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Book of Mormon Stories Diglot Reader on Computer

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BRIGHAM YOUNG UNIVERSITY

GRADUATE COMMITTEE APPROVAL

Of a project submitted by
Neal S. Harmon

This project has been read by each member of the following graduate committee and by majority vote has been found to be satisfactory.

11 Sept. 02
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Edward Green

9/11/02
Steven Yanchar
As chair of the candidate’s graduate committee, I have read the project of Neal S. Harmon in its final form and have found that (1) its format, citations, and bibliographical style are consistent and acceptable and fulfill university and department style requirements; (2) its illustrative materials including figures, tables, and charts are in place; and (3) the final manuscript is satisfactory to the graduate committee and is ready for submission to the university library.

11 Sept. 02

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ABSTRACT

BOOK OF MORMON STORIES DIGLOT READER ON COMPUTER

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Master of Science

This report describes the design, development, and evaluation of a computer-based diglot reader of the Book of Mormon Stories of the Church of Jesus Christ of Latter-day Saints. Di means two and glot means language, thus a diglot reader combines two languages into one reader in order to teach a person to read in a new language. The program, which runs on both Macintosh and Windows computer platforms, contains fifteen chapters of the Book of Mormon Stories and introduces about four hundred Spanish words. This report includes a literature review on the diglot method and related materials, a description of the program and its features, and an evaluation of the program including eight one-to-one evaluations and a small-group evaluation. The small-group evaluation volunteers completed a pretest, studied the reader, completed a posttest, and filled out a questionnaire for their evaluation of the product. Finally, the report examines the strengths and weaknesses of the program and suggests some general guidelines for future diglot reader computer programs in general.
ACKNOWLEDGMENTS

Thanks must go to Robbins Burling (1968) for first attempting to teach French through a diglot reader and finding it very successful. Professors Robert Blair picked up on the idea at Brigham Young University (BYU). He shared it with Professor Ray Graham who created a Book of Mormon diglot reader. Upon discovering Graham’s reader, I incorporated it into my undergraduate honors thesis. Credit for all good ideas must go back beyond the scope of my and surely even their lifetimes. At this university I love, I feel grateful that I can recognize they go back generations, even to God.

Dr. Paul Merrill and Ray Graham saw that a tool built around the diglot method had limitless research potential for future students. Their vision and desire to help others encouraged me. Professor Yanchar taught me principles of research and Dr. Green showered me with opportunities to apply what I learned in school to real-life situations. All department faculty and staff have helped me through mentoring and example. The leaders, parents, and students at American Heritage Schools also supported the project. However, when many volunteers fell through, my family and relatives saved the project by completing the small group evaluation with only last-minute notice.

Saving my companion for last, Trisha has always loved and believed in me. Only she and I know of the hundreds of hours we worked together on this and other projects. In spite of all these hours, she never complains. Instead she looks for ways in which we can share what we learn here at BYU with others.
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Introduction

The diglot reader combines two languages into one reader with the purpose of teaching a person to read in another language (In fact, di means two and glot means language.). Consider the following excerpts from the Book of Mormon Stories Diglot Reader on Computer (BMSDR) created by the author for this project. The first excerpt comes from the first page of the BMSDR and the second comes from the first page of chapter fifteen.

Chapter One—Page One

When José Smith was 14 years old, many iglesias were claiming to be true, y he did not know which one to join.

Chapter Fifteen—Page One

Alma escaped de los siervos del rey Noé y hid por muchos días. Mientras hiding, él escribió what el profeta Abinadí had enseñado.

Notice how much the italicized or Spanish words grow in density from chapter one to chapter fifteen. This change takes place gradually in the BMSDR as new Spanish words appear at about a rate of seven out of every hundred words.

The BMSDR is unique because it brings the capabilities of a computer to the diglot method. The computerized reader for this project has features for seeing the translation, hearing the pronunciation, or recording one’s own voice and comparing it to the native translations.

This report explains the development and evaluation of the BMSDR. More specifically, it describes why the author conducted the project, briefly summarizes relevant literature, describes the BMSDR program in more detail, gives the results of the
formative evaluation of the program, reports the time and financial resources required for
the project, and gives a critique of this work.

Statement of The Problem

The following is an excerpt from the author's undergraduate Honors Thesis that
inspired the project:

Teaching Spanish at the Missionary Training Center (MTC) in Provo, UT from
1999 to 2000, introduced me to the Technology Assisted Language Learning
Program (TALL). I quickly discovered that the missionaries (who used TALL)
knew Spanish much better than I did when I was a student at the MTC. I raved to
friends and family about the results of the new developments in technology. Many
asked if they could have access to the same technology. Because the MTC does
not release the technology to non full-time missionaries, their inquiries planted the
idea of creating a comparable program that would be accessed either over the web
or on compact disc by members of the church. This idea eventually grew into this
thesis (Harmon, 2000).

This quote captures the time in which the author initially perceived a need. The
thesis of which the excerpt speaks (1) outlined strengths and weaknesses of previous
programs created to teach Spanish through The Book of Mormon, (2) reported the results
of a survey conducted to determine the needs of the intended audience, and (3) laid out
the plan and design of the program, leaving production, presentation, and evaluation to a
Masters Project (Harmon, 2000). For the purposes of this project, the survey is discussed
in more detail.
The results of the survey suggested that the author’s perception of a need was accurate. A link to the survey was sent to people who had signed up for a monthly e-mail which described educational products from Latter-day Family Resources (an educational materials store). Most people on the e-mail list were members of the Church of Jesus Christ of Latter-day Saints and interested in religious teaching materials. One hundred twenty-one people responded to the survey and their response seemed very positive. Over 98 percent of respondents or their families wanted to learn a foreign language and more than 90 percent indicated a desire to learn Spanish. Just over 94 percent said they would want to learn Spanish using a computer program that teaches Spanish through *The Book of Mormon*, and nearly 91 percent of respondents said that they would have interest in purchasing the computer program.

Though the survey needed to be interpreted with care due to its being voluntary response, it did show that great interest in the program existed among the respondents. Of the many positive things in the comments section of the survey, one respondent wrote, “Learning a foreign language through that type of a program sounds exciting.” Another wrote, “Please let me know if this becomes available, and for how much. My almost eight-year-old really wants to learn Spanish.” Yet another showed anticipation for the program’s release, “Is this something that may be available in the near future?” The respondents in the sample definitely liked the idea of the program.

The extensive plan for the program consisted of activities divided into eight categories: *Book of Mormon Stories*, ABCs, Prayer, Testimony, Scripture Mastery, Articles of Faith, Write a Missionary, and Hymns. These activities would help members of the Church transfer familiar vocabulary from one language to another.
With the help of Professor Paul Merrill, the author came to realize that the complete design in its entirety was far too ambitious for a Masters Project and he narrowed it down to one section of the program—The Book of Mormon Stories as a computer assisted diglot reader.

Statement of Purpose

The instructional objectives of the final product are:

1. Learners will be able to comprehend a previously un-encountered Spanish passage of text that has vocabulary similar to The Book of Mormon Stories.

2. Learners will acquire 60 percent of the new Spanish vocabulary they encounter from The Book of Mormon Stories. Nelson (1995) showed 63 percent in a study of vocabulary acquisition using the diglot method.

Target Audience

The target audience of the instruction is English-speaking children of the Church of Jesus Christ of Latter-day Saints who want to learn Spanish. The children must have enough reading skills in English to enable them to read The Book of Mormon Stories on their own.
Instructional Materials Search Review

This review includes materials related to the BMSDR and computer-based or print-based religious language instruction. Particular attention is paid to materials geared toward the target language of Spanish. All materials were evaluated based on how well they:

1) Teach one who reads English to read Spanish, using the diglot method.
2) Teach using the familiar religious materials of the Church of Jesus Christ of Latter-day Saints.
3) Utilize the capabilities of a computer to deliver the instruction.
4) Are available to the general membership of the Church.

The reason for using the above as evaluation criteria are outlined in more detail in the author’s Undergraduate Honor’s Thesis (Harmon, 2000).

The library database and grapevine searches yielded only two instructional products based on the diglot method and the Spanish language—Professor Ray Graham’s Book of Mormon Diglot Reader and Professor Robert Blair’s Power-Glide.

Graham’s print-based reader uses The Book of Mormon published by the Church of Jesus Christ of Latter-day Saints. The reader begins in English and slowly converts to Spanish by introducing a new Spanish word every twenty words (5 percent). After a word is introduced in Spanish, it never reappears in English; however, learners still understand contextual meaning because of the supportive English text that remains. Graham’s Diglot Reader also gives definitions of new vocabulary in the margins (marginal glossing).
Upon finishing Graham’s Diglot Reader, which only reaches Alma 21, nearly all text is Spanish.

The *Book of Mormon Diglot Reader* fills the needs of the first two evaluation criteria, using the diglot method incorporated into the familiar religious text of *The Book of Mormon*; however, it lacks the capabilities of a computer. Silver (1997) found the lack of an aid for pronouncing the foreign words one of the most common complaints about Graham’s reader. A computer brings pronunciation within the click of a mouse. One can contact Graham to purchase a copy of his reader, but for many Church members, this is not very accessible.

