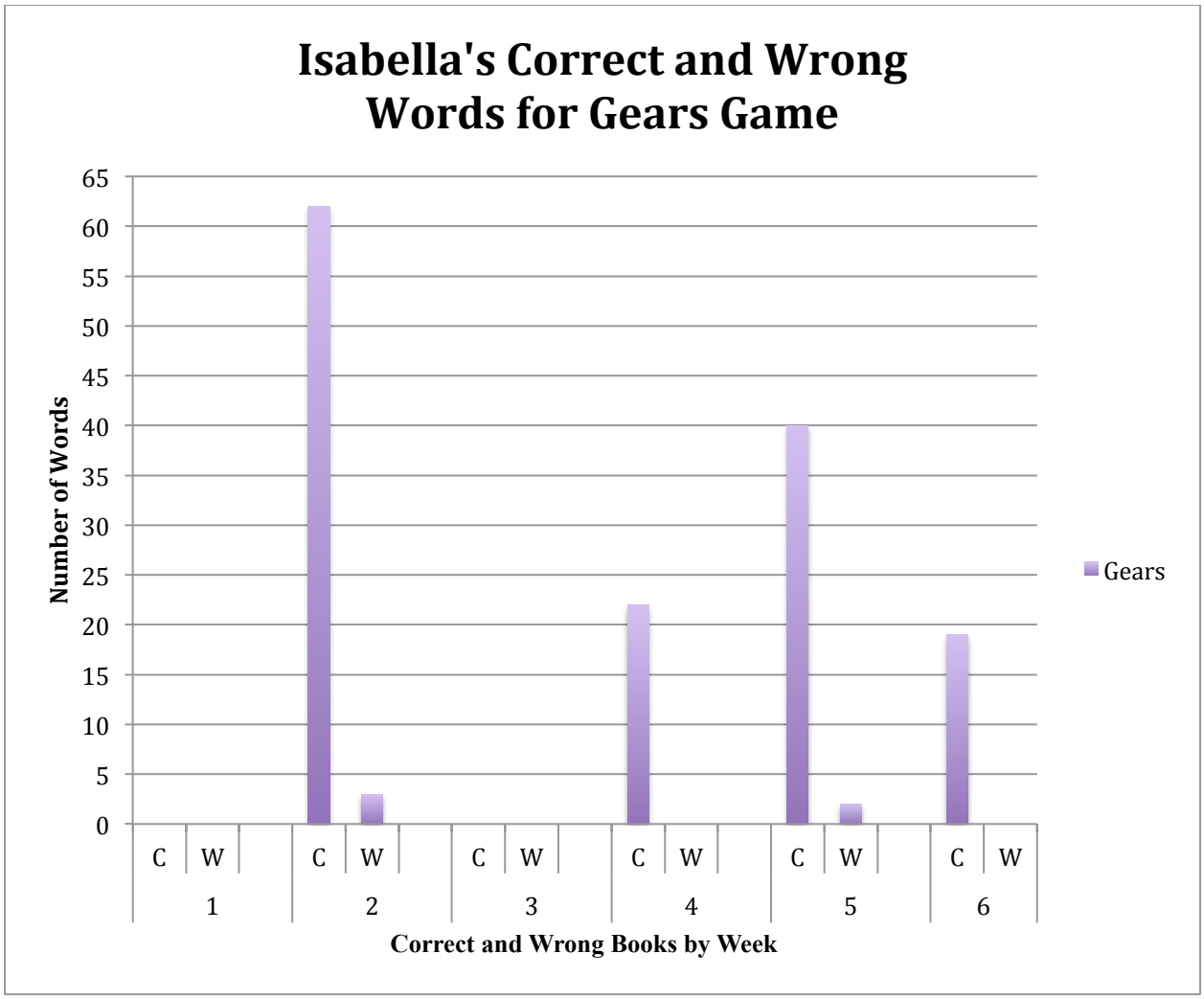
Gears: The background of the Gears shows a variable number of speakers in gear shades. The student taps one of the speakers, hears the sight word and moves the gear with the corresponding sight word from the bottom of the screen to the speaker. This creates a moving gear. The student continues with this procedure until all the gears are hooked together. Isabella played Gears 22 times and made five errors. Table 6 and Figure 12 illustrate Isabella's scores for the Bingo game by week.

Table 6

Isabella's Correct Words and Wrong Words for Gears

Week	1		2		3		4		5		6	
	C	W	C	W	C	W	C	W	C	W	C	W
Game												
Gears	n/a	n/a	62	3	n/a	n/a	22	0	40	2	19	0

Note: n/a: the game was not played that week so no scores were recorded.
C: Correct, W: Wrong



Note: The game was not played all weeks; no scores were recorded those weeks.
C: Correct, W: Wrong

Figure 12. Isabella's Correct Words and Errors for Gears

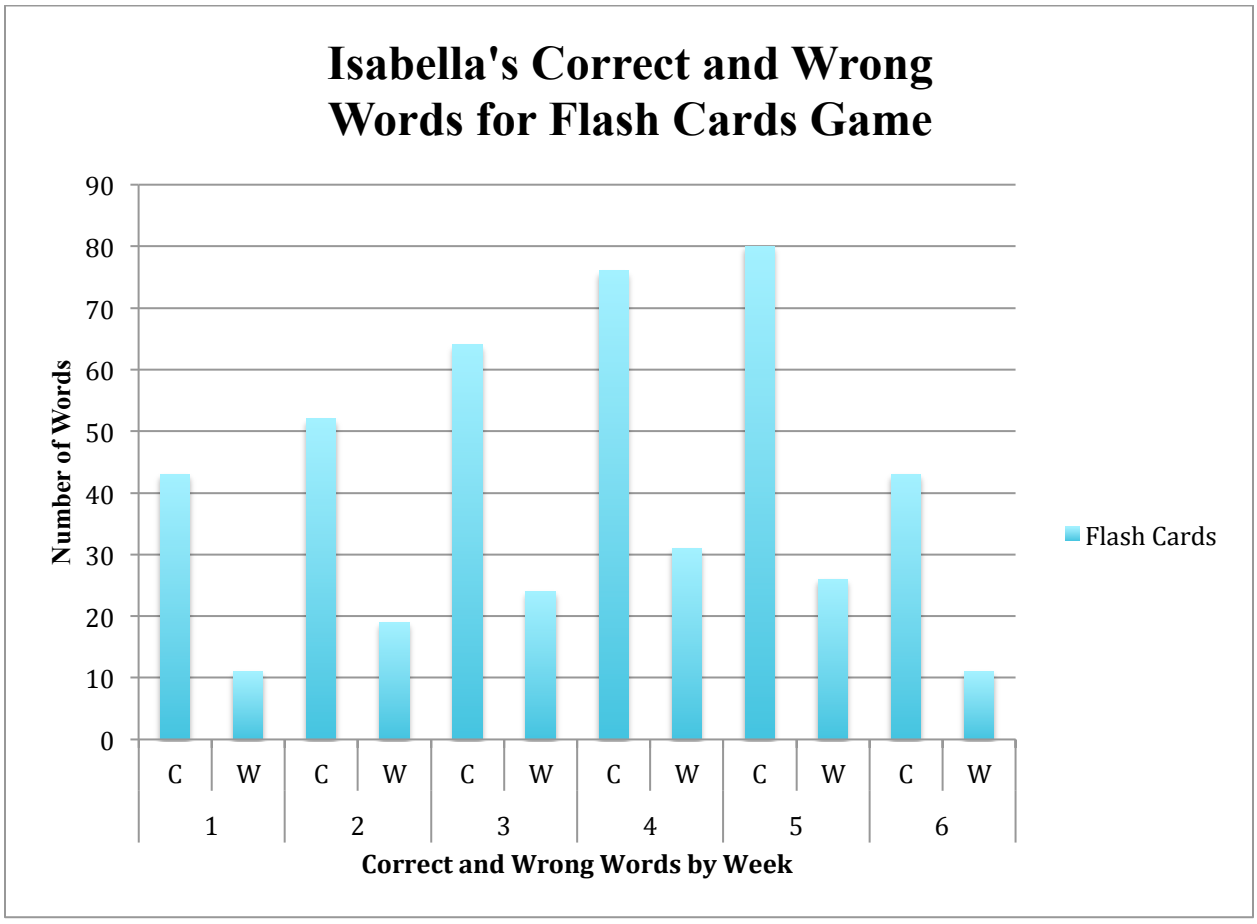
Flash Cards: Flash Cards was the first game Isabella play for each of her 17 to 18 word lists. The first word on her list of words appeared on the screen of the iPad. The researcher instructed her to read the word then tap on the card to hear the word. She also repeated the word whether their call was correct or incorrect. If she misread many words, the researcher would have her play Flash Cards once again. Isabella played Flash Cards 27 times and made 122 errors. Table 7 and Figure 13 illustrate Isabella's scores for the Flash Cards game by week

