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The Development of Interactive Technology for Conveying
Symbols, Signs and Meaning for Beginning
Learners of Arabic

Samuel J. C. Smith

A dissertation submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy

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ABSTRACT

The Development of Interactive Technology for Conveying
Symbols, Signs, and Meaning for Beginning
Learners of Arabic

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This study explored how a computer-assisted second-language instructional method introduced basic Arabic vocabulary and grammar and affected vocabulary acquisition. This instructional method used audio, text and animated images to introduce the vocabulary and grammar in a meaningful step-by-step presentation. Volunteers from Brigham Young University and Brigham Young University-Idaho were randomly assigned to either a control group or an experimental group to participate in interactive Arabic language computer programs. The control group received Arabic instruction by means of computerized flashcards, while the experimental group received Arabic instruction by means of animated images. Following the treatment, the volunteers completed an online posttest to measure how much Arabic vocabulary and grammar they learned. Statistical analyses indicated that, overall, neither method was significantly better than the other for these groups of volunteers.

Keywords: computer-assisted language, second-language instruction

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Chapter 1: Introduction to the Problem

Background

Vocabulary acquisition presents significant challenges to second-language learners, especially in the earliest stages of the learning process. Learning vocabulary in any language is a challenge, even if the native and second languages are related or share many cognate words.

Many methods have been developed over the years to teach second languages using the learner's native language as the medium of instruction. For example, paired-associate learning of vocabulary is one of the most common methods for linking the native vocabulary (L1) to second-language (L2) vocabulary. A common implementation of second-language acquisition occurs with the use of flashcards with the target word on one side and the equivalent word in the student's native language on the other. Another implementation of second-language acquisition would be a list of vocabulary words with the translations beside them. While using the learner's native language is not necessarily an ineffective way to teach another language, it is not the only way.

Other methods have been developed to eliminate the use of the learner's native language as the medium of instruction. For example, I. A. Richards developed a meaningful, narrative-based method of instruction that teaches a second language without using the learner's native language (Richards, Weinstein & Gibson, 1954). This method presents basic vocabulary words associated with the simple images in a gradual, step-by-step manner of introducing new words to the learners. Learners begin with single words and then learn short phrases. The phrases are combined into sentences, starting with short, simple sentences and moving to longer, more complex ones. Vocabulary words are repeated throughout the process, with new words being gradually added.

Richards' early implementation of the meaningful, narrative-based method was limited to books that could employ only text and images (Russo, 1989, p. 433). Richards produced many paperback books for second-language acquisition for European languages and Modern Hebrew, and he began work on materials to teach Arabic but never completed them. With the exception of Modern Hebrew and Tagalog, Richards focused mainly on developing instructional materials for Indo-European languages (Richards, Schmidt Mackey, Mackey & Gibson, 1953; Gibson & Richards, 1965). Most second-language acquisition research conducted by others has likewise been limited to the study of vocabulary acquisition of Indo-European languages; comparatively little research has been done on the acquisition of Arabic vocabulary by English speakers (Alhawary, 2009; Meara, 1996). Consequently, we do not know much about how learners acquire Arabic nor which approaches work best to enable the acquisition of Arabic as a second language.

One thing we do know is that context is important for language acquisition (Cunningham, 2005; Smith, 1975). The challenge is providing enough context for the learners to acquire the meaning of the new vocabulary without becoming a distraction for learners who might come from a variety of cultural backgrounds. Paired-associate learning does not always provide context for second-language vocabulary words, whereas the meaningful, narrative-based method of instruction presents vocabulary in context. Since words in isolation are meaningless (Smith, 1975, p. 88), a method of instruction that does not provide context for vocabulary words should be expected to be less effective than one that does. The meaningful, narrative-based method addresses this problem by providing enough context for learners to interpret the meanings of the words correctly but not so much that the words will be interpreted differently by persons of different cultural backgrounds.

Richards developed his method in the first half of the twentieth century, before computer-assisted language instruction existed, using only phonographs, slide film, and other analog technology. In the 1960s, when computers began to be used for second-language instruction, he became aware of the potential that computers had to integrate multiple channels of input for second-language acquisition (SLA). He believed that at some point in the future, computers would be able to integrate images, sound, and text into a more effective presentation of the subject materials. Since Richards' death in 1979, computer-assisted language instruction has improved to the point he had envisioned. However, his method of meaningful, narrative-based instruction using interactive computer technology has still not been fully realized. There is a need for research where his method of instruction is employed to teach Arabic.

Statement and Significance of the Problem

Within the past four decades, researchers have sought improved computer-assisted instructional techniques for SLA vocabulary, but their studies have not assessed the effect of the meaningful, narrative-based presentation of vocabulary. There is limited research that can guide the instructional decisions that instructors face in their efforts to employ a meaningful, narrative-based learning method to effectively teach Arabic as a second-language. Specifically, there is a need for research that tests the usefulness of the principles of the meaningful, narrative-based method of instruction put forth by I. A. Richards.

It will be useful to determine whether the meaningful, narrative-based learning method of computer-assisted language instruction is just as effective as or more effective than paired-associate learning. Because the learner's native language is not a part of the instruction, translations into other L1s are not necessary, thereby facilitating adaptation for multiple languages.

Statement of Purpose

This study has been designed to investigate whether an interactive, computer-assisted tool based on Richards' method of instruction would be an effective tool for teaching Arabic as a second language. With respect to language learning, if this method should prove to be as effective or more effective than paired-associate learning, it will not only be applicable to vocabulary acquisition for SLA learners of Arabic, but it will also be able to be adapted for use with vocabulary acquisition for other languages as well. This study hopes to show that the meaningful, narrative-based learning method effectively introduces new languages to second-language learners and provides an effective means for presenting Arabic to them.

Research Questions

This study focused on the following research questions: is a meaningful, narrative-based interactive multimedia presentation of basic Egyptian Arabic vocabulary more effective for the comprehension, acquisition, and retention of vocabulary by beginning-level students than a paired-associate presentation of the same vocabulary? Two secondary questions resulted from this study: (a) What is the effect of the two presentations upon engaged and non-engaged learners of a second language? (b) What is the effect of the two presentations upon the associations of spoken and written representations of language and their association with meaning?

Operational Definitions

The following definitions clarify important terms used frequently in this study:

Acquisition. The attainment of vocabulary meaning in the target language as well as the attainment of the ability to decode and recognize new vocabulary in other contexts. The learners

in this study will demonstrate their acquisition of Arabic vocabulary by correctly identifying sound, text, and meaningful elements of the language.

Context. The sentence in which the vocabulary is presented as well as the implied situation in which the sentence would occur. The meaning of the word (or words) will depend on what comes before and after it (them), as well as from the accompanying image.

Effective. This pertains to the improved comprehension for the textual, audio, and representational elements of the new vocabulary words and phrases.

Engaged Students and Non-engaged Students. Engaged students in this study are defined as the Arabic students who are more likely to be intrinsically motivated to learn the materials in the treatment. The non-engaged students are the non-Arabic students who are less likely to be intrinsically motivated to learn.

Gradual. The limited, incremental amount of the presentation of the second-language vocabulary such that the ratio of new to known words does not exceed the learner's ability to comprehend the language encountered.

Meaningful. The use of "relatable and anchorable" tasks that connect what is being learned to "relevant ideas in cognitive structure"; i.e., what is already known (Ausubel, Novak, & Hanesian, 1968, pp. 107–108).

Narrative-based. New vocabulary is presented in a story, providing context for the words' meaning.

One-at-a-time. Only one new vocabulary word or grammatical concept is presented at a time.

Paired-associate learning. The learning of words in pairs so that one word in the L1 will help the learners recall the second in the L2. For this study, this consists of the English translations that accompany the Arabic in classic flashcard vocabulary lists.

Rote learning. The memorization of subject material that is not meaningful—in other words, presented outside of any context and unconnected to previously learned concepts.

Step-by-step. An incremental or “one-at-a-time” approach in which new second language elements are presented.

Chapter 2: Review of the Literature

In this chapter, I discuss the history of the use of multimedia in second-language acquisition, emphasizing the more recent history of computer-assisted tools for Arabic language instruction. I also examine the contributions of I. A. Richards to second-language instruction and discuss research that provides evidence for the importance of elements of instruction promoted by Richards such as frequency, repetition and multiple channels of input.

Historical Overview of Language Learning Technology

Multilingualism or bilingualism has always been the norm rather than the exception (Richards & Rodgers, 2001), and the teaching and learning of second languages has gone on for thousands of years. As Kulik & Kulik (1987) point out, the invention of writing as a tool in instruction transformed education millennia ago when it freed both teachers and learners from the limits and constraints of oral tradition. The invention of the printing press by Johannes Gutenberg in the 15th century made books widely available, which had a profound effect on the dissemination of information.

Beginnings to early 20th century. Modern second-language instruction had its genesis in the Western world only as recently as 17th-century Europe. Until that time, Latin still had been a living language and, as such, was the dominant language of commerce, education, government, religion, and science in much of the Western world since the Roman Empire. By the end of the 16th century, however, Latin had been displaced by vernacular languages such as English, French, and Italian. Jan Amos Komensky, more commonly known as Comenius, was one of many people who tried to reverse this trend. In 1657, he composed a complete course for the instruction of Latin as a second language entitled *Opera Didactica Omnia*, which covered the entire school curriculum. In addition to the curriculum, Comenius outlined his theory of

language acquisition. He held that language acquisition must be accompanied by sensory experience and that language instruction itself must be oral. Furthermore, according to Comenius, schoolrooms should have models and pictures of things to help convey the meaning of the language being taught. As a result, he published the world's first illustrated children's book, *Orbis Sensualium Pictus*, or simply *Orbis Pictus*, in 1658, which covered diverse topics such as botany, zoology, and religion.

This early “multimedia” technique was a picture encyclopedia for children written in Latin and German. While Comenius’ picture book was not a textbook for second-language instruction per se, a quadrilingual edition of *Orbis Pictus* in Latin, French, German, and Italian was published in 1666, allowing readers to compare the vocabulary of these four languages. The book had a long-lasting influence on pedagogy. It is not considered a precursor to audio-visual techniques employed in the classroom, but Comenius himself has often been called the father and forerunner of modern education (see for example Piaget, 1993). Concerning language learning, Comenius wrote, “All languages are easier to learn by practice than from rules. That is to say, by hearing, reading, rereading, copying, initiating with hand and tongue, and doing all these as frequently as possible” (Comenius, 1892, p. 358).

Throughout the 19th and 20th centuries, other great thinkers and linguists developed numerous approaches, methods, and techniques to assist second-language learners in learning European and Asian languages (Richards & Rodgers, 2001). These numerous approaches, methods, and techniques for second-language instruction did not specifically call for multimedia to be used in language instruction. It is important to note that, in the field of language acquisition, the words *approach*, *technique* and *method* are not synonymous, but have specific

meanings. American applied linguist Edward Anthony described the differences between an approach, a method, and a technique in the following manner:

An approach is a set of correlative assumptions dealing with the nature of language teaching and learning. An approach is axiomatic. It describes the nature of the subject matter to be taught. ... Method is an overall plan for the orderly presentation of language material, no part of which contradicts, and all of which is based upon, the selected approach. An approach is axiomatic, a method is procedural. Within one approach there can be many methods.... A technique is implementational—that which usually takes place in a classroom. It is a particular trick, stratagem, or contrivance used to accomplish an immediate objective. Techniques must be consistent with a method, and therefore in harmony with an approach as well. (Anthony 1963: 63–67 cited in Richards & Rodgers, 2001)

One of the earliest methods of second-language instruction was the Grammar Translation Method, which began in Prussia at the end of the 18th century and remained popular until the early 19th century. The Grammar Translation Method was developed as a follow-on from traditional approaches to teaching classical Latin and Greek (Richards and Rogers, 2002, p. 5). Even after Latin had been replaced as the most widely studied foreign language in the Western world, the study of Latin grammar became the model for foreign language study until the 19th century. In the Grammar Translation method, students learn how to read literary texts in the target language and focus their learning on reading and writing. Vocabulary and grammar are learned from bilingual word lists, and the students' mother tongue is used as the medium of instruction. Unfortunately, this method neglects the students' speaking and listening skills, and

most students end up unable to use the target language for oral communication (Richards and Rogers, pp. 6-7).