*Power-Glide*, developed by Dr. Robert Blair and marketed by his son Jim Blair, has incorporated the contextual approach of the diglot method into verbal stories. The courses aim at communication and listening skills as opposed to the diglot method’s focus on reading skills. All of the *Power-Glide* courses, with the exception of one LDS course, focus on adventure rather than religious stories. The LDS version of *Power-Glide* available on cassette tapes teaches one to pray, bear testimony, give a talk, and understand the scriptures, but it lacks the capabilities of the computer. Audiotapes seem cumbersome when compared to the instant pronunciation playback offered by a computer. Although *Power-Glide* offers computer-based courses, they are not based on familiar religious text.

Though not based on the diglot method, Johnson’s *Book of Mormon Reader* (1994), Ashworth and Vigo’s *Learn Spanish Through The Book of Mormon* (1984), and the LDS church’s *Book of Mormon Stories on CD-ROM* (2000) all have religious and/or computer components that justify careful review.
Johnson's *Book of Mormon Reader* (1994) software takes important steps in using the advantages of the computer and *The Book of Mormon* in foreign language instruction. He built his reader for missionaries at the Missionary Training Center. The program has sound files for individual words and verses that were recorded by native Spanish speakers. A recorder and playback device gives missionaries instant feedback to compare their pronunciation with that of the recorded native voice. A Spanish-English or English-Spanish dictionary answers questions about unfamiliar words. In addition to the multiple dictionary definitions, the program also has a word definition feature that gives only the contextual meaning of the word. The missionaries can access grammar principles that relate to specific phrases in the text. They can also reveal or hide the English translation on one side of the screen. Illustrations that relate to the text assist in comprehension too. Finally, they have a note pad on which they can record whatever they wish for future reference. This program uses both the capabilities of the computer and familiar religious text. However, it is neither based on the diglot method nor available to Church membership.

Ashworth and Vigo (1980) wrote a book and produced an audio tape meant for use with an authentic Spanish version of *The Book of Mormon*. *Learn Spanish Through The Book of Mormon* teaches grammar, vocabulary and pronunciation through lessons that relate to *El Libro de Mormon: Otro Testamento de Jesucristo*. (The Spanish edition of *The Book of Mormon*). Its strength lies in its availability to the public and inexpensive price (about $7.00). It is the only program available commercially that teaches Spanish through *The Book of Mormon*. There are weaknesses in Ashworth and Vigo’s program. When compared to Johnson’s *Book of Mormon Reader* computer program, audio tape
technology seems somewhat clumsy in comparison to the immediate pronunciation playback of the computer. Silver (1997) pointed out that the pure Spanish text of *El Libro de Mormon* overwhelmed full-time language learners (missionaries) in the MTC. If students who are immersed in the language find *El Libro de Mormon* intimidating, how much more does it overwhelm part-time students of Spanish?

The Church released *The Book of Mormon Stories on CD-ROM* (2000) in English in all of the distribution centers. This program does not teach Spanish; it is only available in English. Because its words and sentences can be read to the learner at the click of a button, it has a lot of power as an instructional tool for learning to read in English. The program displays images related to the text. Though this program does not teach Spanish and is not based on the diglot method, it is available to the public and uses the abilities of a computer.

After conducting this review, it has become clear that the available materials are either unavailable, or based on audiotape technology, or based solely on English; all weaknesses that the BMSDR may be able to solve.

Instructional Content Review

This section discusses both the use of familiar religious text and the diglot reader.

**Familiar Religious Texts.** Using a familiar religious text enhances the learning experience for members of the Church.

Tobias (1987) drew on previous studies in which the researchers found that the students “interest in their reading, accounted for an average of 30 times more variance than other variables” (p. 225). This “intrinsic motivation (valuing an activity for its own sake) leads to more intense task engagement and greater output than extrinsic motivation
(valuing an activity for exogenous reasons)” (p. 225). The Book of Mormon Stories interest members because they are based on The Book of Mormon, which is “the keystone of [their] religion” (Introduction of The Book of Mormon). Gustafson and Tillman (1991) support familiar texts in foreign language learning. The familiar text can help Church members understand the target language better than other equivalent yet unfamiliar texts because members build foreign language skills based upon stories they know by heart in their native tongue.

**Diglot Reader.** Research on the diglot method demonstrates a history of positive outcomes in favor of the diglot method as a language teaching tool. It provides some prescriptive insights that will help in the process of writing a diglot reader using The Book of Mormon Stories.

In 1968, Robbins Burling made what he called “some outlandish proposals for the teaching of foreign languages” (Burling, 1968). He proposed that one could learn a foreign language faster reading un-encountered foreign words within the context of the learner’s familiar native tongue. Four years later, he claimed that his students learned two years of French vocabulary in one year’s time, using his English-to-French diglot reader (Burling, 1968). Although Burling recognized that his reader could not single-handedly teach students to write, speak, or pronounce words correctly, he was convinced that his radical idea had potential. People have come to call Burling’s idea the diglot method because *di* means two and *glot* means language.

In the years since, many scholars have sought to know how successful the diglot method really is through a variety of research studies (see Sleight, 1982; Port-Fox, 1982; Afarian, 1987; Gunderson, 1993; Nelson, 1995; Silver, 1997; Chen, 1997). Although
Sleight (1982), Port-Fox (1982), Afarian (1987), and Gunderson (1993) conducted studies that bolstered support for the diglot method, their exploratory research designs did not produce any definitive results because they lacked control groups.

On the other hand, Nelson (1995), Silver (1997), and Chen (1997) conducted experiments that helped them draw a few conclusions about the diglot reader.

Nelson (1995) wanted to know (1) how vocabulary acquisition percentages of second language (L2) learners using the Diglot Reader compare with the percentages of first language (L1) learners, (2) how marginal glossing influences vocabulary acquisition, and (3) whether frequency of appearance plays a significant role in learning the vocabulary. In response to her first question, she discovered, “that subjects reading the Diglot Reader gained vocabulary at the same percentage rate (63%) as native speakers in their L1” (p. 56). She concluded that marginal glossing does not increase the vocabulary acquisition of L2 learners using the Diglot Reader. However, when given the choice, teachers and learners indicate that they would prefer to have the marginal glossing feature for convenience. In answering the third question, Nelson found that frequency of appearance is very important for the first twelve appearances. After twelve, new appearances do not significantly increase the probability of learning the word.

In comparing two groups of missionaries learning from either a diglot reader or a straight Spanish version of The Book of Mormon, Silver (1997) found that the diglot reader “has a positive effect on the overall reading experience of the reader,” and “increased levels of vocabulary acquisition while offering at least comparable reading comprehension levels” (p. 83).
Chen (1997) was the first to compare vocabulary acquisition of the diglot method to that of another vocabulary teaching method—the word list method. In his study, the diglot group outperformed the word-list group. Chen (1997), in contrast to Nelson (1995), found that removing marginal glossing after the first five appearances of a word did increase the number of words learned.

In conclusion, research on the diglot reader indicates that, although diglot readers are very labor intensive to write, they (1) ameliorate the stressful nature of learning to read in a foreign language while facilitating vocabulary acquisition equivalent to that of a native learner (Nelson, 1995), (2) improve the learning experience of the reader and increase vocabulary acquisition without sacrificing comprehension (Silver, 1997), and (3) teach vocabulary better than a word list (Chen, 1997).

This research also draws conclusions helpful in the creation of a new reader. People will learn more if they do not always rely on the marginal glossing (Chen, 1997). The ideal number of repetitions for a word is about twelve times (Nelson, 1995).

Instructional Theory Review

This instructional theory review looks at general principles of instructional design, theory and research related to discrimination learning, vocabulary acquisition through reading research, and principles associated with the BMSDR.

General Principles of Instructional Design. The steps taken to complete this project were analysis, design, development, implementation, and evaluation. Though the transitions from one phase to another were not completely clear, analysis and design were mostly conducted and then recorded in the author's Undergraduate Honor's Thesis (Harmon, 2000).
Development began when the author entered a Master’s program and learned the program iShell (2002) from Dr. Merrill. The development process consisted of creating a program to power the BMSDR, running the words through a program to get frequencies, choosing when to introduce the words, writing the reader, preparing the text for the computer program in iShell (2002), and recording the sound files as a pronunciation guide. Last of all, development changes were implemented due to input from a series of one-to-one formative evaluations with volunteers who tried out the program.

**Discrimination Learning.** The process of learning to read a foreign language is largely gaining the ability to discriminate between the different symbols on the page. Discrimination learning is learning to distinguish between items and refer to each by its own name. This type of learning has constituted an important subset of instructional design for many years. For example, Fleming and Levie (1978) outlined some key principles for discrimination in their chapter on memory. They are as follows:

1. Discriminations are most readily learned where the differences between the stimuli are maximal.
   a. Differences can be maximized by exaggerating the criterial features, by increasing the number of feature differences, and by eliminating or reducing the dominance of the non-criterial features.
   b. Training should begin with examples which are most different and proceed to those with finer differences to the extent required.
2. Prior training with the criterial attributes facilitates discrimination learning.
Flemming and Levie (1978) pointed out that stimulus contiguity was still the most questionable of association principles. While some authors argue that it is best to put different items side-by-side in space or close-together in time, other authors argue that differences in characteristics should be learned quite separate in space and time.