Table 7

Isabella's Correct and Wrong Words for Flash Cards

Week	1		2		3		4		5		6	
	C	W	C	W	C	W	C	W	C	W	C	W
Game												
Flash Cards	43	11	52	19	64	24	76	31	80	26	43	11

Note: C: Correct, W: Wrong



Note: C: Correct, W: Wrong

Figure 13. Isabella's Correct and Wrong Words for Flash Cards

Table 8 and Figure 14 illustrate Isabella's total scores per game, the total possible scores, and the percentage she got right for each game. The most effective game for Isabella was Word Machine. She played six games and made only one error. She played Gears 22 times with five

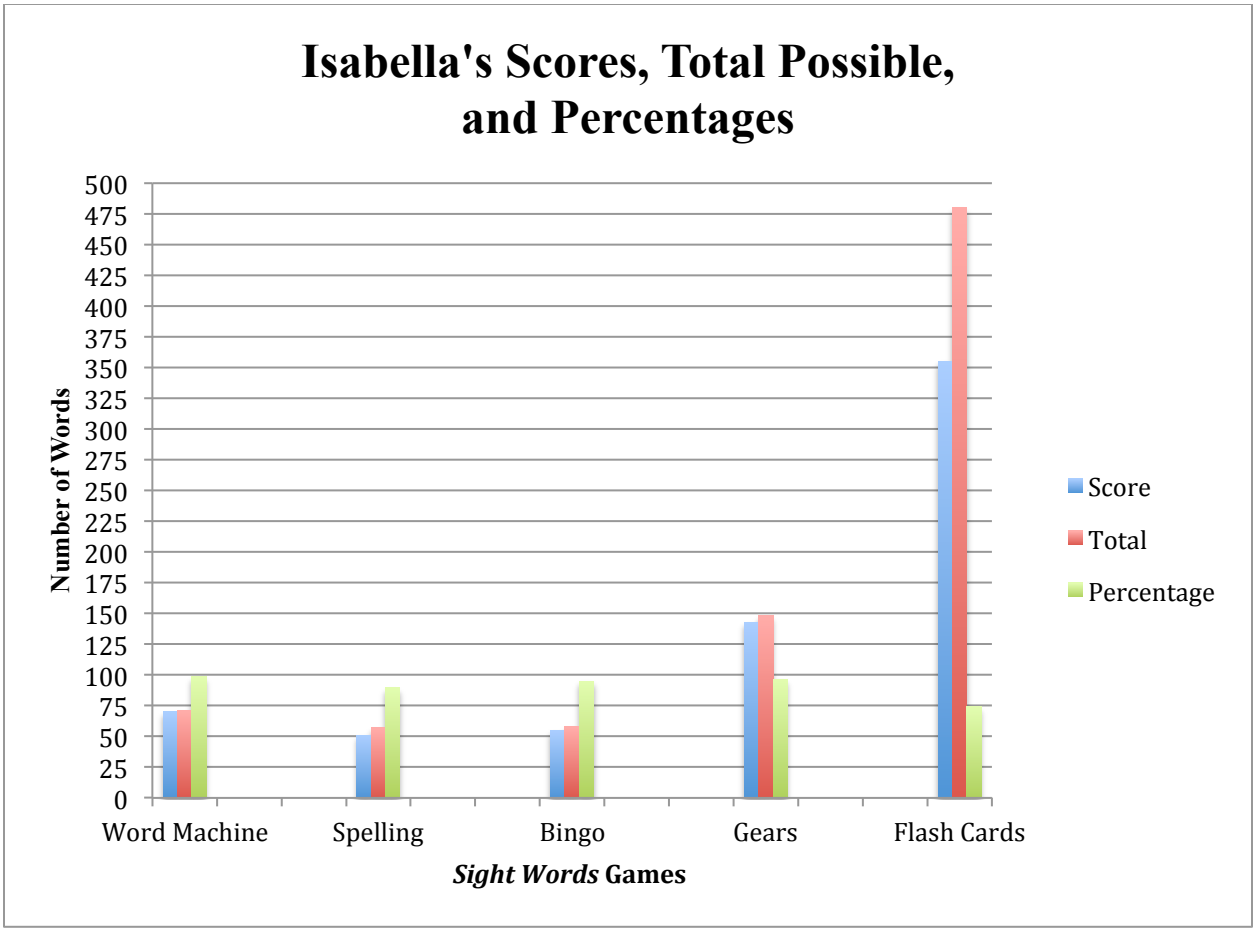
errors making it the second effective game for her. Based on the data, Flash Cards was the least effective. She made 122 errors in 27 games. More comments about this effectiveness will be discussed further in the Discussion and Findings section.

Table 8

Isabella's Scores, Total Possible Words, and Percentages

Game	Score	TPW	Percentage
Word Machine	70	(71)	98.59
Spelling	51	(57)	89.47
Bingo	55	(58)	94.83
Gears	143	(148)	96.62
Flash Cards	355	(480)	73.96

Note: TPW: Total Possible Words



Note: TPW: Total Possible Words

Figure 14. Isabella's Scores, Total Possible Words, and Percentages

Results for Ian

Ian's total score on the two Dolch Sight Words Tests indicate that he improved 20 words on the PrePrimer and Primer lists, which are the appropriate lists for a kindergartner. He did not improve his grade level according to the scale on the Dolch test. He did improve on both of these levels as indicated by Table 9 and Figure 15. His posttest was 30 words of the 102 sight words on these two lists.

Table 9

Ian's Dolch Sight Words Correctly Read on Pretest and Posttest According to Level

Word List	PP	P	Total
Pretest	8	2	10
Posttest	19	11	30
Total Difference	11	9	20

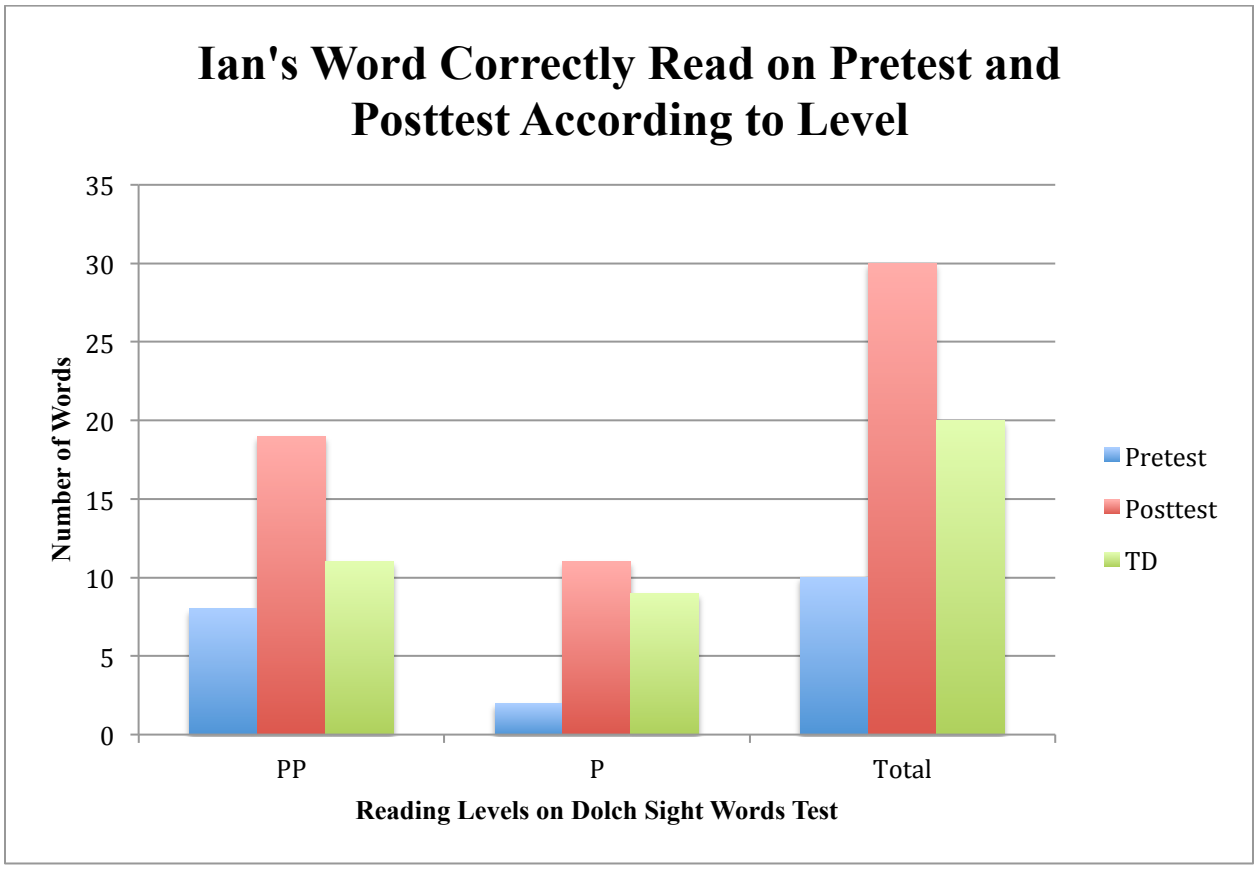


Figure 15. Ian's Dolch Sight Words Correctly Read on Pretest and Posttest According to Level