No doubt influenced by the underlying philosophy of the Grammar Translation Method, Francois Gouin (1831-1896) attempted to learn the German language by memorizing a German grammar book, a dictionary, and a table of more than 200 irregular verbs. Despite the volume of language stored in his memory, Gouin found that he was unable to converse in that language. Gouin's experience memorizing grammar rules and vocabulary lists, while excluding interactions with native German speakers, demonstrated the serious limitations of the assumptions he made regarding the best way to learn a second language (Gouin, 1892). Three years after Gouin's attempt to learn a language through memorization, he had an experience that led him to develop a different outlook.

When Gouin returned home from Germany, he saw that his three-year-old nephew had learned to speak French during his absence, leading him to marvel at how a child could learn a language in three years while he had failed to master a new language in the same amount of time. From his observations of his nephew, Gouin later developed the Series Method, which employs a direct, conversational approach with no grammatical analysis and no vocabulary list memorization.

In this method, an instructor would use a series of five or more sentences describing a logical sequence of actions that would take place in a specific context, such as opening a door or chopping wood, to introduce new vocabulary. The sentences ideally would contain action verbs using the same tense and person. New words were repeated in each succeeding sentence, with more being introduced gradually as the learners became familiar with the vocabulary.

The limitations of the Grammar Translation Method also led to the development of the Direct Method, which is based on natural language learning principles wherein the target language is used exclusively as the language of instruction. Students using this method are actively involved in using the target language in everyday situations and are encouraged to read, speak, write, and think in the target language. The main drawback to the Direct Method is that instructors with native or near-native ability in the target language are essential. The method is more dependent upon the instructor's skill than on textbooks, and not all instructors are sufficiently proficient or effective enough as instructors of a second language. One proponent of this method was Maximilian Berlitz (1852-1921) who developed and marketed his own version. He called it the "Berlitz Method."

20th century multimedia tools for second language acquisition. At the beginning of the 20th century, there was an increased demand for second-language instruction worldwide. Since native-speaking instructors for the target languages were not always available, various audio and visual devices were integrated with the different learning methods to allow learners to hear the target languages spoken by native speakers. At first, audio recordings on phonographs were used as the medium for presenting authentic language pronunciation; other technologies, such as tape recorders, were implemented as they became available. Although such technology provided opportunities to hear the language without a native instructor present, the audio quality was often not high, depending on the medium, and the phonograph records were cumbersome and susceptible to scratches, warping, and other damage. By mid-century, other tools for second-language instruction included 16mm and 8mm sound film, audio tape, and television (Gibson & Richards, 1965). In the 1960s, computers were added to the list of technology used for second-

language instruction. At the end of that decade, computer-assisted instruction programs began to appear for several languages, including Arabic.

In the 1970s, numerous computer programs were designed to teach the different varieties of Arabic vocabulary and grammar to second-language learners. For example, Abboud and Bunderson (1971) began developing instructional software for computer-based instruction systems at the University of Texas at Austin in the late 1960s, completing their first version in 1971. This instructional software, which integrated audio, text, and images, was designed to instruct adults in Modern Standard Arabic and provided instruction in recognizing the letter forms, vocabulary, and grammar. Written for the IBM 1500, the software incorporated various media for input and output, including a light pen that students could point at the screen to indicate their responses, a keyboard for typing answers, an image projector, and an audiotape recorder that played Arabic and recorded students' responses. Students were periodically graded on the materials, and a score of 90% and above would allow them to advance to the next level. Allen (1972) did a study of Abboud and Bunderson's program and predicted that computer-assisted language instruction would help instructors as much as "blackboards and books" (p. 53), and that there would be an increase in the use of computer-assisted language instruction in teaching as computers became more common. Abboud and Bunderson's computer software was updated and improved at least until the 1980s (Abboud, 1981).

Belnap (1993) reported on a computer-assisted Arabic program that he and Dr. Dilworth Parkinson of Brigham Young University developed in the early 1990s. Their program, which integrated audio and text, instructed and drilled students on Arabic vocabulary, grammar, and letters. By this time, technology had advanced so that audio tapes were no longer necessary for

students to hear spoken Arabic. This program integrated audio files into the computer program itself, which students could hear as often as they wished with a simple click of a mouse button.

New millennium. Cushion and Hémard (2002) described various advances that have been made in computer software that employed non-Latin scripts up until the beginning of the new millennium. A year later, they reported on a successful Arabic program designed for beginners at London Guildhall University (2003). Like Belnap and Parkinson's program, this "Arabic for Beginners" course was designed to integrate audio and text to reinforce word recognition through the association of sound and word meaning (p. 262).

Nielson and Carlsen (2003) reported on an interactive, internet-based Arabic program developed at the University of Southern Denmark. Like Abboud and Bunderson's program, this program, called ArabVISL, was designed for more advanced students of Arabic who wish to analyze Arabic grammar in greater detail. Using ArabVISL, students can analyze Arabic sentences in vertical or horizontal tree structures. ArabVISL is an effective tool for grammar practice, but not a tool for the general student or beginner.

Within the past four decades, technology-assisted Arabic instruction has evolved from audio cassettes and slide presentations to videocassettes, DVDs, computer-assisted language learning programs, and the Internet. Advances in computer-assisted language programs have resulted in an increase in students' abilities to access and understand native speakers and cultures (Blyth, 1999) and an increase in student achievement with the language (Kulik & Kulik, 1987).

Factors to Consider When Using Technology for L2 Instruction

While technology for language learning may entertain and impress the learner, its primary purpose must be instructional if its full potential to facilitate the learners' acquisition of the language is to be realized. One of the earliest visionaries to recognize the potential for using

technology to present vocabulary using meaningful, step-by-step techniques to facilitate language acquisition was I. A. Richards (1968). Before exploring his ideas in detail, it will be useful to examine recent research that provides evidence of the importance of frequency effects and reinforcement through repetition; these are principal elements that reinforce the value of Richards' contributions.

Frequency and repetition. Frequency, or the number of times a word is encountered for it to be learned, is a factor in vocabulary acquisition for both first and second languages. Exposure to new words multiple times increases learners' knowledge of how words fit together properly in a sentence and helps learners in the development of their expressive vocabulary (Cunningham, 2005; Greidanus & Nienhuis, 2001; Rott, 1999; Scott, 2005). An expressive vocabulary consists of words whose meanings a person knows well enough to feel comfortable using while speaking or writing. This is generally smaller than receptive vocabulary, which includes words whose meanings are only partially understood.

Ellis (2002) demonstrates that the more a word or a phrase appears in instruction or daily usage, the more likely it is that a person is going to remember the meaning of that word or phrase. Frequency of appearance and usage, therefore, is "a key determinant" (p. 144) of language acquisition because language "rules" emerge from learners' continued lifetime analysis of the characteristics of the language input. While learners become accustomed to the rules and vocabulary of the target language the more they are exposed to it, they ultimately have to figure language out themselves. Gass and Mackey (2002) agree to a point with Ellis that frequency plays an important role in second language acquisition, but contend that it does not answer all the questions. They ask, "If learning is based on frequency in the input... how does one learn what is ungrammatical?" (p. 254). Overall, Ellis' thesis of the importance of frequency is convincing,

but frequency does not provide all the answers; Gass and Mackey expect that as research continues on this subject, questions about the role of frequency in second-language acquisition and how it relates to other aspects of language acquisition will be answered (p. 257).

Bybee and McClelland (2005) argued that repetition leads to fluency and integration. Citing examples from psychologists who studied the effects of practice and repetition on human performance in various skills, they pointed out that the more one performs a task the more quickly and efficiently one eventually does it (p. 384). Webb demonstrated in his studies (2007 and 2009) that “repetition affects incidental vocabulary learning from reading” and that second-language learners who encounter an unknown L2 word more times in informative contexts demonstrate significantly larger gains in vocabulary knowledge than learners who have fewer encounters with an unknown L2 word (2007, p. 64).

Bush, Melby, and Lewis (2011) have shown that the idea that repetition is an important aspect in second-language instruction has diminished in importance since Noam Chomsky’s scathing review in 1959 of B. F. Skinner’s book, *Verbal Behavior*. Chomsky’s attack on Skinner’s behaviorist theory of language acquisition led to the demise of the Audio-Lingual Method of second-language acquisition because it had become associated with behaviorism. Chomsky’s concepts of Universal Grammar and Generative Grammar, which were the central principles used to discredit the Audio-Lingual Method, gained credibility to the point that the Audio-Lingual Method has all but disappeared in practice and, along with it, repetition as an acceptable pedagogical technique (p. 4). Citing research by various applied linguists, Bush, Melby, and Lewis showed that there is value in repetition in second-language acquisition without promoting audio-lingualism (p. 6). Their conclusion is that repetition and frequency are

important tools for second-language learners as long as the activities in which these principles are implemented are meaningful and engaging.

Pictures as contextual support. Carpenter and Olson (2011) demonstrated that “one of the more common findings in memory research is that pictures are remembered better than words” (p. 1). They pointed out that pictures and videos can have a positive effect on the understanding and comprehension of foreign language text and that images and video promote comprehension better than verbal definitions or prereading questions (p. 2). However, they cautioned that this is not always the case, as Lotto and de Groot (1998) showed with native Dutch speakers learning Italian. In their study, Lotto and de Groot paired Italian words with either pictures or Dutch translations. After encoding these items, the participants were given a cued recall test covering the Italian words using the same pictures of Dutch translations as they had previously seen. Accuracy of recall did not differ according to whether the Italian words were learned from pictures or from the translations.

In their study, Carpenter and Olson discussed why some research indicates that images and pictures do not consistently benefit the learning of second-language vocabulary. For example, they conducted a series of experiments in second-language acquisition using Swahili vocabulary. In the first two experiments, there was no significant difference in the mean scores of participants who were presented with images and vocabulary compared with those who were presented with only the vocabulary. In the third experiment, however, some of the participants were cautioned against being overconfident that pictures would help them. The result was that the participants in the image and Swahili vocabulary group, who were cautioned against overconfidence, received a mean score that was significantly higher than not only the

participants in the image and Swahili group who received no warning, but also those in the vocabulary only group who had been cautioned.

Carpenter and Olson concluded that using pictures and words together is more effective than using only words to teach vocabulary, but factors such as overconfidence on the part of the learner can and do effect recall and comprehension (p. 8).

Captions and subtitles as contextual support. Numerous studies have shown that using captions or subtitles with video presentations of a second language are more effective ways of second-language instruction than video presentations without them (Borrás & Lafayette, 1994; Danan, 2004; Guillory, 1998; Vanderplank, 2004). The conclusion derived from this research is that combined input of video and text are effective principles in helping learners recognize and retain new vocabulary words.

Vanderplank (2010) showed that second-language students who watched videos with captions recognized more words from the passages in the listening test than those who watched un-captioned versions of the videos (p. 15). He also pointed out that the students who watched the videos without captions did significantly worse than the other groups in the experiment (p. 19). Borrás and Lafayette (1994) likewise found that students in their experiment who were in the close-captioned group scored higher than those in any other group.

Not only do captions help with word recognition, they also provide reassurance to learners, as Danan (2004) notes:

Captions relieve some of the anxiety experienced by students who sense they have missed an important element and sometimes give up watching because they feel lost. Instead, captioning allows learners to relax, grow more confident in their ability to understand, and direct their mental energy to actual learning. (p. 75)

Guillory (1998) succinctly states the effectiveness of captioned video presentations of second languages thus: “information coming through two channels is better than one” (p. 91).

Dual coding. In the early 1970s, Allan Paivio developed the dual-coding theory (1971) to explain how the human mind processes and organizes visual and verbal inputs. Paivio postulated with his dual-coding theory that there are two cognitive subsystems in the human mind: one for processing non-verbal input such as images, and another for processing auditory-vocal input (1986, p. 57). Paivio theorized that the mind processes both verbal and non-verbal information differently along different channels, creating separate representations for the information processed in each channel. The visual and verbal codes for representing information are both used by the mind to organize new information into knowledge that can be stored, retrieved, and acted upon.

The human mind has difficulty dealing with auditory and visual inputs that do not complement each other. If, however, the images and the audio paired with them do complement each other, the mind remembers the input better. Paivio pointed out that “one system triggers activity in the other” (p. 62). Figure 1 gives a representation of the interaction of the different types of input in the mind. Numerous studies have since confirmed the validity of the dual-coding theory (Nelson, Reed & McEvoy, 1977; Nelson & Castaño, 1984; Danan, 1992; Mayer, Moreno, Boire & Vague, 1999; Carpenter & Olson, 2011).