The author was unable to find relevant studies on discrimination learning within the context of reading. Neither could he find relevant research on contextual discrimination learning in general.

Research on Vocabulary Acquisition Through Reading. For years, researchers have suspected that people acquire much of their vocabulary in context while reading (Swanborn & de Glopper, 1999). During the last seventeen years, much research has been conducted on the topic that is briefly covered in this literature review because of the close tie between learning a new language through diglot and learning unknown vocabulary through reading. Both teach through the context of surrounding words.

In 1985, Nagy and Herman (1987) conducted a study to explore the incidental learning of word meanings from context and they concluded that people learn about 5 percent of the new words they encounter in a text during normal reading. This assumes that the readers’ objective is to read the text and not to learn new vocabulary. The learning is *incidental*.

Since the Nagy and Herman study (1987), many researchers have conducted similar studies, and recently Swanborn and de Glopper (1999) conducted a meta-study of twenty of these studies. They found that researchers’ conclusions systematically differ from 5 to 15 percent. They attributed this variance between researchers to grade level, pretest sensitization, level of reading ability, partial word knowledge, and ratio of
unknown words. They also concluded that the more accurate figure is that readers learn 15 percent of the unknown words they encounter during normal reading. In addition to evidence of incidental vocabulary learning, research also suggests that contextual vocabulary reading helps readers learn words as well as or better and for longer than learning isolated words (Mayberry, 2000; Annetis, 1999; Bustos, Rezzano, & Ponticelli, 1997).

While the vocabulary research above shows that context provides powerful vocabulary learning opportunities, the numbers are lower than the author's BMSDR (50 percent). The author believes this is because vocabulary learning from prior research is incidental (with the exception of the isolated word learning groups used to compare against the contextual word learning groups) whereas the vocabulary learning from diglot reading is intentional. New research must be conducted to explain why these rates change when one reads a diglot reader.

Carver (1994) conducted a study that provides helpful prescriptive information for a diglot reader. He wanted to determine the relative difficulty of a text as a function of the percentage of unknown vocabulary in the text. He found that any less than 2 or 3 percent unknown vocabulary rate does not constitute a useful exercise in vocabulary acquisition. He discouraged free-reading class time in schools because students tend to choose their own grade level of reading. He encouraged reading above grade level as a vocabulary learning activity. This informs diglot-based writers to always introduce new words at a rate of at least three percent. This provides a helpful floor but where is the ceiling? Perhaps more research would answer that question.
Principles and the Book of Mormon Stories Diglot Reader on Computer. This section first addresses discrimination principles, and then Gagne’s events of instruction as they apply to the project.

The stimulus contiguity question mentioned by Fleming and Levie (1978) is an important one for the project because of specific questions about Spanish verbs. Spanish infinitives end with *ar*, *er*, or *ir*. When they are conjugated, the different verb conjugations form patterns. For example, the word *hablar* means “to talk.” One may change the verb to “I talk: *hablo,*” “he talks: *habla,*” “they talk: *hablan,*” etc. The difficulty *The Book of Mormon Stories* present is that they are reduced to the fewest words possible. Many times, the same verb appears many times in the same chapter, but it appears in many different conjugations. Unfortunately, there is not enough text in *The Book of Mormon Stories* for there to be many repetitions of these verbs in their separate conjugations.

Should the writer of a diglot reader take advantage of the frequency of the verb appearances or introduce only one conjugation at a time? This is an empirical question. Taking advantage of the verb frequency, one would introduce *hablar*, *habla*, *hablo*, and *hablan* all together. The next chapter *doblar*, *dobla*, *dobló*, and *doblan* could be introduced. With this approach, one would hope that the learner would see patterns in the different verbs.

Introducing only one conjugation at a time would mean presenting *hablar*, *doblar*, and *enseñar* sequentially. These would later be followed by the introduction of *habla*, *dobla*, and *enseña*, which would later be followed by *hablo*, *dobló*, and *enseño*. 
Which way of introducing the different verbs best helps the learner distinguish between the different verb conjugations? It can be better addressed now that the computerized diglot reader has been created. This question was not addressed for this project.

The BMSDR designer chose to introduce words by verb families rather than by verb conjugations because The Book of Mormon Stories contains a relatively small number of words. In order to expose the learner to one verb as many times as possible, the designer introduced multiple verb conjugations of the same verb. However, the author also decided to simplify as much as possible. In places where “would talk: hablaria” could have been introduced, the designer chose to put “would hablar” in the text. This increased the frequency of the word hablar in the text. Therefore, this project introduced different conjugations of the same verb at the same time, while trying to minimize the number of different conjugations.

Another topic related to the BMSDR is Gagne’s Events of Instruction, which were naturally part of a diglot reader. A close look at the Events of Instruction in the context of a diglot reader helps make clear those Events that are missing. Knowing missing events, the BMSDR can be designed to make up for those deficiencies.

First, a look at how a diglot reader does address many of Gagne’s principles is in order (Events of Instruction are italicized). A familiar text gains attention. Though not explicitly stated in a diglot text, the learning objective is built right into the reader. The objective is to learn to read the text in another tongue. The reappearance of new Spanish words later in the reader reminds the learners of previous material. A diglot reader presents the material as clearly and distinctively as its text is written. In the case of The
Book of Mormon Stories, the language is clear and straightforward. The progression of the text provides a variety of practice situations. The challenge of continuing to understand new vocabulary in the text elicits performance.

The three Events of Instruction in which a diglot reader is weakest is in guiding learning, providing feedback, and assessing performance. Learning guidance only comes from the way in which the diglot writer chooses to present new words. It is static after the diglot reader is written. There is no feedback or assessment of performance except for the visual reminder of progress that is inherent to the diglot reader. Learners can see the foreign words get increasingly thicker and they must decide themselves whether or not they understand what they read.

Attempting to correct for these weaknesses, for this Master’s project, learning guidance was given through telephone calls and a detailed introduction that included suggestions for success. Assessment took place during the pretest and the posttest. Feedback came through the built-in translation and the record playback feature built into the BMSDR. It also came through test scores.
Instructional Materials

The program was created using a program called iShell (2002), which separates the programming engine from the content. This makes it theoretically and practically possible to switch the media files so that the program can gradually move from Spanish to English, French to Italian, and potentially every other romance language. Languages based on other alphabets could possibly be used with this tool, but there would probably need to be ways developed to account for new symbols, using Unicode.

Figure 1 shows the splash screen for the BMSDR. Following the splash screen, the main menu appears automatically.

![Figure 1: Splash Screen](image)

The chapters are accessible through the main menu, which is shown in Figure 2.
Figure 2: Main Menu

Inside of a chapter, one can return to the menu by clicking on the button in the middle of the screen that looks like a house. The house button appears in Figure 3, which is a screen shot of the BMSDR learning interface.
The BMSDR begins in English and introduces about seven new Spanish words every hundred words. It uses 15 chapters of *The Book of Mormon Stories*. These chapters have a total of 5,417 words. Overall, 399 new Spanish words are introduced in the reader. These numbers exclude names of people like *Nefi*, *Lehi*, and *Moroni* because they are so similar in both languages.

Each Spanish word is “clickable” so as to hear a native pronunciation audio file. This is made possible through a text element offered by the program iShell. The text element accepts Rich Text Format files (RTF files). Words in the RTF files that have a strikethrough are recognized as “hot text,” which, when clicked, trigger commands to retrieve the “hot text” and play an audio file named identically to the “hot text.”
feature is significant because without changing one line of computer code, one could
switch the RTF and audio files to a completely different language, easily creating another
language program.

There is a button that enables one to record one's voice (through the computer's
microphone) and play it back in order to compare it against the pronunciation of the
native sound file in the program. As seen in Figure 3, the record button looks like a
microphone and the playback button looks like a speaker. Also, the ability to see the
translation of words is available by clicking on the word while holding down the shift
key.

One moves forward and backward through the BMSDR by clicking on small
arrows located at the bottom of the plates. Between these arrows appear the current page
displayed and the total number of pages in the chapter. Clicking on the forward button
when the last page of the chapter appears in the display advances the program to the next
chapter. Conversely, clicking on the back button on the first page of the chapter causes
the program to go to the previous chapter. If one reaches the last page of the last chapter
and clicks the forward button, the BMSDR returns to the main menu. The same result
comes from clicking the back button when page one of chapter one appears in the
display.

The last feature of the BMSDR is beautiful illustrations accompanying every page
of text that are owned by the Church of Jesus Christ of Latter-day Saints. The Church
gave the developer permission to use the images for educational purposes at Brigham
Young University.
Product Evaluation

The evaluation of the project consisted of one-to-one evaluations and a small-group evaluation.