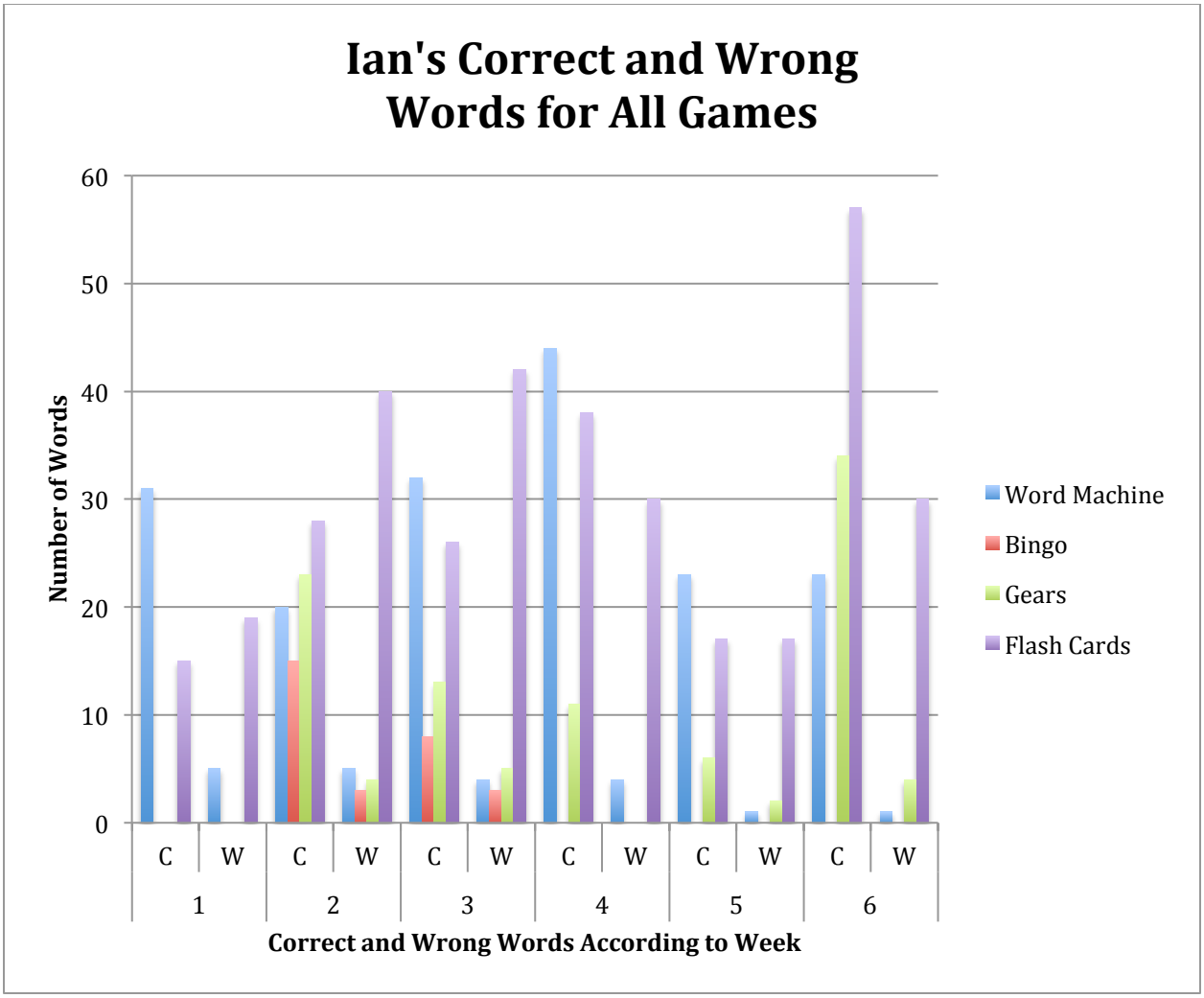
Ian played four games within the *Sight Words* app. Table 10 and Figure 16 depict the number of correctly read and wrong words for each game by week. Any game could be played more than one time in a session and a week period.

Table 10

Ian's Correct and Wrong Words for All Games

Week	1		2		3		4		5		6	
	C	W	C	W	C	W	C	W	C	W	C	W
Game												
Word Machine	31	5	20	5	32	4	44	4	23	1	23	1
Bingo	n/a	n/a	15	3	8	3	n/a	n/a	n/a	n/a	n/a	n/a
Gears	n/a	n/a	23	4	13	5	11	0	6	2	34	4
Flash Cards	15	19	28	40	26	42	38	30	17	17	57	30

Note: n/a: the game was not played that week so no scores were recorded.
C: Correct, W: Wrong



Note: The game was not played all weeks; no scores were recorded those weeks.
C: Correct, W: Wrong

Figure 16. Ian's Correct and Wrong Words for All Games

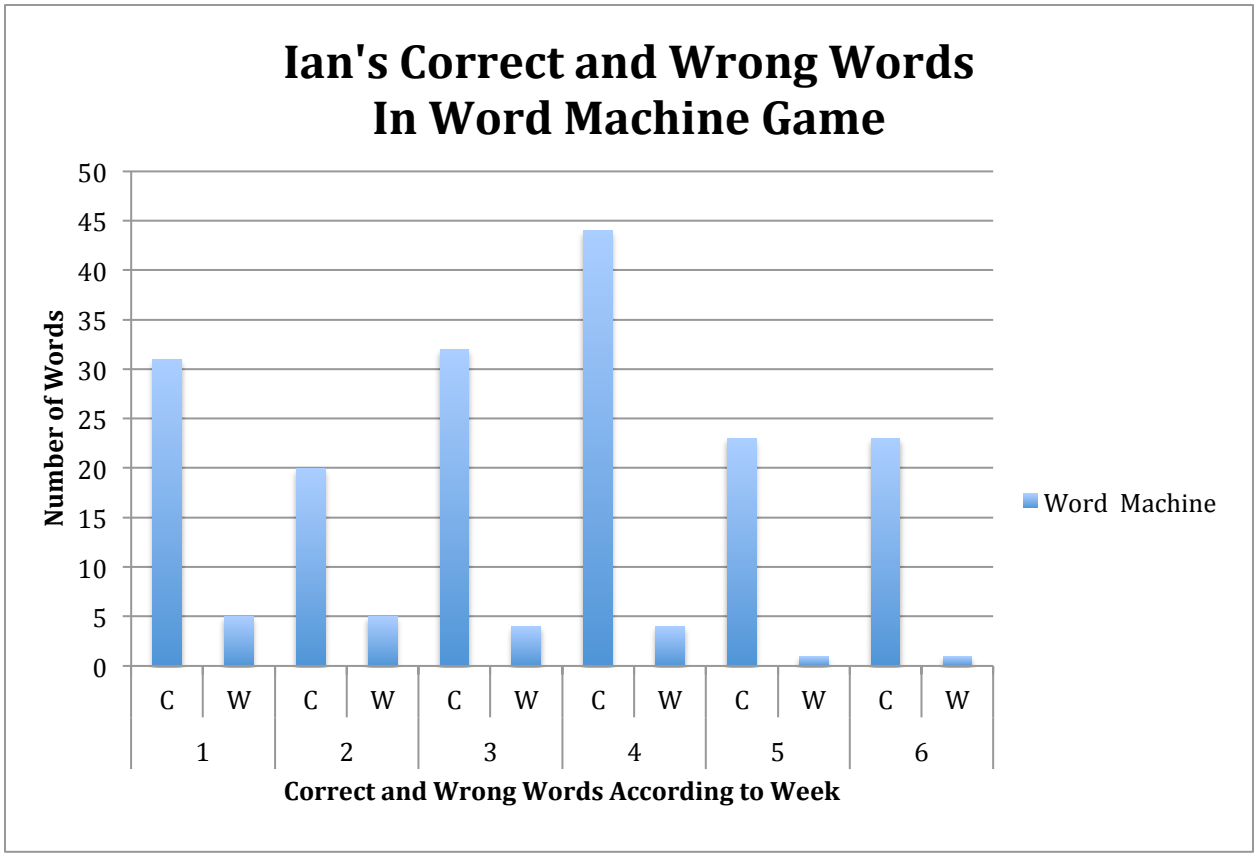
Word Machine: This game pronounces a word and the student selects a word from a group of three words in the first level and five words in the second level. This word recognition game is the least challenging. The researcher chose this game to be Ian's second game because the fewer word choices made it appropriate for a kindergartener. Table 11 and Figure 17 illustrate Ian's scores for the Word Machine game by week. Ian played Word Machine 16 times with 193 words called. He chose 173 words correctly.