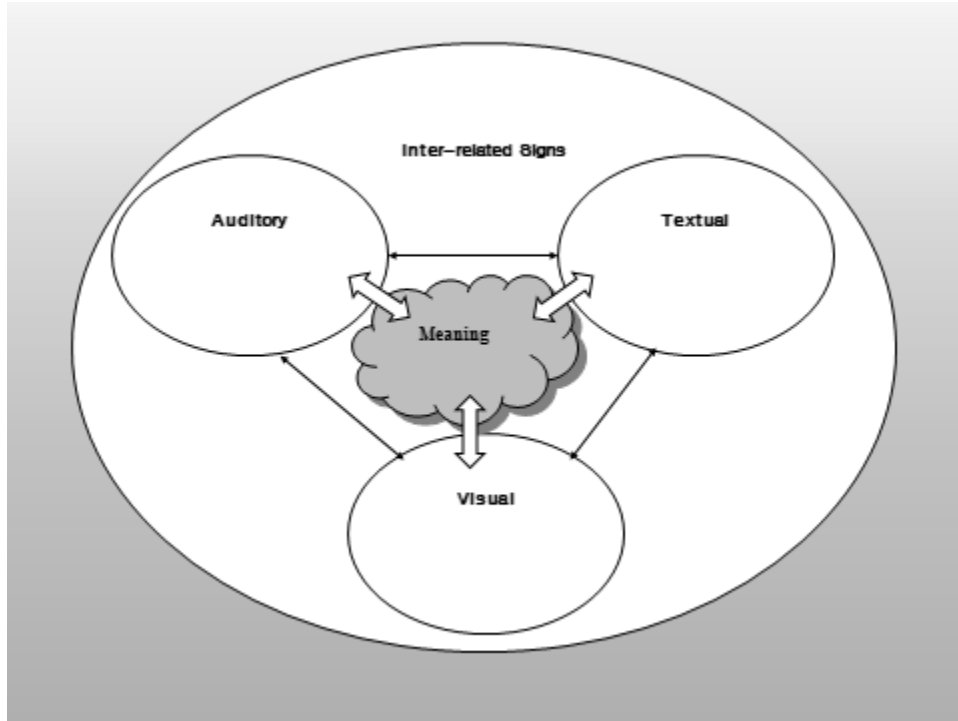


Figure 1. Interaction of input in the mind.

Paivio's dual-coding theory is complemented by Alan Baddeley's working memory model (Baddeley, 1992). In 1974, Alan Baddeley and Graham Hitch developed the working-memory model to describe a more accurate model of short-term memory. In this version of the model, they proposed two formats for temporary memory storage: one for speech and the other for visual and spatial information (Engle, 2010, p. 17). Baddeley and various other research associates have continued to expand the model, and it has become the dominant view in the field of working memory. According to Baddeley (1992), "the concept of working memory has increasingly replaced the older concept of short-term memory" (p. 556).

Baddeley's original model consisted of three main components: the *central executive*, the *phonological loop*, and the *visuo-spatial sketchpad*. The central executive is the supervisory system that controls the flow of information to the phonological loop and the visuo-spatial

sketchpad. These two latter components are short-term storage systems that are dedicated to a verbal content domain and a visuo-spatial domain respectively (p. 556).

The phonological loop deals with speech-based information and it is subdivided into two parts: a *phonological store* and an *articulatory rehearsal component*. Baddeley theorizes that any auditory verbal information enters the phonological store where it is held for one to two seconds. Visual verbal information, such as printed words or nameable pictures, can be encoded in the phonological store, but only after being transformed into phonological code by silent articulation (p. 558).

Baddeley's research has shown that the phonological loop plays a role in long-term phonological learning, such as in acquiring vocabulary in either one's native or a foreign language. He concludes that "the evidence supports the view that short-term phonological memory is crucial in the acquisition of vocabulary" (p. 559).

Meaningful content. Ausubel, Novak, and Hanesian (1968) have demonstrated that learning is most effective when it is meaningful—that is, the new information being acquired is relatable to what the learner already knows (p. 27). Smith (1975) explains it this way:

We do not comprehend indiscriminately, but rather in terms of what we are looking for, in terms of what we want to know. We use what we know about the world in order to make sense of it, not blindly, but by seeking information that will answer specific questions. The true art of making sense of the world lies in knowing what can be safely ignored. (pp. 34–35)

It is cognitively more demanding on a learner to create a new item in his or her memory than to introduce a similar item into an already existing memory through the activation of existing mental schemata. In other words, it is easier to attach a new name to a familiar concept and then

notice differences between the ideas (Ellis, 2002; Lotto & de Groot, 1998; Scott, 2005). When learners recode new information to make it more familiar, it is easier for them to remember this information and consequently they have higher recall and inference capacity (Jiang, 2004; Jones, Levin, Levin & Beitzel, 2000).

Richards' Ideas on Using Multimedia in Language Learning

More than a decade before Paivio published his theory of dual-coding, English literary critic and scholar Ivor A. Richards developed a meaningful, narrative-based presentation of a second language using a gradual, stepwise presentation of language elements. Richards pioneered his method of second-language instruction with his collaborator, Christine M. Gibson, using the *Language through Pictures* series of books that they published in several languages (Russo, p. 433). During World War II, Richards recognized the effectiveness of motion pictures for instruction and devoted an entire chapter in his book *Basic English and Its Uses* to the idea of using "teaching films" to teach Basic English (pp. 91–102). Basic English is a simplified form of English that was created by Richards' associate, Charles Kay Ogden, to be both an international auxiliary language and an aid for teaching English as a second language. Richards optimistically closes the chapter with the following:

We should not let ourselves be too much influenced by the fact that [cinema] has been hitherto, on the whole, a toy. That very fact, by associating pictures so firmly with pleasure, has prepared the way for its greater uses. The cinema has grown up, at last, through instructional films made to meet war needs. We have to turn it now to the service of reconstruction and peace. (p. 102)

Since these early developments, the use of interactive video and other computer-assisted media has been demonstrated by many researchers to be effective aids to instruction, as long as

these tools are used correctly (Belnap, 1993; Blyth, 1999; Christensen, Merrill, & Yanchar, 2007; Crotty, 1984; Denning, n.d.; Kreiner, 1997; Kulik & Kulik, 1987; Lawson, Bodle, Houlette, & Haubner, 2006; Richards, 1960; Schaeffer, 1979; Verano, 1987).

In a later book entitled *Design for Escape: World Education through Modern Media* (1968), Richards wrote that he had nine “chief points” that he wanted to bring to the reader’s attention. For example, Richards stated that the only known way to produce effective people is through education and that this education must use a language that is effectively geared into actuality and action. While the specific type of language that Richards was promoting in his book was Basic English, his points are applicable to second-language acquisition in general. For second-language acquisition, Richards stated that instructional media that employs the eyes and ears must be used together, and the best media for language education are audio, visual, and “computer-handled” (p. 3).

The languages for which Richards developed instruction are Arabic, English, French, German, Hebrew, Hindi, Italian, Russian, Spanish, and Tagalog (Richards, Schmidt Mackey, Mackey, & Gibson, 1953; Gibson & Richards, 1965). According to Russo (1989), Richards began to develop an Arabic language instruction methodology in 1961, based on his *Language through Pictures* series (see for example Richards, Weinstein, & Gibson, 1954), but the project did not make it past the experimental stage (p. 435). Books and filmstrips Richards developed for second language instruction in other languages are nonetheless available and provide a view of Richards’ insights into the challenges of language learning (see for example Richards & Gibson, 2005).

Richards’ method of second-language instruction. Richards used simple stick drawings to illustrate basic words, gradually advancing to more complex language or groups of

words stated in terms of known language. Richards, Weinstein, & Gibson (1954) describe this process in this way:

[T]he text is graded in its intake of both vocabulary and structural elements. Its design makes possible an orderly advance into the language, step by step. The pictorial commentary in stick figure drawings supplies an adequate running explanation of sentences in the earlier sequences. Later, ideas as well as objects can be talked about with the help of words already taught. The book is largely self-reviewing. (p. v)

Stick figures were chosen as the medium of presentation in Richards' materials because they are easy and inexpensive to produce, and—most importantly—culturally neutral so the same figures can be reused for any language (Russo, 1989, p. 445).

Richards (1943) showed that an effective way for second-language learners to learn a language is to build upon the elements of the language that they already know (pp. 39-40). This can be likened to priming a water pump: old pumps need to be primed when air seeps into them causing a loss of pressure. By pouring water into the pump (priming), the pressure is restored and the necessary suction is created for the water to be drawn up from the well. Arabic provides the challenge that for many Western learners, there is little water in the pump already—that is there is little prior knowledge of vocabulary and grammar to build upon.

This progression is designed to parallel the learner's skill level, the one increasing as the other increases. The idea that new knowledge must relate to what is previously known constitutes a crucial concept for second language acquisition if learners are to grasp and comprehend elements of the new language (Smith, 1975, p. 10).

Scaffolding in Richards' method. Richards' use of a narrative-based, meaningful presentation of vocabulary using audio, text, and images provided “scaffolding” for the earliest

stages of second-language acquisition. Gibbons (2002) described scaffolding as “a temporary structure that is often put up in the process of constructing a building. As each bit of the new building is finished, the scaffolding is taken down. The scaffolding is temporary, but essential for the successful construction of the building” (p. 10). In second language acquisition, scaffolding, of course, does not refer to any physical structure but to “the temporary, but essential, nature of the mentor’s assistance in supporting learners to carry out tasks successfully” (p. 10).

Scaffolding can consist of simple things such as stories, toys, and pictures. These items provide beginners with a framework for their discussions, and as their skills increase they will need fewer props to guide them in their conversations. Likewise in stories, pictures help beginning readers with meaning and context, but as the readers gain experience fewer pictures are needed.

Scaffolding, however, is not just a synonym for help. It is as Gibbons points out,

A special kind of help that assists learners to move toward new skills, concepts, or levels of understanding. Scaffolding is thus the temporary assistance by which a teacher helps a learner know how to do something, so that the learner will later be able to complete a similar task alone. (p. 10)

As far as possible, second-language learners need to be engaged with authentic, interesting, and cognitively challenging learning tasks. Scaffolding helps learners toward automaticity. *Automaticity* can be defined as the ability to do a task without occupying the mind with the low-level details required, thereby allowing the task to become an automatic response pattern or habit. Automaticity is usually the result of learning, repetition, and practice.

An Initial Computer-Based Implementation of Richards’ Method

A recent study by Pyle investigated an instructional product that was based upon techniques from Richards’ work by developing a computer-assisted learning tool that integrates

images, sound, and text in a meaningful, narrative-based, step-by-step presentation of basic Modern Standard Arabic vocabulary (Pyle, 2009). An experiment conducted as part of this particular study investigated the effect this approach had on MSA vocabulary acquisition in the initial stages of learning; however, it showed no significant statistical difference in the acquisition and retention of MSA vocabulary by students who used the program and by students who used a paired-associate learning tool (p. 63). It is important to note, as Pyle pointed out in her discussion of the data, that in the experimental group the learners were provided with no English translations of the Arabic vocabulary and were required, therefore, to deduce meanings on their own. The learners who used the paired-associate control test, on the other hand, did have English translations of the Arabic and their scores were no higher than the experimental group's in general (p. 66).

Pyle concluded that the meaningful, narrative-based presentation in her experiment did not work better than the paired-associate presentation for at least two reasons: paired-associate learning helps learners put second language vocabulary into terms of what the learners already understand, and flaws in the design of the computer presentation may have contributed to boredom, thereby diminishing the effectiveness of the program (pp. 69–70).

The research cited in his review of the literature suggests that if second-language acquisition is to be effective, the learning experience should implement four key principles: repetition and frequency (Bybee & McClelland, 2005; Ellis, 2002), meaningfulness (Ausubel, Novak, & Hanesian, 1968; Smith, 1975), and multiple forms of input (Paivio, 1986; Richards, 1968).

For this study, I incorporated meaningfulness into the narrative-based presentation of basic Arabic vocabulary and grammar while at the same time avoiding the use of the native

language. The vocabulary and grammar were introduced step-by-step in a gradual manner using repetition and frequency to facilitate acquisition. In doing so, I extended and improved upon the *Language through Pictures* interactive, multimedia presentations of both Richards and Pyle. These improvements were made to give second-language learners an engaging, interactive presentation of basic Egyptian Arabic vocabulary and grammar wherein they could hear the words pronounced by native speakers, see the written text, and use the animated images to acquire the meaning of the words. They were also able to log in to the presentation and log off at any point, and were able to return and continue where they had left off. They could go back to earlier lessons, review activities, and the alphabet page for review as often as they wished. All these improvements were designed to make the presentation of the Arabic grammar and vocabulary clear and enjoyable for the participants in the study.