One-to-one Evaluations

The single subject evaluations of the product played an important part in developing the program. The author held eight successive one-to-one evaluations of the product with volunteers from the target population.

These evaluations followed a predetermined procedure. Before beginning their one-to-one experience, the volunteers were informed that they should vocalize their thoughts as they progressed through the program. They were shown an example of how this was to be done by the author, and were informed that any difficulties they may have would reveal deficiencies in the program rather than learner deficiencies. After the volunteers felt comfortable with the process, the author observed the volunteers practice the program for thirty minutes as they vocalized their experience while they studied.

During the evaluations, the author carefully looked for problems with the program. When he found that two consecutive one-to-one evaluations revealed a similar problem, he changed the program attempting to fix the problem before the next one-to-one.

The first two one-to-one evaluations revealed that the program needed an introduction to explain the features and give suggestions on using the program. An introduction video was developed and built into the table of contents called “Introduction: Welcome.” It was a three to four minute video that introduced the diglot reader, its features, and some learning suggestions. The video was tested in the next evaluations.
Volunteers of the third and forth one-to-one evaluations skipped right over the introduction as though it were not even in the table of contents. They struggled through the features of the program without the help of the introduction. It was evident that the introduction needed to attract more attention so that the users would select it first. The name of the introduction was changed to “Introduction: How to Use the Program.”

The new introduction title proved effective during the next evaluations. The fifth and sixth volunteers went straight to the introduction. However, they could not remember how to get the translations to appear after watching the introduction and beginning the first chapter of the reader. The three to four minute video had too much information for people to remember.

The author decided that there needed to be either a help button that could refresh the user’s memory on the features and/or a more interactive introduction that would teach the features more effectively. The new interactive introduction would stop after explaining each feature and ask the user to practice the feature before continuing with the introduction. The more interactive introduction is discussed in greater detail later in this report.

Another problem identified in these evaluations was the introduction of “le dijo a” all together. The volunteers found the introduction of three new words confusing and spent considerable time trying to figure out what they meant. The reader was changed so that “dijo” and “le” and “a” were all introduced separately.

Three insufficient translations were identified. The word “dijo” needed its translation expanded from “said” to “said/told” and “las” and “los” from “the” to “the/them.”
The final problems were due to how one of the users incorrectly used the program. He used it in a way that could hamper progress. On every word, he clicked for the translation. He even checked for the translation when he understood the word from the context. He also tried to pronounce the words before he had listened to the native pronunciation. After he mispronounced the words, he tended to mispronounce them even after he had heard the native pronunciation.

Before the small-group evaluation, the author created an interactive introduction, a help button, and made the changes to “le dijo a” and the translation table mentioned in the previous paragraphs. No changes were made for the incorrect use of the program because it only occurred in one single-subject evaluation.

The introduction was created as follows. The introduction has numbers at the top that allow the learner to skip to any part of the introduction at anytime. Figure 4 gives a screen shot of the first part of the introduction.
The Introduction is divided into nine parts. The following list gives the name of each part of the introduction in italics and then describes the section in regular text:

1. *The Diglot Reader* explains what diglot means and how a diglot reader works.

2. *The Pronunciation Feature* shows how Spanish words, if clicked, will playback a native recording of the word.

3. *Practice Pronunciation* encourages the learner to try out the pronunciation feature in the actual diglot environment.

4. *The Translation Feature* explains that if one holds down the shift key and clicks on a Spanish word, then the English translation of the word will appear.
5. *Practice Translation* gives the learner a chance to try out the translation feature in the actual diglot environment.

6. *The Record/Playback Feature* explains how to use the microphone to record one’s voice and then compare it to the native pronunciation provided by the pronunciation feature.

7. *Practice Record/Playback* allows an opportunity to try out the record/playback feature in the actual diglot environment.

8. *Summary and Menu* gives a brief explanation of all the features once again and reviews how to use the main menu.

9. *Suggestions for Success* is an important section that tells the learner to read text out loud, compare one’s own voice to the native pronunciation, and only to look at the translation when necessary.

The help section is similar to the introduction but smaller. It contains only parts two, four, and six of the introduction so as to give the learner a quick reminder as to how each of the features works. A user enters the help section by clicking on the word “help,” which can be seen in the upper-right-hand corner of Figure 3.

The seventh and eighth one-to-one evaluations took place simultaneously with the small-group evaluation. The author observed two boys from one family as they began the program and later when they had advanced further along in the program. The introduction still proved inadequate and needed revision for the following reasons. First, for part two of the introduction, it did not explicitly state that only Spanish text was clickable. Second, during the practice-the-feature sections, the learners did not know how to proceed to the next section until playing around with the introduction for a while to figure it out. The
introduction, perhaps, would be more intuitive if it were step-by-step. For instance, the introduction would say, “click on an underlined word.” After the learner clicks, it would give the native pronunciation and continue, “this is the pronunciation feature. You may click on any underlined word in the program to hear a native speaker say the word in Spanish. Now hold down the shift key and click on the same word.” The introduction would continue like this step-by-step all the way to the end. This would save time spent trying to figure out the introduction. The improvements described were not made for this Master's project because they were discovered after the small-group evaluation had already begun. They are suggestions for the future completion of the project.

Small-Group Evaluation

Participants. American Heritage Schools, Inc. agreed to invite the parents of the children who attend the school to test the BMSDR program. The invitation was sent via the school's newsletter. Interested parents could obtain more information by accessing a website that introduced volunteers to the program, outlined their responsibilities, and provided a means to sign up as a volunteer. The website had a short Flash movie that gave volunteers a little taste of how the program worked. Ten parents volunteered themselves and their children to participate. Altogether they constituted 30 volunteers. When many of these volunteers fell through, 15 personal family members, relatives and one friend volunteered to help. There were twenty-one volunteers who participated in the study, but only 12 of those completed all 15 chapters of the BMSDR.

Instruments. The evaluation had a pretest, posttest, and a participant evaluation of the program. Each of these sections had instructions directing participants in how to respond.
The pretest was designed to assess vocabulary acquisition, and contained fifty multiple-choice questions. Twenty-five of the questions gave a Spanish word with four possible English translations from which to choose the correct translation. The other twenty-five questions gave an English word with four possible Spanish translations. The fifty words were selected randomly from all words introduced in the BMSDR. The instrument was delivered over the web, and automatically scored by Javascript code when the volunteer pressed the submit button. The scores and answers were automatically sent via e-mail to the author. A copy of the pretest may be found in Appendix A.

The posttest consisted of two parts. The first part was identical to the pretest, and the second part was designed to assess comprehension, which presented an unencountered Spanish passage completely different than any found in the BMSDR. However, the passage contained only vocabulary that the learners saw in the BMSDR followed by a field in which participants were asked to write the passage's meaning in English. The passage was split into main ideas for scoring purposes, and emphasis was placed on the main ideas, not on exact words, due to the fact there are various possible definitions for any one word. The author identified fifteen main ideas, each of which was worth one point. A perfect score received fifteen points. The two parts of the posttest were also delivered over the web and sent to the author by email. A copy of the second part of the posttest may be found in Appendix B. The main ideas by which the comprehension section was evaluated appear in Appendix C.

Appendix D contains the product evaluation instrument. It consists of ten statements about the program to which the participants responded strongly agree, agree,
neutral, disagree and strongly disagree. The words “Please enter comments below” and a
text field for typing feedback followed each item.

**Procedures.** Parents received a newsletter that both announced the opportunity to
participate and gave a website address and phone number to sign up. Interested parents
signed up on the website. They received a confirmation phone call giving more detailed
instructions about retrieving the materials.

Participants retrieved a package from the school principal, which contained a CD-
ROM and instructions for participation. The package contained one sheet with
instructions for the parents that told them what to do to get their children started. Parents
were to access the website and guide their children through the pretest before letting them
begin the program. They had further instructions on how to help their children with the
posttest. The package also contained an instruction sheet that guided the learner in
starting the program on the computer.

Students then studied the material within a two-week time period. They could go
as fast as they wished, but were informed that they would have two weeks to complete
the fifteen chapters of the BMSDR.

Parental instructions indicated that immediately after their children had completed
the program, they should help their children access the posttest. Following the posttest, an
e-mail message was sent, thanking the participants for volunteering.

**Results.** Twenty-two volunteers participated in the study. Twelve volunteers
finished all fifteen chapters of the program before taking the posttest. The remaining ten
completed anywhere from four to twelve chapters each, but because their study was
incomplete their data was not included. (Interested readers will find a summary of
incomplete data in Appendix E.) The mean, median, standard deviation, and sample size are reported for the pretest, posttest multiple-choice, and posttest comprehension.

Two problems are worth mentioning respecting the results of the tests. First, the JavaScript code that processed the multiple-choice answers had three errors. Due to these errors, only 47 of the 50 multiple-choice responses were recorded. Therefore, the scores reflect how many the volunteers got correct out of 47. Also, Table 1 seems to have incomplete comprehension samples when compared to the pretest and posttest samples. This is because one volunteer did not complete the comprehension section of the assessment. The comprehension responses and their corresponding scores are found in Appendix F.