Table 11

Ian's Correct and Wrong Words for Word Machine

Week	1		2		3		4		5		6	
	C	W	C	W	C	W	C	W	C	W	C	W
Game												
Word Machine	31	5	20	5	32	4	44	4	23	1	23	1

C: Correct, W: Wrong



C: Correct, W: Wrong

Figure 17. Ian's Correct and Wrong Words for Word Machine

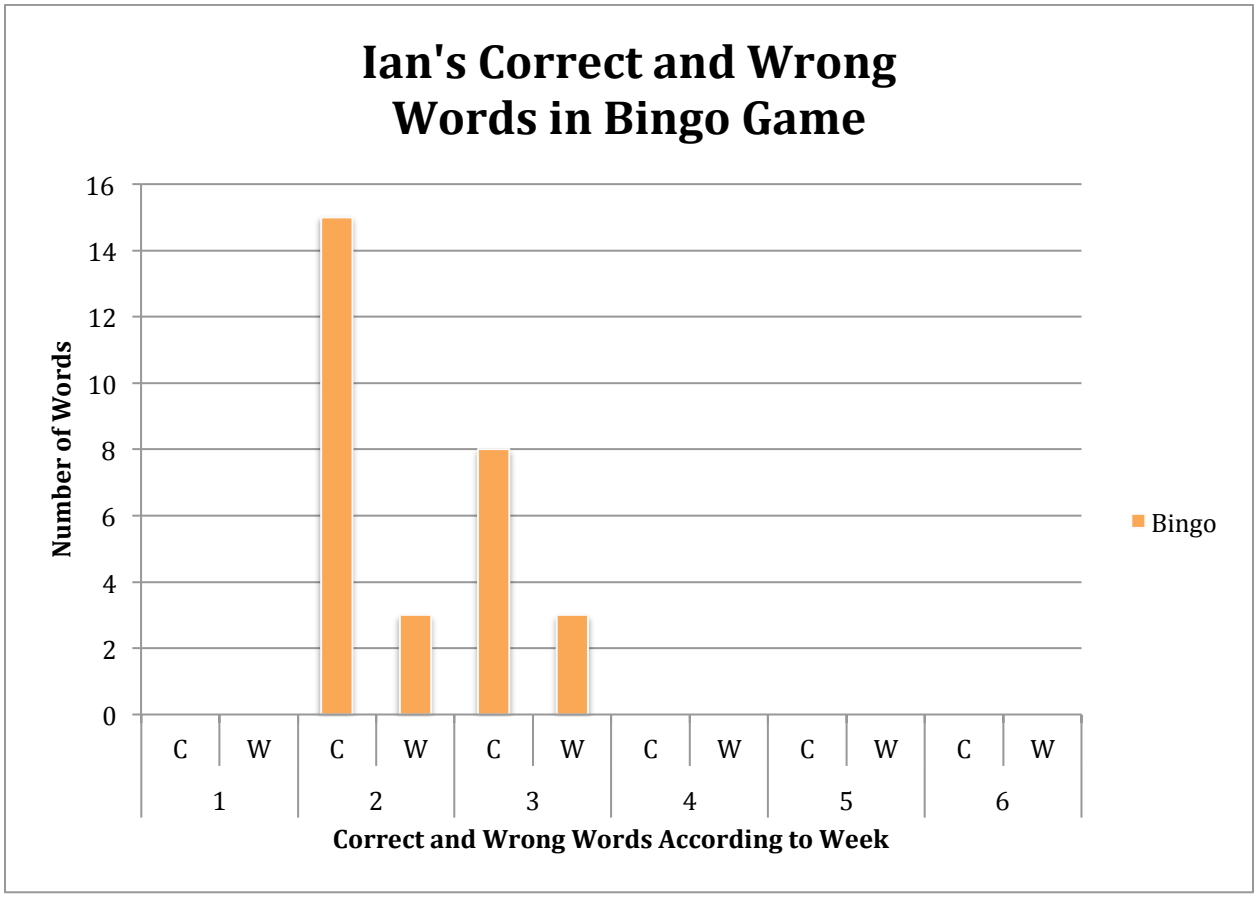
Bingo: Ian only played Bingo three times. Table 12 and Figure 18 illustrate Ian's scores for the Word Machine game by week. Although he recognized 24 of the 29 words called correctly, he did not understand how the game was played.

Table 12

Ian's Correct and Wrong Words for Bingo

Week	1		2		3		4		5		6	
	C	W	C	W	C	W	C	W	C	W	C	W
Game												
Bingo	n/a	n/a	15	3	8	3	n/a	n/a	n/a	n/a	n/a	n/a

Note: n/a: the game was not played that week so no scores were recorded.
C: Correct, W: Wrong



Note: The game was not played all weeks; no scores were recorded those weeks.
C: Correct, W: Wrong

Figure 18. Ian's Correct and Wrong Words for Bingo

Gears: The background of the Gears shows a variable number of speakers in gear shades. The student taps one of the speakers, hears the sight word and moves the gear with the corresponding

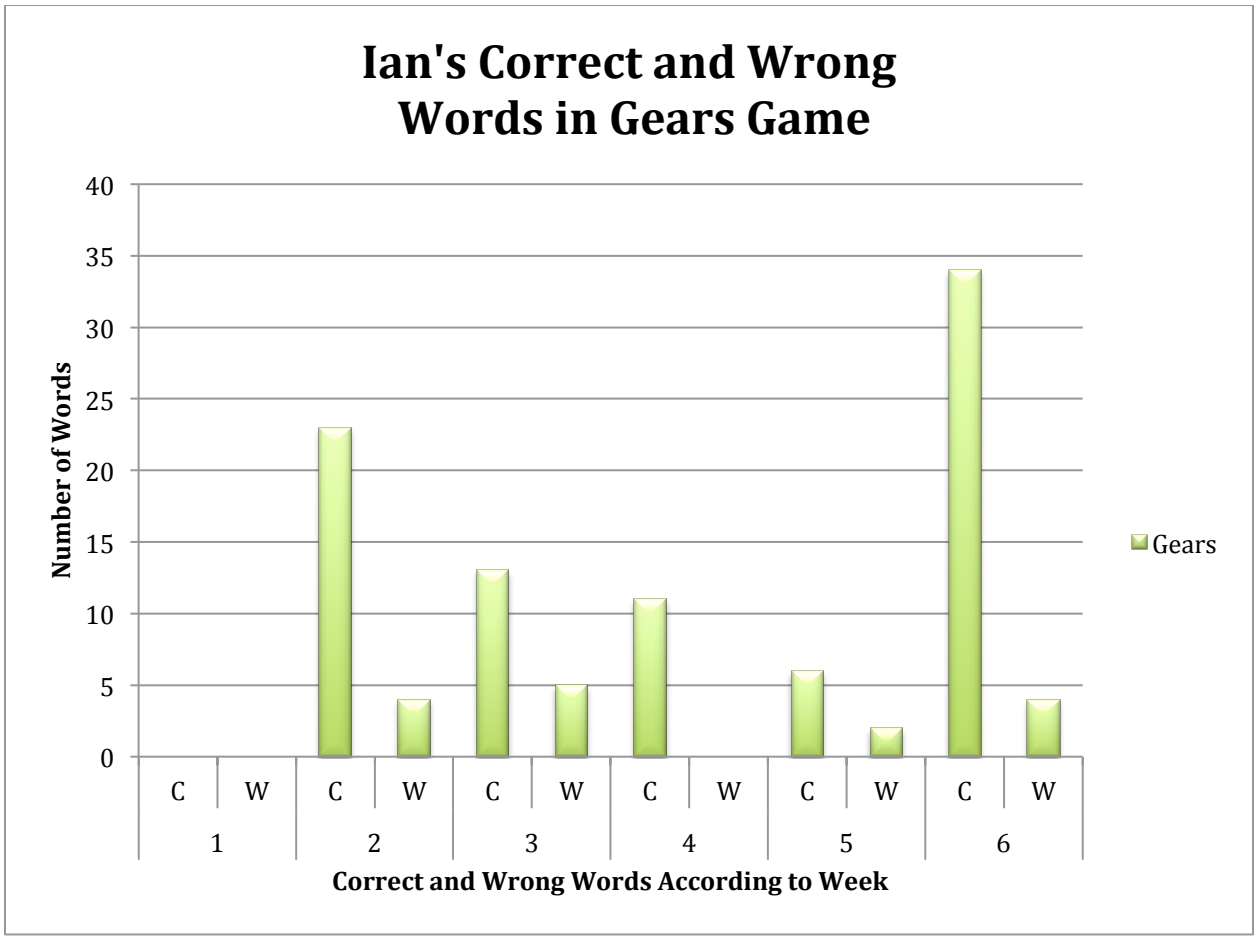
sight word from the bottom of the screen to the speaker. This creates a moving gear. The student continues with this procedure until all the gears are hooked together. Table 13 and Figure 19 illustrate Ian's scores for the Gears game by week. Ian played Gears 11 times with 102 words called. Ian recognized 87 words correctly.