Chapter 3: Method

This study examined how a meaningful, narrative-based, stepwise presentation of vocabulary using an interactive computer program employed, images, sound, and text helped beginning-level learners to learn basic vocabulary of a second language—namely Egyptian Arabic. Arabic was chosen for this study primarily because of its dissimilarity to English and other Indo-European languages that the majority of likely participants would be familiar with. As a Semitic language related to Amharic, Hebrew, and Syriac, Arabic shares no cognates with any of the Indo-European and East-Asian languages spoken by students at BYU and BYU-Idaho. Few students at either university spoke Arabic as their first language, so the likelihood of test subjects being familiar with Arabic before taking part in the experiment was small.

The primary research question addressed in this study was the following: “Will a gradual, stepwise and meaningful narrative-based interactive multimedia presentation of basic Egyptian Arabic vocabulary prove to be more effective in the comprehension, acquisition, and retention of vocabulary by beginning-level students than a paired-associate presentation of the same vocabulary?” The secondary questions are the following: (a) “What is the effect of the different presentations upon engaged and non-engaged learners of a second language?” (b) “What is the effect of the different presentations upon the associations of spoken and written representations of language and association with meaning?”

Development of the Computer Program

For this study, I designed a computer program that provides a scaffold for only the earliest stages of second-language acquisition. The set of ten lessons, review exercises, and a posttest are contained in a computer program that I have called *Yusuf's Illustrated Introduction to Egyptian Arabic*. These ten lessons were not designed or intended to be a complete course of

study for Egyptian Arabic, but the course could be expanded to include more lessons after the manner of I. A. Richards' *Language through Pictures* series.

This was the second Arabic language program based on I. A. Richards' research that I have developed for the computer. The first was designed and developed in 2008 for use in Pyle's study. While the first program integrated images, sound, and text to convey meaning of new vocabulary words, the participants who used the program had no control over the presentation of the vocabulary; they were unable to stop the presentation or return to a previous page to review a word. There were no review exercises between the lessons. Finally, the Arabic vocabulary and sentences were essentially the same as what is found in *Yusuf's Illustrated Introduction to Egyptian Arabic*, but they were written and recorded in Modern Standard Arabic. The results of the experiment of the first computer-assisted program guided the design of the *Yusuf's Illustrated Introduction to Egyptian Arabic*.

Like the program designed for Pyle's study, *Yusuf's Illustrated Introduction to Egyptian Arabic* also integrated images, sound, and text to convey meaning of Arabic words, but the images were animated to eliminate some of the ambiguity of Richards' and Pyle's static line drawings. The purpose of these simple animated images as part of this instructional method was to assist the participants in moving from perception to comprehension. The principles associated with the use of images were that images assist in learners' vocabulary recall, connection formation among words, and impressions in memory. In the presentation of meaningful language accompanied with image, images enabled learners to process the meaning of the image with the Arabic text and sound. These images in the program were based on Richards' simple line drawing design, but have been animated to reduce ambiguity in an attempt to facilitate comprehension. The accompanying sound enabled learners to hear, recognize, and ultimately to

reproduce the sounds of the Arabic vocabulary and develop sound symbol correspondence that will carry them forward in their language learning experience.

Unlike Pyle's program, *Yusuf's Illustrated Introduction to Egyptian Arabic* was designed to allow learners to control the pace of presentation. It was also interactive in that learners could view just one lesson and log off and then return another time to resume learning, or they could go through all ten lessons in one sitting if they chose. Another improvement that this program provided was that once they had gone through a lesson they could review it as much as they pleased, thereby helping with reinforcement.

Even though *Yusuf's Illustrated Introduction to Egyptian Arabic* was computer based, it still followed the core instructional technique Richards developed for his *Language Through Pictures* books. In designing this program, I aimed to produce an effective, computer-based tool using Richards' step-by-step methodology of simple pictures by adapting Richards' method to include sound, animation, and interactivity. The program also expanded upon Richards' approach by including review exercises after the lessons to help the learners solidify their knowledge of the words and phrases they would have just learned in the lessons.

Treatments for the Study

I designed two computer programs for this study, one each for the experimental and control treatments. The program for the experimental treatment presented basic Egyptian Arabic vocabulary using animated images, audio and text. The program for the control treatment presented the same Egyptian Arabic vocabulary using English translations, audio and text.

The vocabulary and phrases I chose for this project followed the patterns and sequences I. A. Richards developed for his *Language through Pictures* series. The language lessons for each language in Richards' series began with personal pronouns (e.g., I, you), simple nouns (e.g.,

man, woman), and gradually progressed to simple sentences (e.g., The woman is there). People who used Richards' *Language through Pictures* materials were exposed to these new language elements multiple times since repeated exposure was expected to help them to refine vocabulary meanings, and the gradual presentation was designed to help avoid cognitive overload.

The experimental treatment. The program for the experimental treatment consisted of the following: login and introduction, alphabet page, lessons, and review exercises. To use the program, the students first logged in (see figure 2). They provided their BYU, BYU-Idaho, or some other identification number; their gender; their year in school; their major; languages previously studied; their age; and a self-rating on a scale of one to ten of how competent they considered themselves at learning another language.

They then clicked on a "submit" button and were taken to an introduction page with an index and instructions on how to use the program (see Figure 3). The introduction provided simple, concise instructions of what to do and how to navigate. Under the instructions were eighteen buttons to take the users to the alphabet page, the lessons, or the review exercises. At first, the students could click only on the alphabet button and the button for lesson one. They could click on the buttons for the higher lessons and the review exercises only after completing the lower lessons. Once all the lessons and exercises had been completed, the students were free to view and review any lesson or review exercise they wished.

The alphabet page consisted of a chart with 30 Arabic letters with instructions underneath explaining how to hear the names of the letters. The students clicked on the individual letters to hear their Arabic names, which also provided their pronunciations. A return button on the page took the users back to the index page, or if the users had come to the alphabet page from one of the lesson pages, it would take them back to the lesson page.



Figure 2. Login page for the experimental treatment.

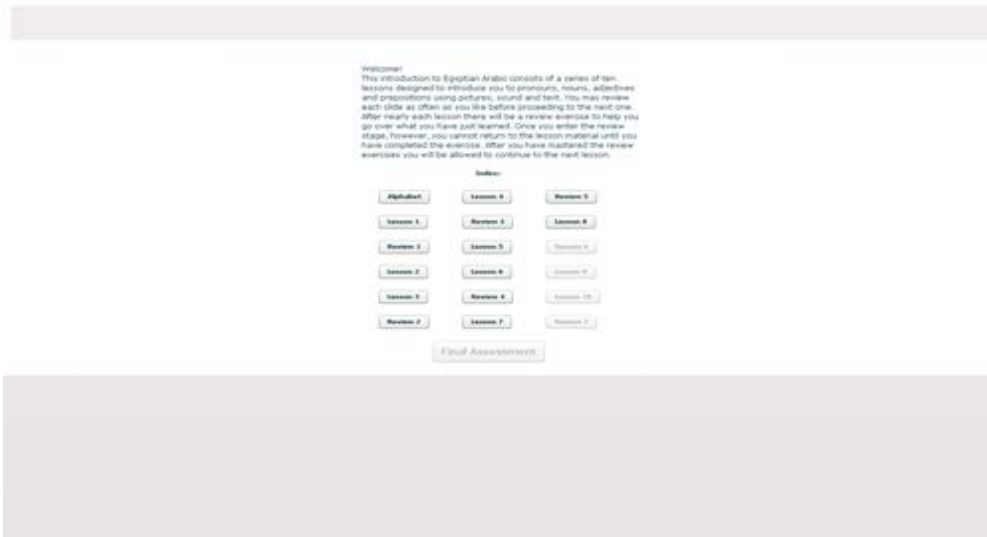


Figure 3. Table of contents for the experimental treatment.

Each lesson consisted of a number of pages, ranging from seven to fifteen according to the lesson. On each page was a picture box, simple instructions, and five buttons: *Back*, *Play Animation*, *Next*, *Alphabet* and *Home* (see Figure 4). The *Play Animation* button activated the animation in the picture box and the audio. Students could click this as often as they liked before moving forward or backward. The *Back* button took them to the previous page and the *Next*

button took them to the next page. The *Alphabet* button took them to the alphabet page whenever they wished to review the Arabic letters. The *Home* button could only be clicked on when the users had come to the last page. The *Home* button took them to the index page, where they could choose to go to the next lesson or review exercise, or go back to a previously viewed lesson or review exercise.



Figure 4. First vocabulary word in the experimental treatment.

The review exercises were designed to test the students' understanding of the relation between the meaning of the pictures, the text, and the audio. For instance, some of the exercises had the users match Arabic text with an animated picture while others had the users match the audio with either pictures or text (see Figure 5). Kirpicke and Roediger (2007) have shown that tests are not simply neutral assessments of what has been learned, but they also produce learning—possibly as much learning as studying the lessons (p. 152).

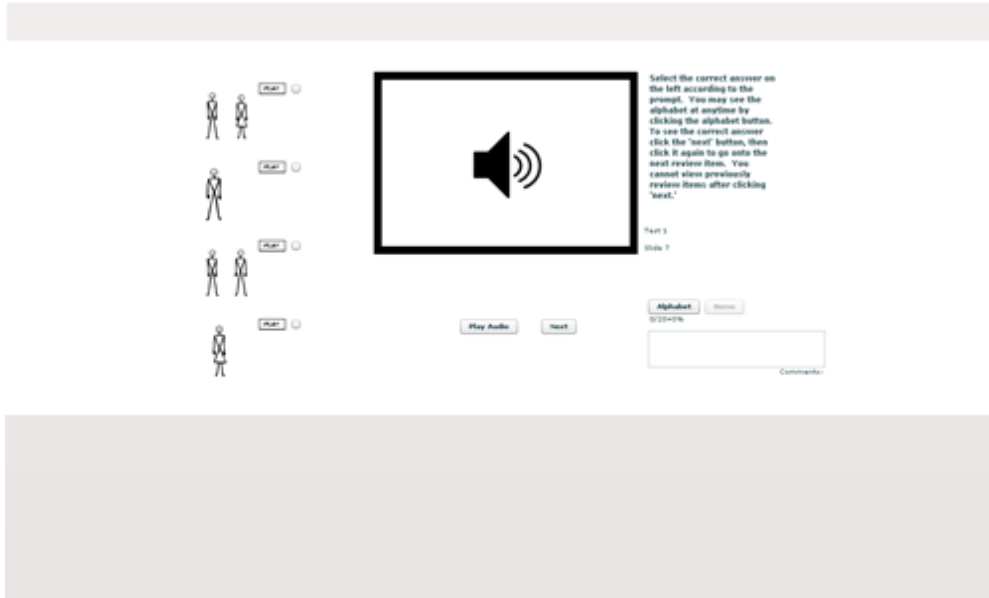


Figure 5. Review page of the experimental treatment.

Each page was set up similar to the lesson pages with a picture box and instructions to the right of it. Answer choices were to the left of the picture box and control buttons called *Play Animation* and *Next* were beneath it. Once the students had selected an answer from the options on the left side of the page, they clicked the *Next* button to find out whether the answer was correct. A green check mark would appear before the correct answer. When the students clicked on the *Next* button again, they were taken to the next page. Unlike the lessons, the students did not have the option of going back to the previous page to redo it. If they wished to redo a question on a page, they had to first complete the review exercise and then retake the entire exercise. There was also an *Alphabet* button and a *Home* button that could be clicked on only when the review exercise had been completed.

The control treatment. The control treatment was identical to the experimental treatment with the login procedure, alphabet page, vocabulary words, and their order of presentation. Vocabulary words were presented in flashcard format with the Arabic word or phrase on one “side” and the English translation on the other. There was an audio button for the

participants to click on to hear the Arabic pronunciation (see Figure 6). Like the experimental treatment, the control treatment was also divided into ten lessons, but there were no review exercises because the participants could review the vocabulary on the cards as a way of testing themselves.