Table 1 presents a summary of the data for those who completed all chapters of the BMSDR.

Table 1

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Multiple-choice</td>
<td>13.17</td>
<td>13</td>
<td>11.09</td>
<td>12</td>
</tr>
<tr>
<td>Post Multiple-choice</td>
<td>30.17</td>
<td>28.5</td>
<td>10.19</td>
<td>12</td>
</tr>
<tr>
<td>Difference</td>
<td>17.00</td>
<td>19.5</td>
<td>9.72</td>
<td>12</td>
</tr>
<tr>
<td>Post Comprehension</td>
<td>9.64</td>
<td>11</td>
<td>4.59</td>
<td>11</td>
</tr>
</tbody>
</table>

Note. Pretests and posttest are the number correct out of 47 and the comprehension is the number of main ideas correct out of 15. The difference is the pretest multiple-choice subtracted from the posttest multiple-choice.
The volunteers got, on average, 30.17 out of 47 or 64 percent of the posttest multiple-choice questions correct. Adjusting for the pretest, the group learned about 17 out of 34 new words or 50 percent. A paired samples t-Test showed that the difference between the pretest and posttest multiple-choice was statistically significant \( t(11) = 6.06, p = .000 \).

Figure 5 summarizes the evaluation responses of all volunteers. The Y-axis lists the percentage of respondents who chose a given option. The X-axis gives all evaluation statements to which the volunteers responded. For example, in responding to statement number two, which says, “The introduction helped me to understand how to use the program,” about 60 percent of respondents strongly agree, about 28 percent agree, 9 percent declared neutrality, 4 percent disagree, and none strongly disagree.
The next section discusses each statement individually along with the volunteers’ response. Appendix G gives the full text version of additional typed comments.

Statement 1: The Book of Mormon Stories Diglot Reader on Computer (BMSDR) introduced new words the right speed for me. This reader introduced 399 new Spanish words within 5417 words of text. This is an introduction rate of over 7 percent, which means that 7 out of every 100 words were new to the reader. Given the overall response to this statement (over 70 percent agree or strongly agree), it seems as though most felt comfortable with the speed of introduction. The only dissenting comments were: “They went pretty fast for me, but I think that is because I only had three days to do it.” Another volunteer who only had three days to study the BMSDR and scored lowest out of those who completed the program said, “I think it should go slower.” Finally, one volunteer
thought it might be too fast for those with no prior experience: "I felt I had an advantage because I knew many words before I began. I think the introduction rate was too fast for someone who started without any previous knowledge of Spanish." The speed at which one introduces words in the diglot reader is an empirical question that deserves attention. Most volunteers in this evaluation indicated that 7 percent was about right for them.

Statement 2: The introduction helped me understand how to use the program. About 90 percent selected agree or strongly agree for this statement. Volunteers thought the introduction helped them understand how to use the program. Comments revealed that two people never used the introduction.

Although the volunteers found the introduction helpful, the author observed one family as they studied the introduction and found that it could be improved (see One-to-One Evaluation section).

Statement 3: I listened to the native pronunciation for every word. Nearly 56 percent chose disagree or strongly disagree. One person did not get the sound to work on the computer. Another dismissed the pronunciation altogether because "everyone has their own accent; so what one person says may sound different from another person." Only 40 percent of the volunteers reported they listened to pronunciation consistently.

Statement 4: I only looked at the translations when I didn't know the word. Given the fact nearly 90 percent of the volunteers selected agree or strongly agree, it appears that volunteers tried to rely on context when possible as they were instructed in the introduction.
Statement 5: I would use the BMSDR to learn Spanish. Only one person disagreed. This volunteer expressed frustration about not understanding how the grammar worked.

Statement 6: I liked the way the BMSDR introduced some Spanish word order in English (e.g. Lehi him gave the plates of brass). Most agreed with this statement (nearly 80 percent).

Statement 7: I like the way the BMSDR helps me learn Spanish. Volunteers responded to this statement affirmatively more than to any other statement (96 percent).

Statement 8: I would prefer to learn Spanish in a different way than the BMSDR. Many disagreed with this statement (around 50 percent). This statement was included to elicit feedback on how people prefer to learn language. However, one volunteer revealed the weakness of asking this of volunteers, admitting, “[I] never tried any other way.” Though the statement may have been directed to the wrong group, one volunteer made a helpful comment, “Diglot seems less stressful than other forms of study, I like it. But, vocabulary is limited to the text. Conversational Spanish is also necessary.”

Statement 9: I would not change anything about the BMSDR because I like it the way it is. Responses to this statement ranged from strongly agree to disagree and all four options received between 20 and 30 percent of the response. This statement also was designed to prompt comments, but was unsuccessful in producing useful information. The only changes that people suggested were to slow down the introduction rate and to make the program so that it would run faster on slow machines.

Statement 10: I had computer problems with the BMSDR. Many seem to have had computer problems. However, contact with the volunteers and comments showed that all
but two of the problems were due to old computers that had problems rather than the BMSDR. One family said that their computer broke and they had to use their Dad’s laptop. Another family said that the sound has not worked on their computer for six months. These last two comments were acquired through phone conversations rather than on the feedback section of the evaluation. The only problem with the program itself was that two words, apparently, produced an error when the learner clicked for translation of the word. This could easily be fixed by the programmer/author.
Schedule

The Gantt chart below gives the timeline for completing the project. The narrow lines represent the expected schedule and the wide lines represent the actual schedule. Notice that the latter tasks were not completed on time nearly as much as the earlier tasks. This is because many of the volunteers did not complete the evaluation and the author was forced to find more volunteers among family and friends. Also, the one-to-one evaluations continued on into the field evaluation because the author conducted eight rather than his expected three.

Figure 6: Expected and Actual Schedules for Project Tasks

<table>
<thead>
<tr>
<th>TIME</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
</tr>
</thead>
<tbody>
<tr>
<td>TASKS</td>
<td>1-on-1 evaluations</td>
<td>Crunch Words</td>
<td>Write diglot reader</td>
<td>Create rtf</td>
<td>Compile Program</td>
</tr>
</tbody>
</table>
Budget

Table 2 gives the anticipated and actual budgets for the project. The budgets include the author's time so as to have a realistic estimate of what a project like this would really cost to produce. Though equipment and software was provided by Family Literacy Centers, Inc. and Brigham Young University free of charge, the cost of the equipment was estimated into the final budget to better know the actual cost.

Table 2

The Expected and Actual Budget for Project

<table>
<thead>
<tr>
<th>Product or Service</th>
<th>Expected Price</th>
<th>Expected Hours</th>
<th>Expected Subtotal</th>
<th>Actual Price</th>
<th>Actual Hours</th>
<th>Actual Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-to-one</td>
<td>15/hr</td>
<td>3</td>
<td>45.00</td>
<td>15/hr</td>
<td>12</td>
<td>180.00</td>
</tr>
<tr>
<td>Crunch Words</td>
<td>15/hr</td>
<td>4</td>
<td>60.00</td>
<td>15/hr</td>
<td>3</td>
<td>45.00</td>
</tr>
<tr>
<td>Diglot Reader</td>
<td>15/hr</td>
<td>36</td>
<td>540.00</td>
<td>15/hr</td>
<td>30</td>
<td>450.00</td>
</tr>
<tr>
<td>Sound Record/Edit</td>
<td>20/hr</td>
<td>40</td>
<td>800.00</td>
<td>10/hr</td>
<td>67</td>
<td>670.00</td>
</tr>
<tr>
<td>.rtf files</td>
<td>15/hr</td>
<td>20</td>
<td>300.00</td>
<td>15/hr</td>
<td>23.5</td>
<td>352.50</td>
</tr>
<tr>
<td>Program</td>
<td>15/hr</td>
<td>10</td>
<td>150.00</td>
<td>15/hr</td>
<td>8</td>
<td>120.00</td>
</tr>
<tr>
<td>Program Revision</td>
<td>15/hr</td>
<td>0</td>
<td>0.00</td>
<td>15/hr</td>
<td>13</td>
<td>195.00</td>
</tr>
<tr>
<td>Testing</td>
<td>15/hr</td>
<td>0</td>
<td>0.00</td>
<td>15/hr</td>
<td>6</td>
<td>90.00</td>
</tr>
</tbody>
</table>
Table 2 (continued)

The Expected and Actual Budget for Project

<table>
<thead>
<tr>
<th>Product or Service</th>
<th>Expected Price</th>
<th>Expected Hours</th>
<th>Expected Subtotal</th>
<th>Actual Price</th>
<th>Actual Hours</th>
<th>Actual Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD ROMs</td>
<td>15/hr</td>
<td>4</td>
<td>60.00</td>
<td>15/hr</td>
<td>13</td>
<td>145.00</td>
</tr>
<tr>
<td>Pretest &amp; Posttest</td>
<td>15/hr</td>
<td>10</td>
<td>150.00</td>
<td>15/hr</td>
<td>8</td>
<td>120.00</td>
</tr>
<tr>
<td>Field Evaluation</td>
<td>15/hr</td>
<td>10</td>
<td>150.00</td>
<td>15/hr</td>
<td>10</td>
<td>150.00</td>
</tr>
<tr>
<td>Project Write up</td>
<td>15/hr</td>
<td>20</td>
<td>300.00</td>
<td>15/hr</td>
<td>39</td>
<td>585.00</td>
</tr>
<tr>
<td>Equipment Use</td>
<td>10/hr</td>
<td>144</td>
<td>1440.00</td>
<td>10/hr</td>
<td>199.5</td>
<td>1995.00</td>
</tr>
<tr>
<td><strong>Grand Totals</strong></td>
<td></td>
<td></td>
<td><strong>$3995.00</strong></td>
<td></td>
<td></td>
<td><strong>$5097.00</strong></td>
</tr>
</tbody>
</table>

The budget went $1102.00 over budget for various reasons. First, instead of recording only the sound files necessary for the first 15 chapters of the program specifically for this Master’s project, sound files were recorded and edited for all 54 chapters of the complete program. Two family members consented to edit the sound files at $10.00 per hour ($10.00 savings). However, they spent more time on equipment than anticipated.