Table 13

Ian's Correct Words and Wrong Words for Gears

Week	1		2		3		4		5		6	
	C	W	C	W	C	W	C	W	C	W	C	W
Game												
Gears	n/a	n/a	23	4	13	5	11	0	6	2	34	4

Note: n/a: the game was not played that week so no scores were recorded.
C: Correct, W: Wrong



Note: The game was not played all weeks; no scores were recorded those weeks.
C: Correct, W: Wrong

Figure 19. Ian's Correct Words and Errors for Gears

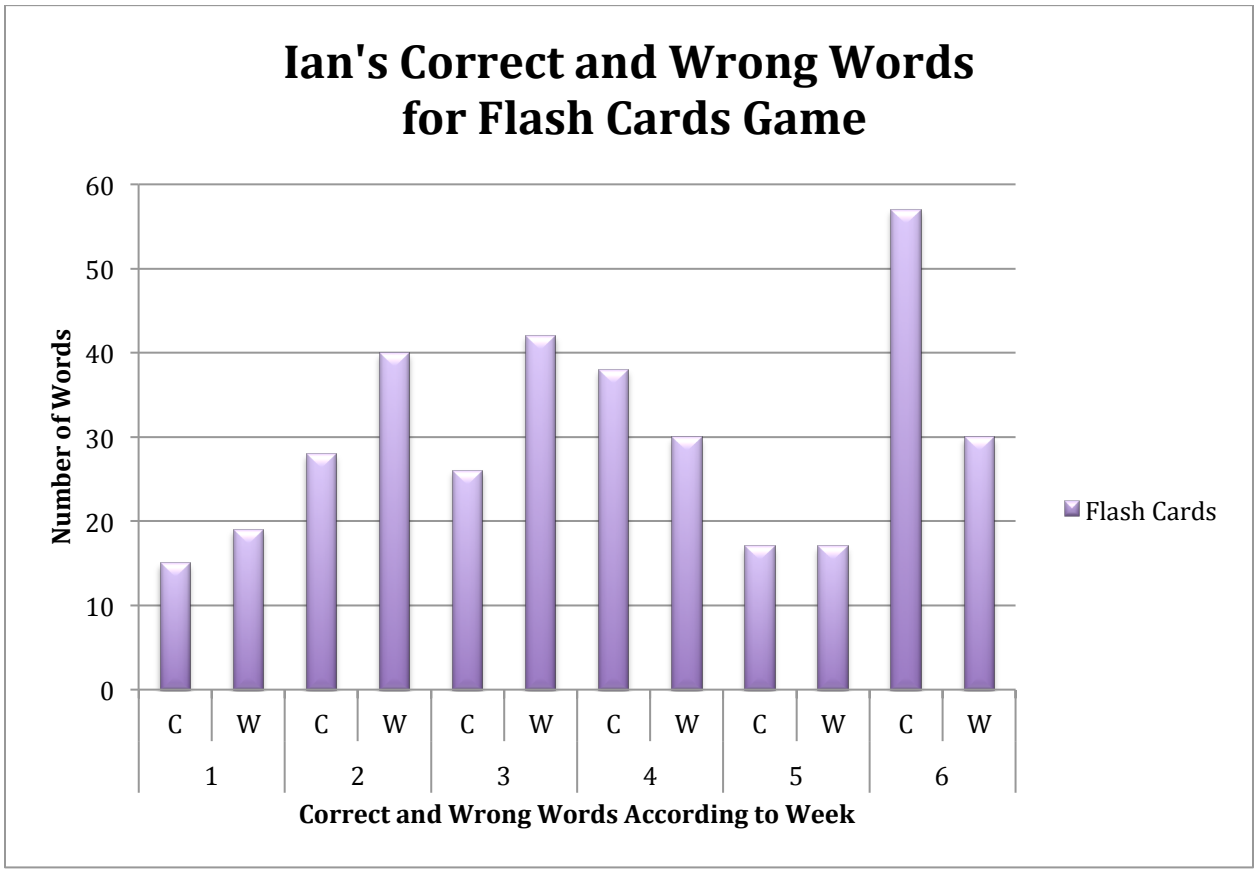
Flash Cards: Flash Cards was the first game Ian play for each of his 17 to 18 word lists. The first word on his list of words appears on the screen of the iPad. The researcher instructed him to read the word then tap on the card to hear the word. He also repeated the word whether the word was correct or incorrect. If he read many wrong words, the researcher would have him play Flash Cards once again. Table 14 and Figure 20 illustrate Ian's scores for the Word Machine game by week. Ian read 181 words correctly of the 193 called in 21 games.

Table 14

Ian's Correct and Wrong Words for Flash Cards

Week	1		2		3		4		5		6	
	C	W	C	W	C	W	C	W	C	W	C	W
Game												
Flash Cards	15	19	28	40	26	42	38	30	17	17	57	30

Note: C: Correct, W: Wrong



Note: C: Correct, W: Wrong

Figure 20. Ian's Correct and Wrong Words for Flash Cards

Table 15 and Figure 21 illustrate Ian's total scores per game, the total possible scores, and the percentage she got right for each game. The most effective game for Ian was Word Machine. He played 16 games and recognized 173 words correctly of the 193 words called. Based on the data, Flash Cards is the least effective. He read 181 words correctly of the 193

called in 21 games. More comments about this effectiveness will be discussed further in the Discussion and Findings section.

Table 15

Ian's Scores, Total Possible Words, and Percentages

Game	Score	TPW	Percentage
Word Machine	173	(193)	86.94
Bingo	24	(29)	82.76
Gears	87	(102)	85.29
Flash Cards	181	(359)	50.42