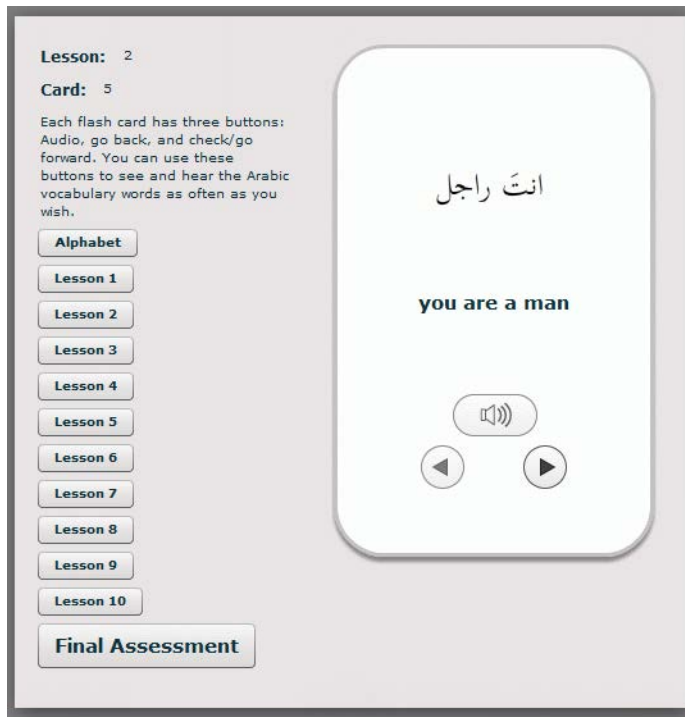


Figure 6. Flashcard from the control treatment.

Assessment of Students' Performance

The criterion measurement (dependent variable) was a 58-item multiple-choice posttest administered immediately after the treatment. This test was subdivided into four question types: (a) match Arabic text to English translation; (b) match Arabic audio to English translation; (c) match Arabic audio to Arabic text; (d) match Arabic text to Arabic audio. I developed all of the test questions based on the review exercises in the experimental treatment. The participants were not asked to match images with text or audio, because no images appeared in the control treatment and I wanted both groups to have an identical final assessment.

Reliability of the measurement instrument was determined by a Cronbach's alpha reliability procedure which yielded a coefficient of .924. In the context of this study, this coefficient indicates that 92.4% of the variance of the total scores is reliable systematic variance (Pedhazur & Schmelkin, 1991, p. 97), which is a very high degree of reliability.

After completing the exercises in either treatment, all the participants took a posttest that assessed the learning outcomes. The posttest consisted of 58 test questions similar to the questions in the review exercises of the meaningful, narrative-based treatment and was identical for both treatment groups. The participants were asked to match Arabic text to English meaning, Arabic audio to English meaning, Arabic audio to Arabic text, and Arabic text to Arabic audio. All scores were recorded by computer and sent to a separate site for retrieval and analysis.

Research Design

I designed this study to provide empirical research on the comparison of a meaningful, narrative-based method using the combined input of images, sound and text with another method employing a paired-associate learning model. The data to be analyzed would come from a comparison of posttest scores at the end of the program and from login data that the participants filled in at the beginning of the program.

Prior to this study, I had already created both *Yusuf's Illustrated Introduction to Egyptian Arabic* and another computer-based program employing a paired-associate learning method as part of a development project for my doctoral program. For my development project, I had learned that the program itself functioned as designed, but I wanted to know how effective it was as a tool for presenting basic Arabic vocabulary using images, sound and text. The purpose of this study was to determine how well this program worked in presenting basic Arabic vocabulary in a meaningful, narrative-based method using the combined inputs of images, sound and text.

Participants. Initially, students in Arabic 101 classes at BYU were invited to participate in this voluntary program as an enrichment experience in the Summer Term 2010, Fall Semester 2010, Winter Semester 2011, and Fall Semester 2011. Because of a low response rate from the Summer Term 2010 Arabic students, high school students involved in the StarTalk 2010 Arabic summer camp at BYU were invited to participate in the program with only a handful participating. I preferred Arabic students to random volunteers because of their intrinsic motivation to learn the language. Pyle's study (2009) showed that some of the participants who volunteered for her study were motivated by the monetary compensation rather than the desire to learn Arabic, so some of them found a way "to skip quickly through the presentation" (p. 67) without learning any Arabic.

Nevertheless, I found it necessary to expand the scope of my recruiting and invited full and part-time employees in the Department of Online Learning and the students of sociology and TESOL classes at BYU-Idaho to participate. These sociology and TESOL classes were chosen because their professors found the project interesting and thought it would benefit their students. The professors offered extra credit to their students who completed the program. One professor even asked if his Boy Scout troop could participate in the program because he was in need of a Tuesday night activity. Furthermore, some of my coworkers volunteered to participate in the study.

For this study, the software was designed to randomly select the participants to receive either the meaningful, narrative-based program or the paired-associate learning program. Students enrolled in the Arabic 101 courses at BYU received the same instruction, with the experimental and control treatments being used right before or on the first day of class of

Summer Term 2010, Fall Semester 2010, Winter Semester 2011, and Fall Semester 2011. All other participants took the treatment at the end of the Fall 2010 and Winter 2011 semesters.

There were 137 people who participated in this program from start to finish. These volunteers were randomly assigned to either the experimental treatment or to the control treatment; 76 participants completed the control treatment and 61 completed the experiment. The discrepancy in the number of participants assigned to each group is attributable to a number of factors: not all participants who started the treatment finished it. Some logged in, viewed parts of the tutorials, and then quit without completing the lessons or the posttest, which may be a result of participants' lack of time or impatience. Others viewed the tutorials and began the posttest, but chose not to complete it. Finally, some participants who took the experimental treatment were unable to continue from the tutorial to the posttest due to a problem with the computer program and did not complete the treatment.

Despite these technical difficulties, by the end of the various treatments I was able to collect data such that the sample sizes in each treatment were roughly equivalent as shown in Table 1. Unfortunately, due to problems with the computer program that selected subjects for the treatments, some students from particular groups were selected disproportionately, which injected bias into the study. For example, five attempts to collect data from Arabic students resulted in a small sample size of only 39 with more than twice the number of students receiving the control treatment.

Required resources for the participants. For subjects who did not have access to the software via their own computer, computer labs were available on both the BYU and BYU-Idaho campuses. Based on the time it took for participants to complete the experiment in Pyle's study (p. 53), I estimated that each participant in my study would need one to two hours to complete all

the lessons and review exercises in the program. Since the participants controlled how quickly they went through the program, the time required for them to complete the program varied from participant to participant.

Table 1
Group Cross Tabulation by Group

	Group					Total
	BYU Arabic students	BYU-I coworkers	Boy Scouts	BYU-I TESOL students	BYU-I Sociology students	
Control	27	23	6	3	17	76
Experiment	12	7	1	11	30	61
Total	39	30	7	14	47	137

I therefore found it necessary to collect data from other sources to increase my sample size. These other sources consisted of participants of various ages, academic majors, and interest levels in the experiment. Most of these participants were students of colleagues who wished to support me in my research and thus found ways to involve their students in my experiment. This resulted in a larger sample group of non-engaged participants that performed at a lower level than the engaged Arabic students. This differential selection that was made in the group of non-engaged students as well as the low sample sizes injected bias into the study.

Procedures. The participants used their personal computers or computers in labs at BYU-Idaho to access the instructional program. At the beginning of the treatment, the participants completed a questionnaire about their age, gender, and language skills, and experience (see Figure 1). They were then randomly assigned by the computer software to either the experimental treatment group or the control treatment group. The experimental treatment

group took the test *Yusuf's Illustrated Introduction to Egyptian Arabic*. The control treatment group took a test in which they were presented with digital flashcards that contained the same vocabulary words and phrases that were in the test taken by the experimental treatment group.

Both programs presented simple Arabic vocabulary words starting with subject pronouns and progressing to short sentences. After some of the lessons in the experimental treatment, the participants had review exercises to perform. These exercises consisted of matching text to images, images to sound, and sound to text. The paired-associate program consisted of the same vocabulary and sentences being presented on “flashcards” with audio and text, but without images. Instead of stick-figure images that guided the participants to infer the meaning of the vocabulary, the English translation was provided. Those who participated in the paired-associate program were free to look at, review, and advance to the next “flashcard” at their leisure. When both groups were finished with the lesson portion of the study, they were taken to the posttest.

Data collection. There were two types of data to be collected: the personal login data at the beginning of the treatment and the posttest scores. During the testing and data collection in the summer and fall 2010, I noticed that more participants were completing the control treatment than the experimental treatment. Likewise, of all those who completed either treatment, many lacked the login data. It was not until the end of Fall Semester 2010 that a participant informed us that he had had difficulty accessing the posttest after participating in the experimental treatment. A problem in the software had developed, which evidently had prevented some of the participants who had been randomly selected to take the experimental treatment from performing the posttest. They, therefore, participated in the learning and review exercises, but did not participate in the posttest, which provided a score. This explained why I was receiving more

posttest scores for the control treatment than for the experimental treatment, and this problem was corrected at the beginning of the Winter Semester 2011.

Many of the participants in both treatment groups completed the posttest, but their login data were not recorded. We consulted with the computer programmers who designed and maintained the data collection program, but were unable to discover the cause of the malfunction. I was able to track down, however, the identities of most of the BYU-Idaho students who took part in the experiment because their professors were able to match their names to their BYU-Idaho identification numbers. Some students did not use their student numbers and were not traceable. BYU Arabic students from Summer Term 2010, Fall Semester 2010, and Winter Semester 2011, whose login data were not recorded, were also not traceable since we did not know what classes they were in. StarTalk students whose login data were missing were likewise unidentifiable. For the Fall Semester 2011 Arabic students, we still had a problem collecting the login data, but were successful in retrieving those data from 20 of the 21 participants. Despite this setback, I was able to retrieve the login data for all but 16 from the entire control treatment group and all but four from the entire experimental treatment group.

Data analysis. Once all the posttest data for both treatment groups had been collected, we used analysis of variance (ANOVA) and two-tailed *t*-tests to compare the methods of the meaningful, narrative-based, and the paired-associate programs with the personal information collected from the login page. I also used these data to compare the posttest scores of the different groups of volunteers.

Chapter 4: Results

As stated previously, the general purpose of this study was to compare a meaningful, narrative-based instructional technique with paired-associate learning in order to investigate its effects on vocabulary acquisition in the initial stages of second-language learning. This was the primary research question addressed: is a gradual, stepwise, and meaningful, narrative-based interactive multimedia presentation of basic Egyptian Arabic vocabulary more effective for the comprehension, acquisition, and retention of vocabulary by beginning-level students than a paired-associate presentation of the same vocabulary? An analysis of the results from this study will be presented in this chapter.

Statistical Analysis

I measured the results of a 58-question posttest that was identical for both the experimental treatment and the control treatment. Both a *t*-test and an ANOVA were conducted on the posttest scores of the two treatment groups for all subjects. The results of the analysis in Table 2 show that there was no statistically significant difference ($p = .60$) between the scores of the two treatment groups.

Table 2
Posttest Scores of All Participants

Groups	<i>N</i>	Mean	Std. deviation	Std. error mean
Control	76	35.45	13.346	1.531
Experiment	61	35.52	11.138	1.426

$p = .600$

In addition to their posttest scores, the participants' personal data were included in the assessment to measure the effect on their test scores. These data were collected when they logged in to the program. Unfortunately, there was a problem with the program that collected the login

data that caused the login data of some of the participants to not be recorded. I was able to identify most of the participants whose login data were missing and ask them to provide those data again. However, I was unable to retrieve the login data for 15 participants from the control treatment group and four from the experimental treatment group. Using time stamps and files of data that I had collected earlier in the study, I was able to determine with some certainty the groups to which these participants belonged. As shown in Table 3, the largest group of participants consisted of 47 volunteers and the smallest consisted of seven.

Table 3
Combined Posttest Scores for All Groups

Groups of Volunteers	<i>N</i>	Mean	Std. deviation	Std. error mean
BYU Arabic students	39	43.28	10.410	1.667
BYU-Idaho sociology students	47	32.23	11.063	1.614
BYU-Idaho TESOL students	14	32.29	13.697	3.661
BYU-Idaho coworkers	30	34.03	12.901	2.355
Boy Scouts	7	26.43	4.826	1.824
Total	137	35.48	12.368	1.057

I ran a multiple linear regression analysis controlling for sex, age, previous language experience, language-learning proficiency, and the treatment groups to which the participants belonged. The results showed that females scored slightly higher than males, and older people scored slightly higher than younger people; however, none of the differences were statistically significant. In Table 4, the analysis of the data shows that there was statistical significance only between those who stated they were good at learning languages and those who stated they were not.