Second, there was a problem encountered with the .rtf files that required 13 hours to fix. Third, the designer unwisely did not include time for revision and testing. Finally, data entry took much longer than expected and added much more time to the write up.
Critique

This critique first explains how well the program met its objectives. Next, it looks more closely at the multiple-choice items that volunteers found more difficult. Third, it points out weaknesses in the evaluation of the program. Fourth, it considers implications of this evaluation for diglot readers on computer. Fifth, it states the greatest inhibitor to the success of the diglot reader as well as a way of overcoming it. Finally, it points out the strengths and potential of the BMSDR itself.

How Well The Program Met Objectives

Before continuing, it is important to note that this discussion of objectives focuses on those who completed the entire program because the objectives were set assuming that learners would complete the entire program. As laid out in “Statement of Purpose,” the two objectives were:

1. Learners will be able to read a previously un-encountered Spanish passage of text that has vocabulary similar to *The Book of Mormon Stories*.
2. Learners will acquire 60 percent of the vocabulary they encounter from *The Book of Mormon Stories*.

The first objective was only met in part as volunteers on average comprehended about two thirds of the unencountered passage.

The program nearly achieved the second of its two objectives. Those who completed the program scored, on average, 30 out of 47 or 64 percent instead of the 60 percent stated in the objectives. Correcting for the pretest, the participants only learned 17 out of 34 or 50 percent. Why did the volunteers fail to meet the objective? Particular
words, given the low number of volunteers who got them right, seemed particularly difficult and deserve more attention.

**Difficult Words**

Individual items on the test varied in difficulty. Appendix H includes a chart that graphically represents the difficulty index for each item on the multiple-choice test. As a point of reference, the author chose to examine the items that fall below Nelson's (1995) 63 percent expected level. They are as follows: teach, teaching, beautiful, important (plural), priest, also, still, was translating, dreary, come, *oraron* (they pray), *luchar* (to fight), *la* (the), *fuego* (fire), *enseñó* (taught), *él* (he/him), *creyó* (believed), *construyó* (built), *cada* (each), *ataron* (they tied), and *al* (to the/upon). Table 3 gives the percentage of volunteers who got the word correct, the number of times the word appears in the text, and the number of times a very similar word appears in the text (e.g. *la* and *las*).

At first glance, there is an obvious weakness to most of the words, they did not appear enough in the text. Especially considering that Nelson (1995) found the ideal number of repetitions for a word to be about twelve times. Words and numbers of particular interest are bolded because of their patterns. Three of the bolded words appeared more than 12 times and the other bolded words were verbs.
Table 3

Difficult Words: Percentage Correct, Appearances of Word and Similar Words in Text, and Conjugations

<table>
<thead>
<tr>
<th>Word</th>
<th>Percentage Correct</th>
<th>Appearances</th>
<th>Similar Word Appearances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creyó</td>
<td>25</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Teach</td>
<td>33</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Still</td>
<td>33</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ataron</td>
<td>33</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Was translating</td>
<td>42</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Dreary</td>
<td>42</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>La</td>
<td>42</td>
<td>117</td>
<td>175</td>
</tr>
<tr>
<td>Cada</td>
<td>42</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Teaching</td>
<td>50</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Luchar</td>
<td>50</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Enseñó</td>
<td>50</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Construyó</td>
<td>50</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Oraron</td>
<td>50</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Beautiful</td>
<td>50</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Important (plural)</td>
<td>50</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Also</td>
<td>50</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Fuego</td>
<td>50</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Al</td>
<td>50</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Priest</td>
<td>58</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Come</td>
<td>58</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>él</td>
<td>58</td>
<td>69</td>
<td></td>
</tr>
</tbody>
</table>

Volunteers struggled with three words even though they appeared more than twelve times—*al, la,* and *cada.* In the posttest, *cada* and *la* had very good distracter words. For *cada,* many chose “every” instead of “each” and for *la,* many chose “she” or
"her" instead of "the." It, presumably because it combines two words (a and el), was difficult to pick up. This suggests that extra teaching aids may be necessary for a learner to make very fine discriminations between words.

Excepting "important (plural): importantes," none of the "difficult" words are cognates—words that look and sound alike in both languages. In the case of importantes, only one character differs between the two options. The volunteers struggled with the plural versus singular on this word.

One of the most noticeable struggles is with verb conjugations. Only 15 verbs appeared on the test, but volunteers struggled with 10 of them (about 67 percent). Volunteers struggled with 12 words that were other parts of speech. Considering there were 32 of these words in the entire test, volunteers struggled much less (only about 38 percent) than they did with verbs (about 67 percent). Because these words did not appear 12 times, definite conclusions cannot be drawn. However, further exploration of how to help learners learn verbs in the diglot reader is necessary.

Weaknesses of Evaluation of Program

This section discusses problems with the evaluation of this program. There were problems with both the design and the timing of the evaluation.

The pretest and posttest multiple-choice questions were identical, which introduced pretest sensitization problems. This could have been avoided by splitting the volunteers into groups and only administrating the pretest to one of the groups. Then the scores of both groups could have been compared to get an estimate of the amount of influence the pretest had on those who took it.
Another problem was the lack of control. Participants were asked to complete the 15 chapters regardless of the amount of time they spent on it, provided that they do it in less than two weeks. This problem could have been fixed in one of two ways. First, the study could have taken place in a computer lab at the school. In this way participants would have each spent the same amounts of time on the computers. The second possibility would be to track the time students spend on task. This type of a record would provide a control for amount of time spent on the program.

The program was distributed to the volunteers on their last day of school at American Heritage Schools. This was a poor time to ask families to participate in a product evaluation because “no school means no studying.” Many families left on vacations. Others got occupied with moving, camp, and other summer activities. To summarize, in spite of repeated reminders by phone, for most volunteers, summer activities took precedence over studying the BMSDR.

The author believes that if the evaluation had been held in conjunction with school days the volunteers would have been more consistent.

**Implications for Diglot Readers on Computer**

The BMSDR proved to be a popular program among the volunteers, and even though it did not completely meet its objectives, the program was an effective tool for helping people to learn. The creation of the BMSDR taught the author many things about the diglot reader, and as a result, helpful suggestions will be useful to those who create diglot readers in the future.

They are as follows:
1. Diglot readers need an introduction that explains how to use them most effectively. The introduction should be simple and step-by-step.

2. Verb conjugations may require additional instruction outside of the contextual diglot reader to help learners discriminate between conjugation forms.

3. Words that are similar to other words (e.g. *la* and *ella*) also may need additional instruction to help learners discriminate between them. A helpful suggestion to this problem would be an exercise that places the similar words side by side and requires that the learner recognize what distinguishes the words from one another.

4. Children have less experience with reading comprehension and require more instruction than adults in order to achieve similar comprehension levels in a foreign language.

5. Most volunteers thought the 7 percent introduction rate was comfortable, however, empirical research seeking an optimal rate of introduction is necessary. An introduction rate of less than 2 to 3 percent is not effective (Carver, 1994).

6. New words should be repeated 12 times if possible (Nelson, 1995).

**Greatest Inhibitor to The Growth of The Diglot Reader: Time**

Diglot readers require enormous amounts of time to construct and the process is difficult and tedious. Previous writers have also noted how difficult these readers are to create (Gunderson, 1993; Nelson, 1995; Silver, 1997).

The BMSDR was not an exception. A description of the process is illustrative. First, the author used Word Cruncher (1985) to find out the number of times each word appeared in the chapter and book. The frequencies provided information on how to introduce new words. If a word appeared multiple times in the current chapter, it was a
good candidate for introduction. Cognates also were selected first for introduction. Once a word had been introduced, the writer kept a record of where and which words were introduced. He also had to keep track of how fast he was introducing words. The author held copies of both the English and Spanish texts side by side to help make decisions.

Later, the author used a word processor's "find and replace" feature to change a word and all future occurrences of the word in the text. Replacing the words introduced new difficulties because many words did not directly translate from English to Spanish. The author had to make alterations manually where words did not translate correctly.