Note: TPW: Total Possible Words

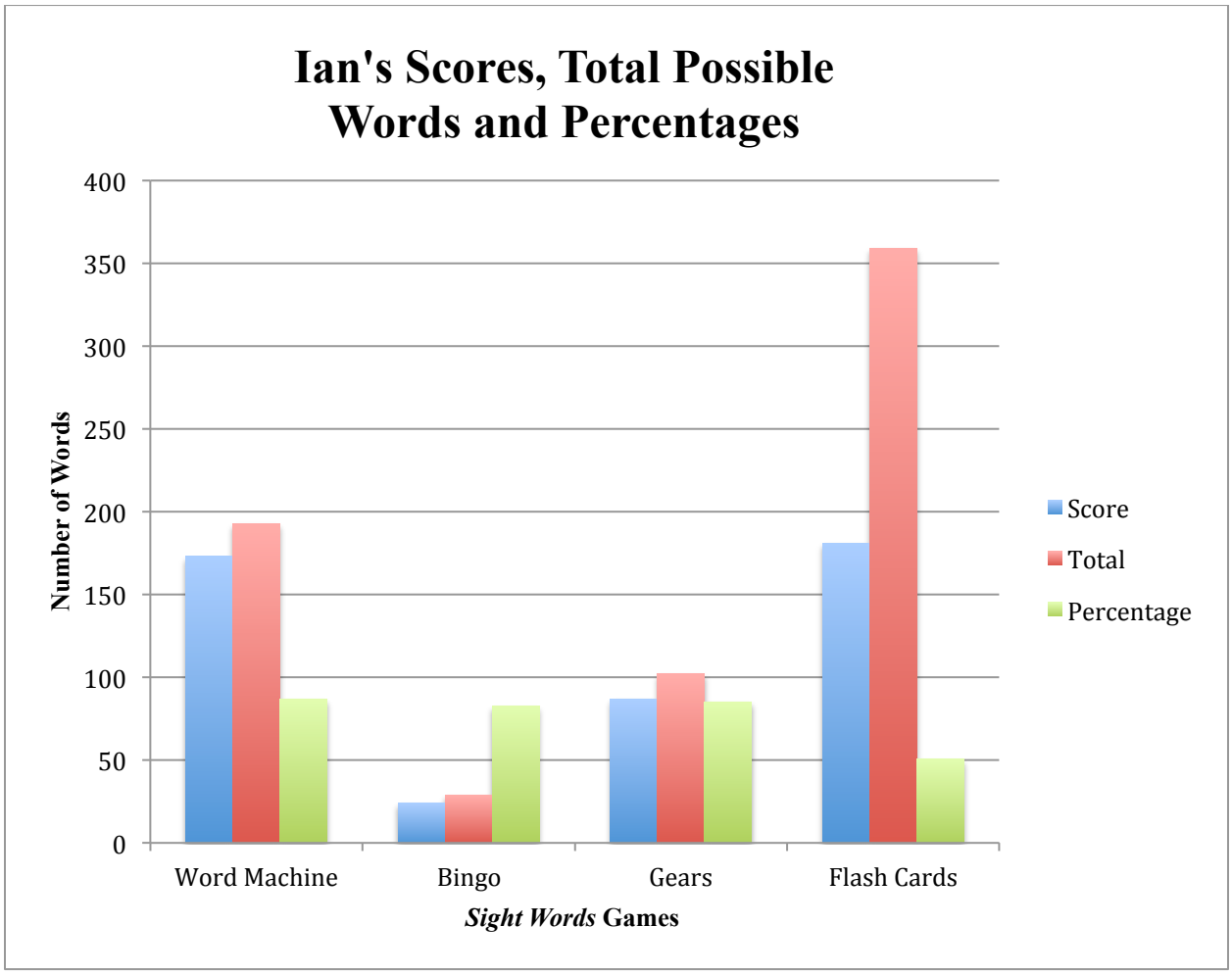


Figure 21. Ian's Scores, Total Possible Words, and Percentages

Discussions and Findings

Data from the Dolch pretest and posttest indicated improved sight word acquisition for both Isabella and Ian. Isabella's scores indicated that she improved 32 words. Ian's scores on the two Dolch Sight Words Tests indicated that he improved 20 words on the PrePrimer and Primer lists, which are the appropriate lists for a kindergartner. Data from the games of the *Sight Words* app similarly demonstrated that using the assistive technology did improve both students' sight words knowledge. However, the researcher found the data misleading for effectiveness of the games because of the different method Flash Cards was used.

Game Effectiveness

The Flash Cards game was the initial game used for each sibling and acted as a form of instruction. It was the only game that required the student to read the word orally before hearing the app pronounce the word. This procedure allowed Isabella and Ian to attempt to read each word on their list and receive feedback before beginning the other games using these words. The researcher found this procedure very effective even though the data does not show this. The researcher did agree with the first and second most effective game, particularly for English Language Learners.

The Word Machine was the most effective game for both Isabella and Ian. This game pronounces the sight word twice, one to specify the selection and then again after the student makes the selection. The voice for the pronunciations is alternated with a male and a female voice. If the student did not hear or understand the word, they could click the speaker button to hear the word again. The male and female voices are also alternated each time the speaker button is selected. This procedure is helpful for English Language Learners to hear the word and associate the text multiple times.

Gears was the second most effective game for both students. This game also has the speaker button that allows them to hear the word multiple times. However, this feature only works before but not after the word is selected. It is possible for the student to hear the word only once. Ian did regularly utilize the speaker button in both Word Machine and Gears.

Vietnamese Language Influence

The researcher examined the words Isabella and Ian incorrectly read on the Dolch pretests and/or posttest to determine if these words are typically difficult for Vietnamese speakers who are learning English as a second language. Ian struggled with the word *the* through the data session and prior tutoring sessions. At first the tutor found this puzzling because *the* is the third word introduced in his reading text. While doing the research for this paper, she discovered that the /th/ sound does not exist in the Vietnamese language. Ian continued to struggle with this word and did not read it correctly in the posttest. The Vietnamese language does not have any consonant clusters. Isabella missed *thank, their, these* and *those* on the pretest. She correctly read *thank* and *those* on the posttest but missed *their* and *these*. Isabella struggled with the word *small*, which also had a beginning consonant cluster. She read it correctly on the pretest but incorrectly on the posttest (Center for Applied Linguistics, 1977).

Examples of English middle sounds that do not exist in Vietnamese are short vowels. Isabella did not correctly read the word *got* which contains the short /O/ in the pretest but did in the posttest. Similarly, she also read *sit* with a short /I/ in the pretest and but incorrectly in the posttest. Although she had no problems with the short /U/ in *put*, she was inconsistent with *could*. She read this word correctly in the pretest and misread it in the posttest (Center for Applied Linguistics, 1977).

Vietnamese have difficulty hearing the English final /r/. Isabella struggled with the word *our* but did read it correctly in the posttest. The Vietnamese language does not contain final consonant clusters (Center for Applied Linguistics, 1977). Isabella read both hurt and cold incorrectly in the pretest. She struggled with these words throughout the data collection periods but then read both of them correctly in the posttest

Implications

The findings of this case study showed the assistive technology intervention using the *Sight Words* app on an iPod was effective in helping Isabella and Ian improve their sight word acquisition. Teachers can utilize this app with an iPod or Kindle in their classrooms. Once students are trained to use the app, they can play the games with limited supervision. The app might be used as a reading center.

Limitations

The participants of the case study were second grader Isabella and kindergartner Ian, two siblings whose family speaks Vietnamese at home. The results from the assistive intervention of playing games from 22Learn's Sight Words app on an iPad did improve both students' sight word knowledge. However, these findings cannot be generalized to all English Language Learners of all ages. Reading problems for ELLs can be contributed between the differences of their first language and English. Vietnamese and English languages have very few sounds in common (Center for Applied Linguistics, 1977), which makes reading more difficult for Vietnamese students. Vietnamese and other Asian languages do have similar English pronunciation problems. These findings might be generalized to these other nationalities with some research about the specific language. Age of the ELL student should be taken into consideration as well. Ian began learning English just two years before in preschool. His sight

word acquisition was slower than his second-grade sister. Both his English skills and his kindergarten reading skills should be considered.

The assistive technology was effective during the short six-week data collection and would probably be even more effective in a year-long program. The app could be used in a reading center rotating students. The researcher has used this app with three first-graders at a time. One plays the game and the other two students read the words.

Reflections and Action Plan

The paper-based Dolch was typed on a typewriter. As allowed in the procedures, the researcher made flash cards of the words and used them for the pretest and posttest. This was a cumbersome procedure, both preparing the cards and using them to administer the tests. In the future she would prefer to use the Flash Cards component of *Sight Words* instead.

The researcher has already shared the results with the teachers of both Isabella and Ian. They were both excited about the results and the improvements their students made. When she was working with the first grade students, she saw that all but two students would benefit from sight word instruction. When she reported this to their teacher, the researcher also explained her research. Even before the data collection procedure for this study was completed, the first grade teacher requested that the researcher start a pilot program to use Kindles and educational games apps for reading intervention. The teacher's preference is to use Kindles because she is more familiar with them and they are more cost effective than iPads. The first app will be *Sight Word*s used in this study. The pilot will utilize one Kindle and the researcher's iPod. The researcher also plans to test projecting the iPad using Apple TV so the whole class can participate. She will also do research to determine if projection of Kindles is also possible.

After the data collection procedure ended, the researcher began using other educational games in her tutoring sessions with Isabella and Ian. Isabella enjoyed timed tests in Spring Math, also from 22Learn. She found doing subtraction facts more fun by competing with herself to obtain higher scores on the scoreboard. She did not groan about doing subtraction problems with regrouping when she did them with Math Grouping by Hetal Shah. This app transforms the iPad into a blackboard to solve the problem with student's finger. Ian practiced his phonics skills with a 22Learn app called Phonics Island Adventure. A monkey named Abby travels around an island on a train. She requests the student's help to place animals with names that begin with specific sounds or letters on the train. His favorite feature for this app was the choice of an electronic sticker after short tasks. The researcher plans to obtain more age-appropriate apps for their tutoring sessions.