Table 4
Determinants of Arabic Test Scores

Model	Unstandardized coefficients		Standardized coefficients		
	<i>B</i>	Standard error	Beta	<i>t</i>	Significance
(Constant)	19.155	5.840		3.280	.001
Sex	-.467	2.217	-.019	-.211	.833
Age	-.022	0.153	-.013	-.142	.887
Control/Experiment	2.263	2.228	.092	1.015	.312
Language Studied	1.836	3.952	.042	.464	.643
Scale of proficiency	2.169	0.584	.338	3.714	.000

The null hypothesis for this analysis was that there was no difference between the means achieved by the participants in each of the treatment groups. The results from the analyses indicated that the experimental treatment had no statistically significant difference ($p < 0.05$) in the effect on the participants' posttest scores. We, therefore, fail to reject the null hypothesis.

Even though the posttest scores in general do not demonstrate a significant statistical difference between the two treatments, Table 5 shows that comparisons of sub scores in the posttest are worthy of note. The posttest consisted of four different question types: (a) match Arabic text to English translation, (b) match Arabic audio to English translation, (c) match Arabic audio to Arabic text, and (d) match Arabic text to Arabic audio (see Table 5).

Table 5
Combined Group Statistics for All Participants on Subtests

Question type	Groups	<i>N</i>	Mean	Std. deviation	Std. error mean
Match Arabic text to English	Control	76	8.39	4.109	.471
	Experimental	61	9.30	3.904	.500
Match Arabic audio to English	Control	76	17.61	6.128	.703
	Experimental	61	16.69	5.393	.691
Match Arabic audio to Arabic text	Control	76	3.99	2.056	.236
	Experimental	61	4.23	1.667	.213
Match Arabic text to Arabic audio	Control	76	5.49	2.840	.326
	Experimental	61	5.39	2.445	.313

Overall, the BYU Arabic students performed better in both treatments than the participants in the other groups as shown in Table 6. Their higher scores, however, are not statistically significant ($p < 0.05$). These results led to the secondary questions: (a) “What is the effect of the different presentations upon engaged and non-engaged learners of a second language?” (b) “What is the effect of the different presentations upon the associations of spoken and written representations of language and association with meaning?”

To answer these questions, a comparison of performance was done on the four different question types between engaged students (i.e., Arabic students) and non-engaged students (i.e., non-Arabic students). The resulting data in Table 6 show that the engaged students, on average, performed better than the non-engaged students in each of the four categories of questions. The difference in their performance was statistically significant ($p < 0.05$).

Table 6

Group Statistics for BYU Arabic Students

Question type	Groups	N	Mean	Std. deviation	Std. error mean
All Questions	Control	27	43.48	11.584	2.229
	Experimental	12	42.83	7.542	2.177
Match Arabic text to English	Control	27	10.78	3.672	0.707
	Experimental	12	10.42	3.579	1.033
Match Arabic audio to English	Control	27	20.07	5.038	0.970
	Experimental	12	20.83	2.657	0.767
Match Arabic audio to Arabic text	Control	27	5.33	1.641	0.316
	Experimental	12	4.75	1.485	0.429
Match Arabic text to Arabic audio	Control	27	7.30	2.554	0.492
	Experimental	12	6.75	2.221	0.641

Table 7 presents a comparison of the scores of engaged and non-engaged students, showing that students who were intrinsically motivated to learn the materials in the treatment did slightly better than those who were not so motivated. However, due to the small sample size of the study and the difference between the numbers of engaged participants and non-engaged participants, there is no significance at the $p < .05$ level. It is possible that if the cell sizes had

been the same for both groups, then there might have been a significant difference. However, we cannot claim a significant difference for this analysis.

Table 7
Differences Between Engaged and Non-engaged Students

Group	Number correct	Arabic text to English	Arabic audio to English	Arabic audio to Arabic text	Arabic text to Arabic audio
Non-engaged					
Mean	32.380	8.050	15.960	3.670	4.780
Number	98.000	98.000	98.000	98.000	98.000
Std. deviation	11.739	3.965	5.850	1.838	2.452
Engaged					
Mean	43.280	10.670	20.310	5.150	7.130
Number	39.000	39.000	39.000	39.000	39.000
Std. deviation	10.410	3.601	4.420	1.598	2.441
Total					
No mean	35.480	8.800	17.200	4.090	5.450
Number	137.000	137.000	137.000	137.000	137.000
Std. deviation	12.368	5.809	5.809	1.890	2.662

An analysis of variance in Table 8 shows that difference between scores of engaged students and non-engaged students in the four types of posttest questions was statistically significant. This indicates that the engaged students in this study performed differently from the non-engaged students on the overall test and on each of the subtests.

Table 8
Analysis of Variance for Engaged versus Non-Engaged Subjects

		Sum of squares	df	Mean square	F	Sig.
# Correct	Between groups	3317.276	1	3317.276	25.612	.000
	Within groups	17484.928	135	129.518		
	Total	20802.204	136			
AT to E	Between groups	190.866	1	190.866	12.772	.000
	Within groups	2017.412	135	14.944		
	Total	2208.277	136			
AA to E	Between groups	527.534	1	527.534	17.532	.000
	Within groups	4062.144	135	30.090		
	Total	4589.679	136			
AA to AT	Between groups	61.138	1	61.138	19.437	.000
	Within groups	424.628	135	3.145		
	Total	485.766	136			
AT to AA	Between groups	154.419	1	154.419	25.755	.000
	Within groups	809.420	135	5.996		
	Total	963.839	136			

An analysis of the differences between the control treatment group and the experimental treatment group, as well as between engaged students and non-engaged students, resulted in no significant difference as seen in Table 9. This analysis shows that the engaged students seemed to do better than the non-engaged students ($p = .098$), which is significant at the $p < .10$ level, meaning that there is a less than ten percent chance of stating that there is a difference when in reality there might not be.

Table 9
Between-Subjects Effects Dependent Variable: Number Correct

Source		Type III sum of squares	df	Mean square	F	Sig.
Intercept	Hypothesis	141588.110	1	141588.110	49.099	.090
	Error	2883.744	1	2883.744		
Control experiment	Hypothesis	26.484	1	26.484	0.378	.649
	Error	70.142	1	70.142		
Engaged	Hypothesis	2883.744	1	2883.744	41.113	.098
	Error	70.142	1	70.142		
Control exp. engaged	Hypothesis	70.142	1	70.142	0.539	.464
	Error	17300.938	133	130.082		

An analysis of how the students performed in just the Arabic text to English posttest questions showed potential interaction ($p = .134$) between the control treatment and engagement. Table 10 shows that engaged students did perform better in the control treatment, but the difference is not significant.

Table 10

Between-Subjects Effects Dependent Variable: Arabic Text to English

Source		Type III sum of squares	df	Mean square	F	Sig.
Intercept	Hypothesis	8629.917	1	8629.917	53.640	.086
	Error	160.885	1	160.885		
Control experiment	Hypothesis	15.442	1	15.442	0.471	.617
	Error	32.816	1	32.816		
Engaged	Hypothesis	160.885	1	160.885	4.903	.270
	Error	32.816	1	32.816		
Control exp. engaged	Hypothesis	32.816	1	32.816	2.268	.134
	Error	1924.236	133	14.468		

Table 11 shows that in the Arabic audio to English posttest questions, engaged learners did slightly better than non-engaged ($p = .094$) in both the control and the experimental treatments.

Table 11

Between-Subjects Effects Dependent Variable: Arabic Audio to English

Source		Type III Sum of squares	df	Mean square	F	Sig.
Intercept	Hypothesis	32903.419	1	32903.419	65.636	.078
	Error	501.300	1	501.300		
Control experiment	Hypothesis	0.219	1	.219	0.020	.911
	Error	10.986	1	10.986		
Engaged	Hypothesis	501.300	1	501.300	45.632	.094
	Error	10.986	1	10.986		
Control exp. engaged	Hypothesis	10.986	1	10.986	0.361	.549
	Error	4049.355	133	30.446		

Table 12 shows that in the Arabic audio to Arabic text questions, there was a statistically significant interaction ($p = .041$) for the non-engaged students in the control treatment.

Table 12

Between-Subjects Effects Dependent Variable: Arabic Audio to Arabic Text

Source		Type III sum of squares	df	Mean square	F	Sig.
Intercept	Hypothesis	1884.860	1	1884.860	40.574	.099
	Error	46.455	1	46.455		
Control experiment	Hypothesis	0.465	1	.465	0.036	.880
	Error	12.873	1	12.873		
Engaged	Hypothesis	46.455	1	46.455	3.609	.308
	Error	12.873	1	12.873		
Control exp. engaged	Hypothesis	12.873	1	12.873	4.240	.041
	Error	403.801	133	3.036		

For the Arabic text to Arabic audio questions, there was no statistically significant interaction for the non-engaged students in the control treatment group. Table 13 shows that neither group did better than the other.

Table 13

Between-Subjects Effects Dependent Variable: Arabic Text to Arabic Audio

Source		Type III sum of squares	df	Mean square	F	Sig.
Intercept	Hypothesis	3454.586	1	3454.586	27.556	.120
	Error	125.367	1	125.367		
Control experiment	Hypothesis	0.004	1	0.004	0.001	.986
	Error	7.751	1	7.751		
Engaged	Hypothesis	125.367	1	125.367	16.175	.155
	Error	7.751	1	7.751		
Control exp. engaged	Hypothesis	7.751	1	7.751	1.290	.258
	Error	798.941	133	6.007		

Student Feedback

I did not design the posttest to include questions on how students felt towards either treatment, but I did receive some formal feedback from a small segment of the participants. The TESOL students were invited by their professor to provide feedback on the experiment, and 11 of them chose to do so. More than half described their experience as “interesting,” two called the program “effective,” one called it “fun,” and another called it “amazing.” Two students complained of being frustrated with the experiment, and one complained of headaches after

having to make so many connections in a short amount of time. The data did not indicate whether one of the treatments was considered overall to be more “amazing,” “effective,” “fun,” or “interesting” than the other.

However, of the TESOL students who participated in the experiment and chose to provide feedback, eight commented on the experimental treatment, two commented on the control treatment, and one did not make it clear which treatment he or she received. One student expressed concern that there was “a lot of information to memorize.” Others commented that the tutorials were easy to follow at first, but they grew confused as the treatment progressed. Some students expressed their satisfaction at their ability to learn Arabic from the pictures and some were puzzled by the choice of vocabulary used in the experiment. Some found the Arabic text useful and others did not. More qualitative data like these would be helpful in future studies to understand the mindset of the participants taking part in the experiment.

In summary, the statistical analyses performed on the data collected indicate that, overall, there is no statistically significant difference ($p < 0.05$) between the mean scores of the experimental treatment and control treatment groups. However, the test scores from the experimental treatment group were, on average, slightly higher than those of the control group. Also, some groups of participants in the experimental treatment group received significantly higher scores for certain question types.

When examining the analysis of the login data, there is significance for those who stated they were good at learning languages compared with those who stated they were not. Overall, the analysis of these data indicates that one instructional method is not significantly more effective in presenting basic Egyptian Arabic vocabulary words and sentences to students who have little to no previous experience with that language.

Nevertheless, there was a statistically significant difference overall between the scores of engaged students and non-engaged students in the four types of posttest questions. For the questions involving the matching of Arabic text to the English translation, the engaged students in the control treatment group scored higher, but not significantly. For the matching Arabic audio to English translation questions, engaged students in both treatment groups scored higher, but, again, not significantly. However, in the matching Arabic audio to Arabic text questions, non-engaged students in the control treatment group scored significantly higher than any other group. Finally, in the matching Arabic text to Arabic audio, neither group scored higher in either treatment. The results of these interactions suggest that if a similar study were to be conducted with only engaged students, there is a possibility that a statistically significant difference might be found between the treatment groups.

Chapter 5: Discussion

The purpose of this study was to explore whether second-language learners could more easily acquire, comprehend, and retain basic vocabulary and phrases in Egyptian Arabic by using a method of instruction that combines audio, text, and animated images than they could by using flashcards.

This study was designed to answer the following question: Is a gradual, stepwise, and meaningful, narrative-based interactive multimedia presentation of basic Egyptian Arabic vocabulary more effective for the comprehension, acquisition, and retention of vocabulary by beginning-level students than a paired-associate presentation of the same vocabulary? The analyses of the data show that there was no statistically significant difference in the overall scores of students using these two different instructional methods.

Two secondary questions have arisen from the analysis of the data. The first question asks: what is the effect of the different presentations upon engaged and non-engaged learners of a second language? The analyses of the data showed that, overall, engaged learners perform better than non-engaged learners although not always at a significant level.