After the author had introduced and replaced all the words, he split the complete text file into its individual pages and saved them as separate documents. He also added strikethroughs to all of the Spanish words during this same step. Then the author placed these separate page files into folders for each chapter. This was all necessary for the program to run smoothly and retrieve the needed data.

Finally, the author had to build a table with a column for the words and their translations for the computer program to access as well. As stated before, writing a diglot reader is a time-consuming process.

The author found that upon finishing 15 chapters of the BMSDR he struggled to keep all the information and files straight. It was very difficult to make changes or correct mistakes. For instance, if the author discovered that he needed to introduce a word in a new place, he had to return to the original text file so that the "find and replace" feature would work (word processors cannot find and replace across documents). Then he had to rebuild changed pages as separate documents.
Yet, the author sees a solution to this problem—an application written specifically for writing a diglot reader. The application, as the author envisions it, would have the features of the word processor, Word Cruncher (1985), and tracking. The program would use the capabilities of a computer to bring all the tools necessary to make decisions about the introduction of words into one editing environment. More specifically, the application would display the frequency of words in the current chapter, the next chapter, and remaining frequencies in the entire book. It would calculate for the application user how fast he or she was introducing words. It would have the feature of simply selecting a word in English and then clicking on the target word in Spanish to change the word. The application would also have the power to export different file types. It would be able to export the whole text or separate files of the individual pages. A powerful program with these capabilities would speed up the process. Perhaps, the author roughly estimates, nearly 70 percent.

**Strengths and Potential of The Book of Mormon Stories Diglot Reader on Computer**

The most obvious weaknesses of the BMSDR were fixed during the one-to-one evaluations. The small-group volunteers did not find many problems with the program itself. The BMSDR not only helps people learn to read Spanish, it does it in a way they enjoy. Parents and children both really like the BMSDR and perhaps see its potential better than the developer himself.

As the author conducted one-to-one evaluations, volunteers raved about the program time after time. One mother asked why the program was not out on the market. She even offered to help finance the project herself to make it available to people. Another volunteer explained to the author that the program and the idea of computerized
diglot had enormous potential. The volunteer encouraged the author to begin a business and distribute the program so that it would be available to the volunteer's interested friends and neighbors.

If the author had unlimited time and resources, he would create a diglot writer application and finish the 54 chapters of the BMSDR from English to Spanish. Then he would make another version from Spanish to English. The author believes that others would respond to the BMSDR as positively as the volunteers. The program has potential as a worldwide teaching tool. It could be relatively inexpensively converted into other languages and distributed Church wide. It has direct application for a global Church. It could help pre-missionaries prepare for their missions. It could help the growing Church membership outside of the U.S. learn English. It would also become a valuable teaching resource in the homes of families all over the world. What better way to extend the influence of the Book of Mormon Stories than to use them as a tool for teaching another language while teaching values and religious principles?
References


Appendix A

Multiple-choice for Pretest and Posttest

First Name:  
Last Name:  

Instructions: For parts one and two, please choose the best translations for the words. You may click on the Spanish words to hear their pronunciation. There are more instructions for parts three and four. Remember that this test is only to help find problems with the program.

Part 1: Spanish to English

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Submit
Appendix B

Comprehension Test

Part 3: Comprehension

Instructions: Please read the passage below. Every Spanish word appeared in the Book of Mormon Stories Diglot Reader.

Muchos años ago, algunas personas viajaron a América para encontrar la libertad de religión. Las personas encontraron en América paz y una tierra hermosa. En América, las personas trabajaron mucho para vivir felices. Los Indians ayudaron las personas en América.

But el rey de where las personas had traveled no wanted que ellos should have su libertad. El rey mandó que su ejército should venir a América para luchar con las personas que lived en América. Los hombres en el ejército viajaron a América across el mar en barcos.

Las personas en América lucharon por su libertad. Ellos defeated el ejército del rey. Today, muchas personas en América enjoy la libertad gracias a our ancestors.

Now that you have read the passage, please write in the area below what the passage means in English.
Appendix C

Scoring Key for the Comprehension Test

Responses will be evaluated on whether they captured the main ideas—not the exact translation of words. The following key splits the passage into the essential ideas. Each idea is worth one point. A perfect score is worth 15 points.

Muchos años ago, algunas personas viajaron a América
Many years ago, some people traveled to America

para encontrar la libertad de religión.
in order to find religious freedom.

Las personas encontraron en América paz y una tierra hermosa.
The people found in America peace and a beautiful land.

En América, las personas trabajaron mucho
In America, the people worked very much

para vivir felices.
in order to live happily.

Los Indians ayudaron las personas en América.
The Indians helped the people in America.

But el rey de where las personas had traveled
But the king from where the people had traveled

no wanted que ellos should have su libertad.
did not want that they should have their freedom.

El rey mandó que su ejército should venir a América
The king commanded that his army should come to America

para luchar con las personas que lived en América.
in order to fight with the people that lived in America.

Los hombres en el ejército viajaron a América across el mar en barcos.
The men en the army traveled to America across the sea in ships.

Las personas en América lucharon por su libertad.
The people in America fought for their liberty.
Ellos defeated el ejército del rey.  
They defeated the king’s army.

Today, muchas personas en América enjoy la libertad  
Today, many people in America enjoy freedom

gracias a our ancestors.  
thanks to our ancestors.
Appendix D

Volunteers’ Evaluation of Program

Instructions: Please respond to the statements below to help us make this program better. Choose whether you strongly agree (SA), agree (A), remain neutral (N), disagree (D), or strongly disagree (SD). Then add any additional comments in the text field to the right of the question.

<table>
<thead>
<tr>
<th>Strongly Agree (SA)</th>
<th>Agree (A)</th>
<th>Neutral (N)</th>
<th>Disagree (D)</th>
<th>Strongly Disagree (SD)</th>
</tr>
</thead>
</table>

1. The Book of Mormon Stories diglot reader (BMSDR) reader introduced new words the right speed for me. Please enter comments below:

2. The introduction helped me understand how to use the program. Please enter comments below:

3. I listened to the native pronunciation for every word. Please enter comments below:

4. I only looked at the translations when I didn't know the word. Please enter comments below:

5. I would use the BMSDR to learn Spanish. Please enter comments below:

6. I liked the way the BMSDR introduced some Spanish word order in English (e.g. *Lehi him gave the plates of brass*). Please enter comments below:

7. I like the way the BMSDR helps me learn Spanish. Please enter comments below:

SA A N D SD
8. I would prefer to learn Spanish in a different way than the BMSDR. Please enter comments below:

SA A N D SD

9. I would not change anything about the BMSDR because I like it the way it is. Please enter comments below:

Strongly Agree (SA) Agree (A) Neutral (N) Disagree (D) Strongly Disagree (SD)

SA A N D SD

10. I had computer problems with the BMSDR. Please enter comments below:

I have additional comments. Please enter comments below:

Reset Submit
### Appendix E

#### Aggregate Group, Partial Chapters, Above 18 and Below 18 Full, Above 18 and Below

**18 Partial Descriptive Statistics**

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
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Aggregate Group, Partial Chapters, Above 18 and Below 18 Full, Above 18 and Below 18 Partial Descriptive Statistics (continued)

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Note. Pretests and posttests are the number correct out of 47 and the comprehension is the number of main ideas correct out of 15.

The Results of One-Tailed Paired Samples t-Tests Comparing Pretests and Posttests of All Groups

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<td>.045</td>
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Appendix F

Comprehension Responses

Note: scores are contained inside of parentheses. No corrections were made for spelling or punctuation. The text is literally what the students wrote without editing.

Volunteer 1—Below 18 (14)
Many years ago, some people journeyed to America in order to find the liberty for religion. The people found in America a beautiful land. In American, the people traveled many in order lived happy. The Indians helped the people in America.

But the king from where the people had traveled didn't want the they should have the liberty. The king commanded that the army should come to America in order to fight with the people that lived in America. The men in the armies journeyed to America across the sea in ships.

The people in America fought for the liberty. They defeated the armies of the king. Today, many people in American enjoy the liberty thanks to our ancestors.

Volunteer 2—Below 18 (6)
Many years ago some people came to america to have freedom of religon. the people were helped by the indians. the people from where they traveled didn't wt them to be free they commanded that that they not separate themselves but the americans fought today many people in america enjoy the liberty thanks to our ancestors

Volunteer 3—Below 18 (0)
(none)

Volunteer 4—Below 18 (7)
Many years ago, algunas personas went to America para encontrar her liberty of religion. The people encountered in america paz and una tierra her sister. The america, the people trabajaron many part ? happy. The Indians ? the People in America.

Bet the king of where the people had traveled no wanted ? they should have he liberated. The king ?? k ? should ? to America ? luchar ?? people K lived in America. Her brothers in the ?? to america across the maren ?.

The People in America ? for her libertad. The defeated the ? of the king. Today, many people in America enjoy the liberated thankyou to our ancestors.