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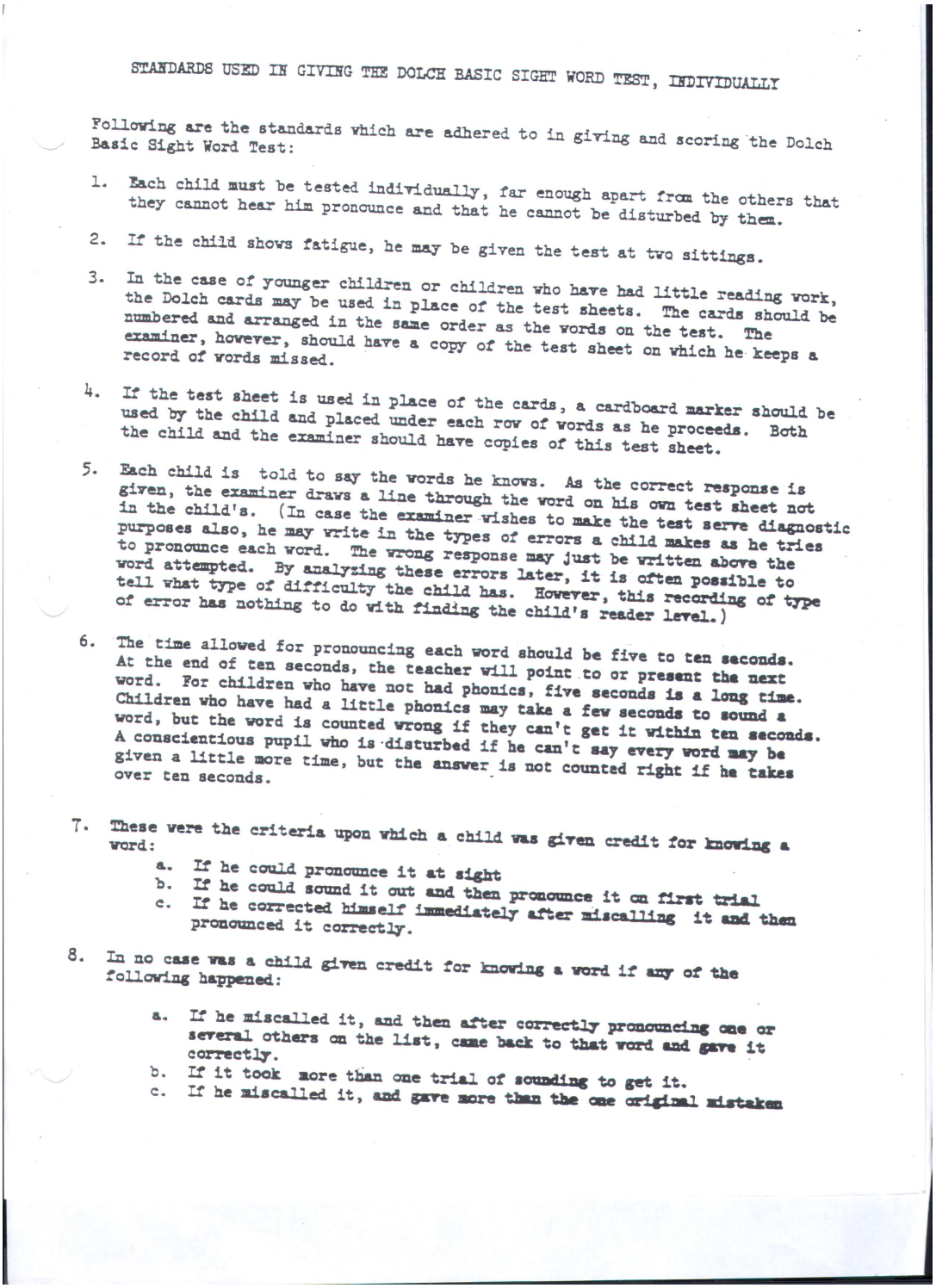
Appendix



STANDARDS USED IN GIVING THE DOLCH BASIC SIGHT WORD TEST, INDIVIDUALLY

Following are the standards which are adhered to in giving and scoring the Dolch Basic Sight Word Test:

1. Each child must be tested individually, far enough apart from the others that they cannot hear him pronounce and that he cannot be disturbed by them.

2. If the child shows fatigue, he may be given the test at two sittings.

3. In the case of younger children or children who have had little reading work, the Dolch cards may be used in place of the test sheets. The cards should be numbered and arranged in the same order as the words on the test. The examiner, however, should have a copy of the test sheet on which he keeps a record of words missed.

4. If the test sheet is used in place of the cards, a cardboard marker should be used by the child and placed under each row of words as he proceeds. Both the child and the examiner should have copies of this test sheet.

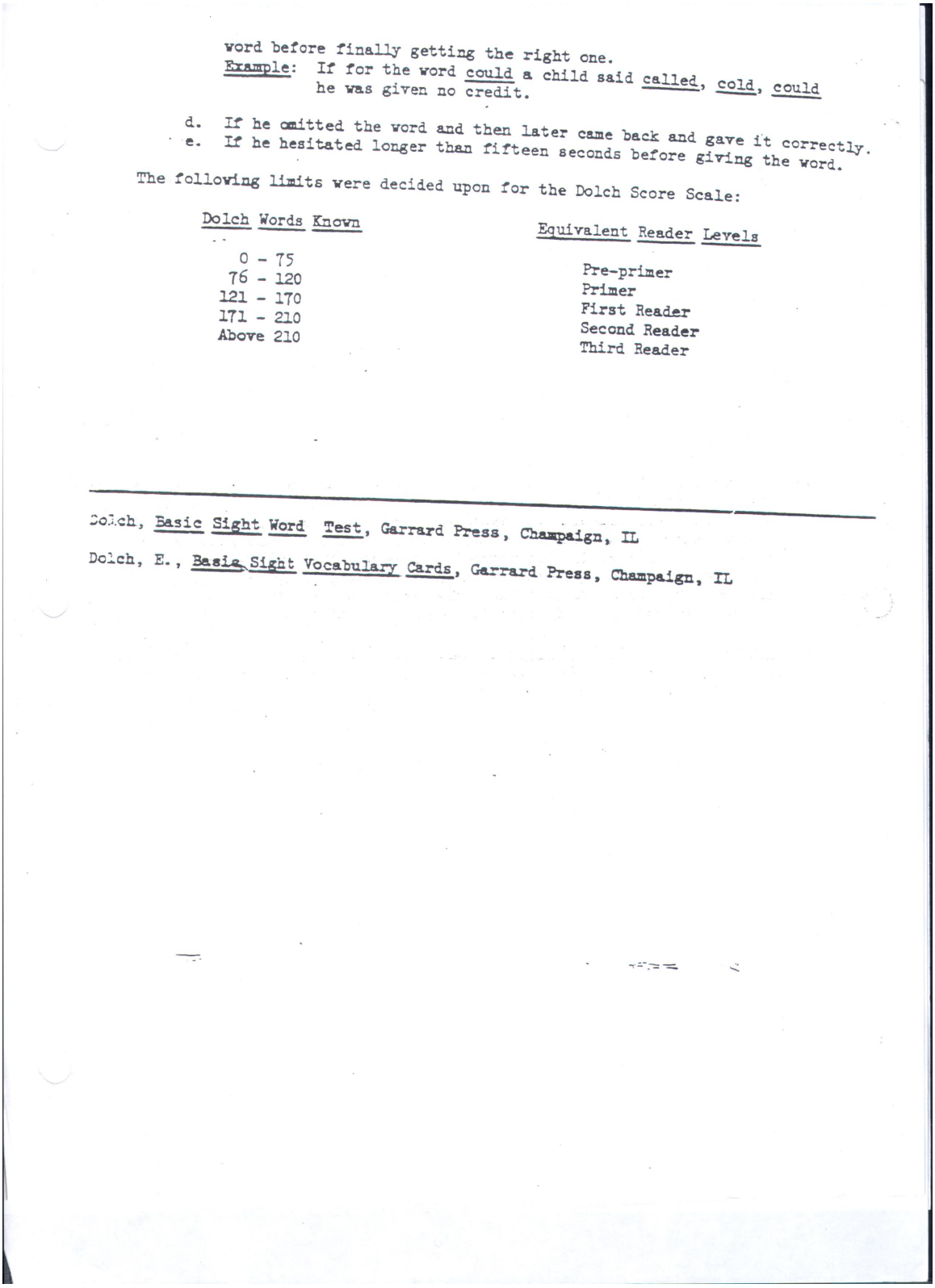
5. Each child is told to say the words he knows. As the correct response is given, the examiner draws a line through the word on his own test sheet not in the child's. (In case the examiner wishes to make the test serve diagnostic purposes also, he may write in the types of errors a child makes as he tries to pronounce each word. The wrong response may just be written above the word attempted. By analyzing these errors later, it is often possible to tell what type of difficulty the child has. However, this recording of type of error has nothing to do with finding the child's reader level.)