The second question asks: what is the effect of the different presentations upon the associations of spoken and written representations of language and association with meaning? The analyses of the data show that, overall, there is no statistically significant difference in the performance of engaged and non-engaged participants in both treatments. There was, however, significance in the performance of non-engaged students in the control treatment group for the Arabic audio to English translation questions.

Summary of Results

The results from the data analyses showed that there was no statistically significant difference between the two methods of vocabulary presentation overall, but in a comparison of subgroups there were some statistically significant differences between the scores of engaged students and non-engaged students when the scores of the four different question categories were compared. To review, the four different types of questions asked were the following: (a) match Arabic text to English translation; (b) match Arabic audio to English translation; (c) match Arabic audio to Arabic text; and (d) match Arabic text to Arabic audio. The results showed that, on average, the engaged students performed better than the non-engaged students in each of the four categories of questions.

In the matching of Arabic text to the English translation questions, the engaged students in the control treatment group scored higher, but not significantly. For the matching Arabic audio to English translation questions, engaged students in both treatment groups scored higher, but again, not significantly. However, in the matching Arabic audio to Arabic text questions, non-engaged students in the control treatment group scored significantly higher than any other group. Finally, in the matching Arabic text to Arabic audio, neither group scored higher in either treatment.

Analyses of the data show that engaged students scored better when the questions types involved matching either Arabic text or audio to an English translation. Non-engaged students in the control group who answered the matching Arabic audio to Arabic text had the most significant results; however, this was not so when the questions consisted of matching Arabic text to Arabic audio.

Limitations

This study was restricted in the number of new language elements that could be presented in the short amount of time available for the control and experimental treatments, as well as in the selection of language elements that were presented. Due to their complexity, no verbs were presented in the program, so only short nominal sentences were used. Verbless sentences are possible in Arabic, because the verb “to be” as a copula is dropped in the present tense (e.g., one would say, “I am human” as “I human”). All the sentences in this study were copular sentences that did not require the verb. These sentences, however, consisted of nouns, pronouns, adjectives, and prepositions.

The vocabulary and the grammar presented in the program were basic and were meant to provide learners only with scaffolding upon which to build for later instruction in Arabic.

Words evoke different images for different learners since every learner has a different background and different life experiences that influence the way he or she learns a new language. Some words are easier to illustrate than others. A noun, for example, is easier to represent with an image than an adjective. This is true even for learners who have limited background knowledge in the area of the language they are studying.

The instructional materials for this study were designed to present a universal meaning of a word by focusing on the more typical features of people, objects, and situations. The images were simple but detailed enough to allow learners to comprehend the meaning of the language elements being presented.

The instructional method of the meaningful, narrative-based presentation of language accompanied with images, sound, and text through gradual presentation was not meant to be a

shortcut to learning, but rather a help to facilitate the learning process in the initial stages of second-language acquisition.

There were some problems with the computer software that limited the data collected for all participants in this study. The earliest posttests for some of the summer and fall of 2010 participants did not record all 58 answers, and some participants' posttests had scores of more than 58 answers. The software that collected and recorded the login data for all the participants did not always function properly and many data were lost. In reviewing all the data that the computer collected, I saw that there were participants who logged in to the experiment once, but then appeared to have not viewed the treatment. Other participants had partial posttest scores recorded, but I cannot tell from the data whether the participants gave up part way through, or whether the computer failed to record their complete scores.

The button that took participants to the posttest sometimes did not work in the experimental treatment, which kept some participants from taking the posttest. I do not know how many participants in the experimental treatment that did not take the posttest because they either gave up at the nonfunctioning button or thought that the treatment was over. In addition to the malfunctioning button, some participants commented in e-mails that a couple of the questions in the posttest lacked the audio component, making it difficult to answer those questions.

Originally, my intention was to test this instructional method on Arabic students because of the likelihood of their being more intrinsically motivated to learn the vocabulary in the program. Due to the technical problems, I received complete posttest scores for only 39 Arabic students from Summer Term 2010, Fall Semester 2010, Winter Semester 2011, Fall Semester 2011, and the Summer Term 2010 StarTalk students. This small sample size of participants resulted in my going to other groups such as the TESOL and sociology students to recruit more

participants. The recruitment of non-Arabic students resulted in a larger sample size, but it also resulted in a larger sample group of non-engaged participants that performed at a lower level than the engaged Arabic students. As I stated previously, the low sample sizes and this differential selection made in the group of non-engaged students injected bias into the study.

From the experiment itself, it is impossible to determine whether the scores that the participants received at the end of the posttest were due to the effectiveness of the method in presenting new vocabulary or whether the scores were due to a higher level of interest and motivation of some of the participants. The data indicated that, on average, the engaged students performed better in both treatments than the non-engaged students. It is possible that the Arabic students had more intrinsic motivation to learn, memorize, and understand the vocabulary presented in the treatment than did the non-engaged participants in the other groups. This is because Arabic students were not participating in the study for extra credit, but were likely participating to help them learn the language for their Arabic 101 course. Furthermore, there is the possibility that the Arabic students represented a segment of the population that has a higher aptitude for learning a non-cognate language such as Arabic.

The non-engaged participants took part in the experiment because it was offered as an extra credit assignment, a Boy Scout activity, or because they simply wanted to help out. The mean scores of the Arabic students in both treatment groups were more than ten points higher than the scores of the non-engaged participants, but the difference is not statistically significant. Statistically significant differences became evident when their scores were compared with the non-engaged participants' scores on a category-by-category basis for each of the four types of questions in the posttest. Nevertheless, I remain uncertain about what factors motivated their performances on the posttest. This is because none of the participants were asked either in the

login questions or as part of the posttest their attitudes toward the subject material of the experiment.

Finally, the length and the scope of the lessons may have limited the effectiveness of this study. The participants were introduced to only basic nouns, pronouns, adjectives, and prepositions, but not to any verbs. This limited vocabulary was designed to keep the material simple for beginning-level learners. Ivor Richards' second-language instruction books present learners with more than ten lessons containing much more vocabulary, which enabled them to speak and write more than the materials presented as part of this study. To have presented as many lessons in the tutorial as Richards does in his materials would have required more time than most volunteers would have been willing to devote.

I had estimated that the experimental treatment would take around an hour for most participants to complete and slightly less time for the control treatment. Students reported that it took them between 45 minutes and an hour to complete the treatment and posttest. Perhaps the length of time required of volunteers may have deterred some from participating and others to quit before completing it. However, this is not an unusual amount of time for students to spend at one time to learn a little more than three dozen Arabic words. Indeed, *Yusuf's Illustrated Introduction to Egyptian Arabic* introduces 43 new vocabulary words (five of which are plural forms) in ten lessons that take the participants one to two hours to complete. While this is less vocabulary than Arabic 101 students at BYU learn in their first lesson, the BYU Arabic students generally have class time, reinforcement through interaction with their instructor and classmates, as well as an evening to practice and memorize the new vocabulary.

Reflections on Findings

This study of a computer-assisted, interactive method of second-language instruction called *Yusuf's Illustrated Introduction to Egyptian Arabic* was designed to match the principles put forth by I. A. Richards and continued the research that Pyle conducted in 2009 by building upon the first program that I designed for that experiment. This was the second computer-assisted Arabic language program based on Richards' research that I have developed.

The first was created for use in Pyle's study, and it also integrated images, sound, and text to convey meaning of new vocabulary words. That program, however, granted the users no control over the presentation of the vocabulary; they were unable to stop the presentation or return to a previous page to review a word. Moreover, there were no review exercises between the lessons. Finally, the Arabic vocabulary and sentences were essentially the same as what is found in *Yusuf's Illustrated Introduction to Egyptian Arabic*, but they were written and recorded in Modern Standard Arabic. The results of the experiment of the first computer-assisted program guided the design of the *Yusuf's Illustrated Introduction to Egyptian Arabic*.

At the conclusion of her research, Pyle suggested for future studies a few improvements to the computer-based presentation: (a) make the software interactive; (b) introduce the Arabic alphabet as part of the instruction; (c) add learning exercises; and (d) images need to be clearer and more consistent.

As I designed this version of the program, I applied these improvements by making the treatment interactive with clearer, animated images. I also included an alphabet page before the vocabulary presentation that the learners could refer back to anytime throughout the program. After nearly every lesson, I included review exercises to help the learners reinforce their new knowledge of the Arabic words. The presentation of new vocabulary words and phrases in the

lessons was basic and repetitive. It followed a step-by-step process to allow the learners to recognize, understand, compare and contrast the text, sound, and meaning of the basic Arabic words. The lessons and review exercises were designed to help the learners make connections to previously acquired knowledge to help them acquire and retain the meanings of the new vocabulary and phrases. On each page of the lessons, the learners saw the image conveying the meaning of the new word or phrase as well as the written text.

Accompanying the image and text was the audio to help the learners hear how the new word or sentence sounded. The learners were free to repeat the animation and audio as many times as they wished before proceeding to the next page and could even go back to previous pages for reference. The images were simple and animated to reduce ambiguity in the meaning of the words. The audio for the presentation was recorded by native Arabic-speakers so that the spoken vocabulary would sound authentic.

With the possible exception of the StarTalk volunteers, most of the participants in this study had not studied any Arabic before. Of the five groups of volunteers who participated in the experiment, all of those who received the experimental treatment scored, on average, more than 61.24% correct with a total mean score of 35.52 out of a possible score of 58. Those who received the control treatment, in general, scored slightly lower with 61.12% correct, being the lowest score, and a total mean score of 35.45 out of a possible score of 58.

Despite the improvements I made for *Yusuf's Illustrated Introduction to Egyptian Arabic*, there was not a significant difference between the posttest scores of the two treatment groups. Nevertheless, when controlling for gender, age, previous languages studied, and scale of language-learning proficiency for those in the experimental treatment group, the participants on average did 2.263 points better than the control treatment group. This is not statistically

significant for a sample size of 137 participants and it is equivalent to only 3.9% of the posttest score. Therefore, for this group of the participants, the experimental treatment did not significantly improve test scores over the control treatment.

The similar results of both treatments are likely due to the lack of major differences between the treatments. While the experimental treatment was based on the narrative, meaning-based method of instruction developed by I. A. Richards, it did not differ from the control treatment in vocabulary, narrative presentation, interactivity, use of audio and text, repetition, and gradual presentation of new vocabulary. The difference between the two treatments was the use of images in the experimental treatment to convey meaning and the review exercises between the lessons.

Ausubel, Novak, and Hanesian (1968) and Smith (1975) demonstrated that learning is most effective when the new information being acquired is relatable to what the learner already knows. English translations of Arabic vocabulary do help learners relate what they already know to the new vocabulary and grammar presented in the treatment. The combined presentation of vocabulary using audio, text, and translation confirm Paivio's dual-coding theory and Baddeley's working memory model. The combined channels of input benefited the participants in both treatment groups even though there was a difference in the kinds of input.

Richards' *Learning through Pictures* method of presenting a new language using a gradual, stepwise presentation of vocabulary using images instead of translations is an effective tool for teaching a second language. This study, however, has shown that this method is not more effective than a paired-associate method using flashcards. It also shows that the participants who saw no English translations in their treatment did just as well on the posttest as the participants

who saw English translations for the Arabic. Generally, the engaged students did better on the posttest than the non-engaged students.

In the questions involving the matching of Arabic text to the English translation, the engaged students in the control treatment group scored higher, but not significantly. It is likely that the engaged students in the control treatment group scored higher because of their motivation to learn the materials and because they had an English translation in front of them in the treatment. Similarly, in the matching Arabic audio to English translation questions, engaged students in both treatment groups scored higher, but again, not significantly. It is possible that the engaged students in the control treatment group scored higher because of their motivation to learn the materials and because they had the English translation in front of them. The engaged students in the experimental treatment group scored higher possibly because of their motivation to learn the materials.

The non-engaged students from the control group, however, performed significantly better on the posttest in the Arabic audio to English questions than any other group. It is possible that these non-engaged students scored higher on these questions because they had the English translation available during the treatment. The engaged students, however, also had the English translations so it is impossible to determine why they did not score higher on these types of questions. Finally, in the matching Arabic text to Arabic audio, neither group scored higher in either treatment. It is possible that the engaged students did not do better than the non-engaged in these types of questions because the English translations in the treatment did not help them match a word written in Arabic foreign text to an Arabic recording.