Volunteer 5—Below 18 (4)
Many years ago some people wanted liberty and religion, Indians and Americas were there, they thought they should have a king but some people thought they should not, today Americas enjoy there liberty because of our ancestors.
Volunteer 6—Above 18 (11)
Many years ago people came to America to enjoy religious freedom. These people found a beautiful land. But they struggled greatly. The indians helped them.

But the people in the place from which they traveled did want them to have liberty. These men came across the sea in boats.

The americans fought for liberty. They defeated the bad guys. Today American enjoy freedom and we must be thankful to our ancestors.

Volunteer 7—Above 18 (15)
Many years ago some people traveled to America so they could have freedom of religion. The people found peace and a beautiful land in America. In America the people worked hard to live happily. The Indians helped the people in America.

But the king from where the people had traveled did not want them to have their liberty. The king commanded his army to come to America to fight the people who lived in America. The men in the army traveled to America across the ocean in ships.

The people in America fought for their liberty. They defeated the army of the king. Today, many people in America enjoy freedom thanks to our ancestors.

Volunteer 8—Above 18 (11)
Many years ago, some people came to America seeking the freedom of religion. The people found in America a beautiful land. In America, the people suffered much for their happiness. The indians taught the people in America. But the king where the people had traveled didn't want them to have their liberty. The king commanded that. The people in America fought for their liberty. They defeated the army of the king. Today, many people in America enjoy the liberty thanks to our ancestors.

Volunteer 9—Above 18 (13)
Many years ago, people traveled to America for liberty of religion. The people coming to America for peace in homeland. In America, people were happy. The Indians were people already in America.

But the king where the people had traveled did not want them to have liberty. The king commanded that his army should come to America and make war with the people who live in America. The men in his army traveled to America across the sea in boats.

The people in America fought for their liberty. They defeated the army of the king. Today many persons in America enjoy liberty thanks to our ancestors.

Volunteer 10—Under 18 (2)
Many years ago all the people in America was liberty of religion. The people in America should be free.
Volunteer 11—Under 18 (1)
Long time ago man's the that teach priest a they

Brother that long

Volunteer 12—Under 18 (8)
Many years ago a person landed on America to get their freedom of religion. The Indians were on America. But the King did not want anyone to have freedom. They went across the sea to America in boats.

They defeated the king. Today many people in America enjoy liberty thank you to our ancestors.

Volunteer 13—Above 18 (15)
Many years ago, some people traveled to America to find freedom of religion. The people found in America peace and a beautiful land. In America, the people worked very hard for a happy life. The Indians helped the people in America.

But the king of where the people had travelled did not want them to have their liberty. The king commanded that his army should come to America to fight with the people who lived in America. The men in the army travelled to America across the sea in boats.

The people in America fought for their liberty. They defeated the army of the king. Today, many people in America enjoy liberty thanks to our ancestors.

Volunteer 14—Above 18 (14)
Many years ago, people journeyed to America for religious freedom. The found a peaceful and beautiful land. The people in America were very happy. The Indians helped the people in America.

The king from land where the people came from didn't want them to have freedom. He commanded that they should come to America and fight with the people that lived here. The men that journeyed to America came across the sea in ships.

The people here fought for liberty and defeated the king. Today many people live here and enjoy freedoms thanks to our ancestors.

Volunteer 15—Above 18 (8)
It is talking about how people traveled to America to find the freedom of religion that they wanted. The Indians helped the people. However, once they came the King did not want to let them go. The people fought for their freedom or liberation. Today many people in America are greatful to their ancestors for giving them liberty.

Volunteer 16—Above 18 (9)
Many years ago people traveled to America to live and have freedom of religion. There were many Indians here in America. The Indians helped the people. The king of the land
that the people left did not think the people should be free. He thought he should still
govern the people here in America. The people fought the king and won. Today we
enjoy this liberty because of our ancestors.

Volunteer 17—Below 18 (0)

Volunteer 18—Above 18 (3)
Many years ago,...I don't know, It talks about the indians and freedom of religion adn
the sacrifice they made to cross the waters and come to America. Today many people in
America enjoy the liberty granted to us by our ancestors.

Volunteer 19—Below 18 (7)
But the king in that land didn't want them to have liberty. The king commanded

The people in America ___ for liberty. They defeated the wicked King. Today, many
people in America enjoy and give thanks to our ancestors.

Volunteer 20—Above 18 (13)
Many years ago, many people journeyed to America to find freedom of religion. The
people who came to America found peace and a beautiful land. In America, the people
wanted to live with a lot of happiness. The indians found the people in America.

But the king from where the people had traveled didn't want them to have freedom. The
kink commanded that his armies should go to America and fight with the people who
lived in America. The men in his army journeyed to America across the sea in ships.

The people in America fought for their freedom. They defeated the armies of the king.
Today, many people in America enjoy freedom thanks to our ancestors.

Volunteer 21—Below 18 (12)
Many years ago, some people traveled to America so they could find liberty and religion.
The people found happiness in America and new land. In America, the people found
many things. The Indians helped the people of America.

But the king of the people had traveled not wanting that they should have his freedom.
The king commanded that his friends could go to America with the people that lived in
America. The men in the city traveled to America the sea in a ship.

The people in America loved his liberty. They defeated the city of the king. Today, many
people in America enjoy the freedom and give thanks to our ancestors.
Appendix G

Volunteers’ Responses to Evaluation Statements.

1. *The Book of Mormon Stories diglot reader (BMSDR) reader introduced new words the right speed for me.*

   - They went pretty fast for me, but I think that is because I only had three days to do it.
   
   - I think it should go slower.
   
   - I felt I had an advantage because I knew many words before I began. I think the introduction rate was too fast for someone who started without any previous knowledge of Spanish.

2. *The introduction helped me understand how to use the program.*

   Please enter comments below:

   - Very good.
   
   - I cannot enter an opinion on this because I could not get it to pull up on my computer.
   
   - I didn't go to the intro

3. *I listened to the native pronunciation for every word.*
- I would have listen more but it took too much time for only having three days.

- I may have listened to one or two, but found that it didn't really help. From time to time I am around Spanish speaking people and find that like Americans everyone has their own accent; so what one person says may sound different from another person.

- I didn't know how to make sound on the computer I was using

4. I only looked at the translations when I didn't know the word.

- I couldn't figure out if you had a way to look up the words or not so I used an English/Spanish dictionary. If there is a way it should be explained better. If there is not a way it should be there so that people do not have to spend time looking them up in the dictionary. Besides, some people may not even have a dictionary. (Note: This is the same person who did not use the introduction)

5. I would use the BMSDR to learn Spanish.

- O YEA. IT'S THE BEST. I can see how this program would help people learn spanish real fast.
- Again I am undecided on this. The program was very slow to run on my computer. In fact I could only get to Chapter 4 because after that I got error messages. I had to re-boot my computer 3 times and still could not get it to run. If it were suited more for my computer I may think about doing more.

6. I liked the way the BMSDR introduced some Spanish word order in English (e.g. Lehi him gave the plates of brass).

- It gives a good feel for Spanish grammar ahead of time.

7. I like the way the BMSDR helps me learn Spanish.

- IT is a very very very very very very very very very very very very very amasing program.

- Familiar text makes it easier to understand vocabulary from the context.

8. I would prefer to learn Spanish in a different way than the BMSDR.

- THIS IS DEFFENETLY THE BEST PROGRAM EVER MAID IN THE HOLE WIDE WIDEST WORLD. YEA!!!. #1

- never tried any other way
- D1glot seems less stressful than other forms of study, I like it. But, vocabulary is limited to the text. Conversational spanish is also necessary.

9. I would not change anything about the BMSDR because I like it the way it is.

- LOOK AT THE LAST COMMENT. IT IS THE BEST.

- Please make sure that it is able to be used by all computers. Not everyone has IBM's. Also, there are slower computers and faster computers, this needs to be made for all to run at the same speed. It's not very fun to wait a half an hour for something to boot up, if it even does.

- Maybe slow down the introduction rate

10. I had computer problems with the BMSDR.

- THERE WAS TO PARTS I DON'T REAMEMBER WHERE THEY ARE BUT THE HAD SOME PROBLEMS. WHEN I WOULD PRESS SHIFT ENTER IT WOULD NOT BRING IT UP. THAT ONLY HAPPEND ON TWO WORDS.

- I just think I need a new computer

I have additional comments.
- PEACE OUT (BMSDR).

- I probably spent a total of 2 hours on this project today so I was really going. If I did it in a slower time frame I could do a better job of noticing details (like verb tense) etc.

- I think this is a great way to learn Spanish. You are working with something you are familiar with, so it comes much easier.

- Its good

- I think the program is FANTASTIC and has tremendous potential!!

- I would recommend giving this program to natives to the Spanish language and get their feedback. In going through it with my dictionary some of the words were not correct. By doing this it would ensure that things are being used properly.

- I really enjoyed this program. I would use it in my home. I did not have much time to explore it.

- I love it

- I think it would be nice if you just had to right click on a Spanish word to see the definition
Appendix H

Percentage of Volunteers Who Got Each Item Correct on Posttest

A Closer Look at Each Item

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Percentage of Respondents Who Got Item Correct