6. The time allowed for pronouncing each word should be five to ten seconds. At the end of ten seconds, the teacher will point to or present the next word. For children who have not had phonics, five seconds is a long time. Children who have had a little phonics may take a few seconds to sound a word, but the word is counted wrong if they can't get it within ten seconds. A conscientious pupil who is disturbed if he can't say every word may be given a little more time, but the answer is not counted right if he takes over ten seconds.

7. These were the criteria upon which a child was given credit for knowing a word:
   a. If he could pronounce it at sight
   b. If he could sound it out and then pronounce it on first trial
   c. If he corrected himself immediately after miscalling it and then pronounced it correctly.

8. In no case was a child given credit for knowing a word if any of the following happened:
   a. If he miscalled it, and then after correctly pronouncing one or several others on the list, came back to that word and gave it correctly.
   b. If it took more than one trial of sounding to get it.
   c. If he miscalled it, and gave more than the one original mistaken

Figure 1. Dolch Sight Word Test Instructions, Page 1



word before finally getting the right one.
Example: If for the word could a child said called, cold, could he was given no credit.

d. If he omitted the word and then later came back and gave it correctly.
e. If he hesitated longer than fifteen seconds before giving the word.

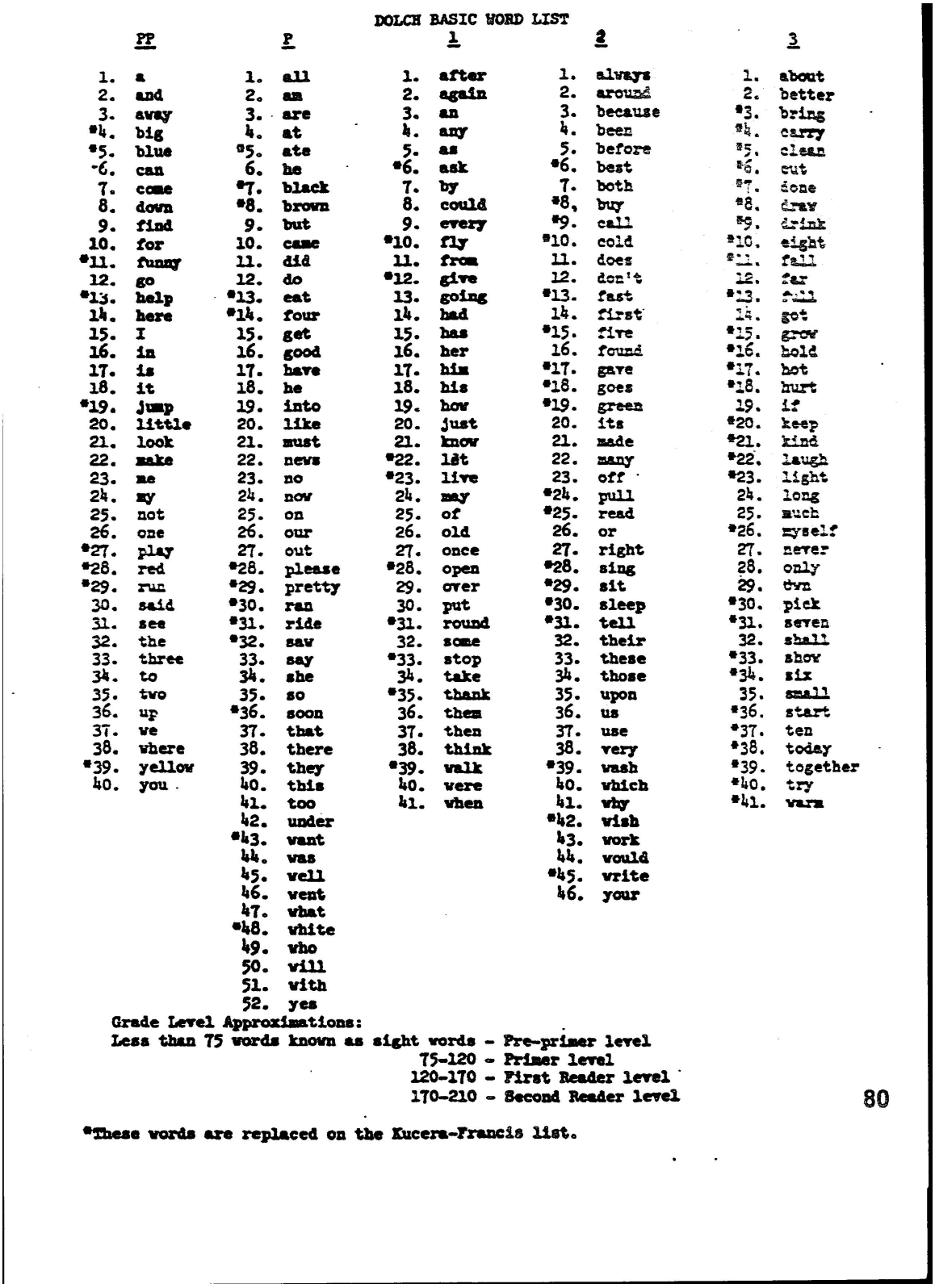
The following limits were decided upon for the Dolch Score Scale:

Dolch Words Known	Equivalent Reader Levels
0 - 75	Pre-primer
76 - 120	Primer
121 - 170	First Reader
171 - 210	Second Reader
Above 210	Third Reader

Dolch, Basic Sight Word Test, Garrard Press, Champaign, IL

Dolch, E., Basic Sight Vocabulary Cards, Garrard Press, Champaign, IL

Figure 2. Dolch Sight Word Test, Page 2



DOLCH BASIC WORD LIST

PP	P	1	2	3
1. a	1. all	1. after	1. always	1. about
2. and	2. am	2. again	2. around	2. better
3. away	3. are	3. an	3. because	*3. bring
*4. big	4. at	4. any	4. been	*4. carry
*5. blue	*5. ate	5. as	5. before	*5. clean
6. can	6. be	*6. ask	*6. best	*6. cut
7. come	*7. black	7. by	7. both	*7. done
8. down	*8. brown	8. could	*8. buy	*8. draw
9. find	9. but	9. every	*9. call	*9. drink
10. for	10. came	*10. fly	*10. cold	*10. eight
*11. funny	11. did	11. from	11. does	*11. fall
12. go	12. do	*12. give	12. don't	12. far
*13. help	*13. eat	13. going	*13. fast	*13. full
14. here	*14. four	14. had	14. first	14. got
15. I	15. get	15. has	*15. five	*15. grow
16. in	16. good	16. her	16. found	*16. hold
17. is	17. have	17. him	*17. gave	*17. hot
18. it	18. he	18. his	*18. goes	*18. hurt
*19. jump	19. into	19. how	*19. green	19. if
20. little	20. like	20. just	20. its	*20. keep
21. look	21. must	21. know	21. made	*21. kind
22. make	22. new	*22. let	22. many	*22. laugh
23. me	23. no	*23. live	23. off	*23. light
24. my	24. now	24. may	*24. pull	24. long
25. not	25. on	25. of	*25. read	25. much
26. one	26. our	26. old	26. or	*26. myself
*27. play	27. out	27. once	27. right	27. never
*28. red	*28. please	*28. open	*28. sing	28. only
*29. run	*29. pretty	29. over	*29. sit	29. own
30. said	*30. ran	30. put	*30. sleep	*30. pick
31. see	*31. ride	*31. round	*31. tell	*31. seven
32. the	*32. saw	32. some	32. their	32. shall
33. three	33. say	*33. stop	33. these	*33. show
34. to	34. she	34. take	34. those	*34. six
35. two	35. so	*35. thank	35. upon	35. small
36. up	*36. soon	36. them	36. us	*36. start
37. we	37. that	37. then	37. use	*37. ten
38. where	38. there	38. think	38. very	*38. today
*39. yellow	39. they	*39. walk	*39. wash	*39. together
40. you	40. this	40. were	40. which	*40. try
	41. too	41. when	41. why	*41. warm
	42. under		*42. wish	
	*43. want		43. work	
	44. was		44. would	
	45. well		*45. write	
	46. went		46. your	
	47. what			
	*48. white			
	49. who			
	50. will			
	51. with			
	52. yes			

Grade Level Approximations:
Less than 75 words known as sight words - Pre-primer level
75-120 - Primer level
120-170 - First Reader level
170-210 - Second Reader level

80

*These words are replaced on the Kucera-Francis list.

Figure 3. Dolch Basic Word List