These results show that the treatments worked differently for different groups of people. Nevertheless, it is remarkable that the non-engaged students in the control group scored

significantly higher on the Arabic audio to English translation questions and nothing else. When learning the vocabulary, they would have used digital flashcards that provided the combined input of audio, text, and English translation. Perhaps this confirms the research of Borrás and Lafayette (1994), Danan (2004), Guillory (1998), and Vanderplank (2004) whose different studies found that students who watched videos with captions recognized more vocabulary words in a second language than students who watched uncaptioned videos. One can assume from these results that the combination of audio, text and translation provided the right combination of input for these students to associate Arabic audio to the correct English translation. This combination of input likely benefitted the engaged students in the control group also for two of the question types, but not to the same extent.

Suggestions for Future Research

Having improved upon the computer-based instruction that we designed for Pyle's study, I had anticipated higher posttest scores for the experimental treatment in this study. Since the posttest scores were not higher for this study, I have some suggestions for future research on this topic.

First of all, the sample size for the study should be larger. While many people began the treatments, the majority did not complete them for various reasons, which could well include problems with the software or perhaps an apparent lack of interest. I recommend that, if possible, future studies would recruit from Arabic students—from more than one university if necessary—in order to obtain a large sample size of engaged participants who are interested in the subject material and to reduce the type of bias that was potentially introduced into my study. On the other hand, if one wishes to see how well this type of instruction works with non-engaged students, future sample groups should exclude Arabic students who have the aptitude for

studying a non-cognate language as well as the intrinsic motivation to learn the materials. Further studies could also be focused more on how students with different levels of engagement respond to different kinds of treatments and types of questions.

Another possibility would be to reduce the number of elements that students have to learn. One TESOL student commented that “the whole tutorial was a lot of information to memorize.” Some students stated that they had difficulty reading and figuring out the alphabet. One bluntly stated, “I hardly looked at the written words; they made no sense to me.” The inclusion of the Arabic script may have confounded things when students were already faced with having to learn new concepts, sounds, and vocabulary. Some comments from the TESOL students showed that some of them had difficulty learning the Arabic audio and text, but were better able to learn the vocabulary from the images or English translations. One student, however, stated that even though she “had a hard time trying to learn the alphabet” she did a lot better on the questions that involved matching audio and text and vice versa. These comments demonstrated that individuals have different strengths and weaknesses in second-language acquisition and some learn better from certain kinds of input than others. Further studies could emphasize vocabulary acquisition without the students having to master the Arabic alphabet and others could emphasize the written and/or audio components of the language more.

In future research, it would be beneficial to include questions in the posttest concerning how the participants felt about the treatment they received. Feedback from some of the participants in this study hinted that some of the participants enjoyed the program, while others expressed frustration, but I could not tell from the limited data received which treatment the participants enjoyed more.

Finally, it is possible that the posttest might have been too long and should be reduced to no more than 30 questions. In addition to questions about the vocabulary and grammar in the lessons, it would be helpful to include questions about how the participants felt about the study. Questions asking them about their interest and motivation would be enlightening as well as questions about how much they enjoyed the experience.

Conclusion

I designed this study to examine how a meaningful, narrative-based, step-by-step method of second-language instruction would affect learners' acquisition of basic Egyptian Arabic vocabulary and grammar compared to a paired-associate method. I hoped that the results of this study would show that this method is more effective in teaching a new language to beginners, but the scores received from the participants in this study showed that it was not much more effective than flashcards. While most of the participants who received the experimental treatment did, on average, score higher than their counterparts who received the control treatment, statistical analyses of the final test scores showed no statistical significance between the overall scores of both groups.

One difference that I noticed between groups was how motivation is a significant factor in learning a new language. On average, the Arabic students in both treatment groups scored ten points higher than students and participants from the other groups. As engaged learners, they were likely motivated to learn the vocabulary in the experiment to help them with their studies in Arabic 101. There is certainly an interaction between the treatment group and the engagement factor, for engaged learners will do well no matter what because they are intrinsically motivated to learn the materials at hand.

Nevertheless, considering that 61 volunteers of varying backgrounds and levels of motivation, who knew little to no Arabic, were able to learn as much as they did in such a short amount time—without English translations—shows that the meaningful presentation of new vocabulary integrating images, sound, and text can be just as an effective method for second-language instruction as flashcards.

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Appendix A: Experiment Script**Lesson One****Slide One**

اهلا

(man waving) *Hello***Slide Two**

انا يوسف

(man points to self) *I am Yusuf***Slide Three**

اهلا

(man turns head and looks to another man and waves) *Hello***Slide Four**

انتَ

(man looking at and pointing to the other man) *You* (masculine singular)**Slide Five**

اهلا

(man turns head and looks to a woman and waves) *Hello***Slide Six**

انتِ

(man turns head and points to the woman) *You* (feminine singular)**Slide Seven**

اهلا

(woman waving) *Hello***Slide Eight**

انا مريم

(woman pointing at self) *I am Maryam***Slide Nine**

اهلا

(woman turns head and looks to the man and waves) *Hello***Slide Ten**

انتَ

(woman looking at and pointing to the man) *You* (masculine singular)

Slide Eleven

انتِ

(woman looking at and pointing to another woman) *You* (feminine singular)**Slide Twelve**

هو

(man not looking at but pointing to another man) *He***Slide Thirteen**

هي

(man not looking at but pointing to a woman) *She***Slide Fourteen**

هو

(woman not looking at but pointing to a man) *He***Slide Fifteen**

هي

(woman not looking at but pointing to another woman) *She*

Words introduced: Ahlan, Anaa, Inta, Inti, Huwa, Hiya, Maryam, Yusuf

Lesson Two**Slide One**

راجل

(man standing but not pointing at anything) *man***Slide Two**

انا راجل

(man pointing to himself) *I am a man***Slide Three**

ست

(woman standing but not pointing at anything) *woman***Slide Four**

انا ست

(woman pointing to herself) *I am a woman*

Slide Five

انتَ راجل

(woman looking at and pointing to the man) *You (ms) are a man***Slide Six**

انتِ ستّ

(man looking at and pointing to the woman) *You (fs) are a woman***Slide Seven**

هو راجل

(woman not looking at but pointing to the man) *He is a man***Slide Eight**

هي ستّ

(man not looking at but pointing to the woman) *She is a woman*

Words introduced: Raagil, Sitt

Lesson Three**Slide One**

ولد

(boy standing but not pointing at anything) *Boy***Slide Two**

انا ولد

(boy pointing to himself) *I am a boy***Slide Three**

انا سمير

(boy pointing to himself) *I am Samir***Slide Four**

انتَ ولد

(man looking at and pointing to the boy) *You (ms) are a boy***Slide Five**

انتَ راجل

(boy looking at and pointing to the man) *You (ms) are a man***Slide Six**

بنت

(girl standing but not pointing at anything) *Girl*

Slide Seven

أنا بنت

(girl pointing to herself) *I am a girl***Slide Eight**

أنا فاطمة

(girl pointing to herself) *I am Fatima***Slide Nine**

انتِ بنت

(man looking at and pointing to the girl) *You (fs) are a girl***Slide Ten**

انتِ راجل

(girl looking at and pointing to the man) *You (ms) are a man***Slide Eleven**

انتِ ستّ

(girl looking at and pointing to the woman) *You (fs) are a woman***Slide Twelve**

انتِ بنت

(woman looking at and pointing to the girl) *You (fs) are a girl***Slide Thirteen**

هو ولد

(woman not looking at but pointing to the boy) *He is a boy***Slide Fourteen**

هي بنت

(woman not looking at but pointing to the girl) *She is a girl*

Words introduced: Walad, Bint, Samir, Fatima

Lesson Four**Slide One**

أحنا

(two males pointing to themselves) *We*

Slide Two

احنا

(two females pointing to themselves) *We***Slide Three**

احنا

(two males and a female pointing to themselves) *We***Slide Four**

انتو

(male pointing at three males) *You* (masculine plural)**Slide Five**

انتو

(male pointing at three females) *You* (feminine plural)**Slide Six**

هم

(male pointing toward three males) *They* (masculine)**Slide Seven**

هم

(male pointing toward three females) *They* (feminine)

Words introduced: Ihna, Intu, Huma

Lesson Five**Slide One**

انا راجل

(man pointing to himself) *I am a man***Slide Two**

هم رجالة

(man not looking at but pointing to three men) *They are men***Slide Three**

انا وهم رجالة

(man pointing to himself and to the men) *I and they are men***Slide Four**

احنا رجالة

(man pointing to himself and to the men) *We are men*

Slide Five

انا ستّ

(woman pointing to herself) *I am a woman*

Slide Six

هم ستات

(woman not looking at but pointing to three women) *They are women*

Slide Seven

انا وهم ستات

(woman pointing to herself and to the women) *I and they are women*

Slide Eight

احنا ستات

(woman pointing to herself and to the women) *We are women*

Slide Nine

انتو رجالة

(women looking at and pointing to the men) *You (mp) are men*

Slide Ten

انتو ستات

(men pointing to the women) *You(fp) are women*

Words introduced: Rigaala, Sitaat, Wa

Lesson Six**Slide One**

انا ولد

(boy pointing to himself) *I am a boy*

Slide Two

هم ولاد

(boy not looking at but pointing to three boys) *They are boys*

Slide Three

انا وهم ولاد

(boy pointing to himself and to the other boys) *I and they are boys*

Slide Four

احنا ولاد

(boys pointing to themselves) *We are boys*

Slide Five

انا بنت

(girl pointing to herself) *I am a girl*

Slide Six

هم بنات

(girl not looking at but pointing to three girls) *They are girls*

Slide Seven

انا وهم بنات

(girl pointing to herself and to the other girls) *I and they are girls*

Slide Eight

احنا بنات

(girls pointing to themselves) *We are girls*

Slide Nine

انتو ولاد

(girls looking at and pointing to the boys) *You (mp) are boys*

Slide Ten

انتو بنات

(boys looking at and pointing to the girls) *You (fp) are girls*

Words introduced: Wilaad, Binaat

Lesson Seven**Slide One**

ده بيت

(picture of a house) *This is a house.*

Slide Two

الراجل قدام البيت

(man standing in front of the house) *The man is in front of the house.*

Slide Three

الراجل ورا البيت

The man is behind the house.

Slide Four

الرجل في البيت

(man in the house) *The man is in the house.***Slide Five**

ده قط

(picture of a cat) *This is a cat.***Slide Six**

القط والرجل قدام البيت

*The cat and the man are in front of the house.***Slide Seven**

القط والرجل ورا البيت

*The cat and the man are behind the house.***Slide Eight**

القط والرجل في البيت

*The cat and the man are in the house.***Slide Nine**

القط على البيت

*The cat is on the house.***Slide Ten**

الرجل تحت القط

The man is beneath the cat.

Words introduced: Da, Beit, 'Udaam, Wara, El-, Fi, 'Utt, 'Ala, Taht

Lesson Eight**Slide One**

البيت ده كبير

*This house is big.***Slide Two**

البيت ده صغير

*This house is small.***Slide Three**

القط ده كبير

This cat is big.

Slide Four

القط ده صغير

This cat is small.

Slide Five

الراجل كبير

The man is big.

Slide Six

الولد صغير

The boy is small.

Slide Seven

الولد ده طويل

This boy is tall.

Slide Eight

الولد ده قصير

This boy is short.

Slide Nine

البننت دي طويلة

This girl is tall.

Slide Ten

البننت دي قصيرة

This girl is short.

Words introduced: Kabir, Saghir, Tawil, Tawila, 'Asira, Di

Lesson Nine

Slide One

ده الشمس

This is the sun.

Slide Two

الشمس في السما

The sun is in the sky.

Slide Three

الشمس فوق البيت

The sun is above the house.

Slide Four

ده جبل

This is a mountain.

Slide Five

الجبل ورا البيت

The mountain is behind the house.

Slide Six

الجبل كبير

The mountain is big.

Slide Seven

البيت صغير

The house is small.

Slide Eight

الشمس فوق الجبل

The sun is above the mountain.

Slide Nine

الشمس فوق الجبل والبيت

The sun is above the mountain and the house.

Slide Ten

الجبل والبيت تحت الشمس

The mountain and the house are below the sun.

Words introduced: Shams, Sama, Gebel, Fo'

Lesson Ten**Slide One**

انا هنا

(man pointing to the ground) *I am here.*

Slide Two

البيت هناك

(man pointing to the house) *The house is there.*

Slide Three

الستّ في البيت

(man pointing to the woman) *The woman is in the house.***Slide Four**

الستّ هناك

(man pointing to the woman) *The woman is there.***Slide Five**

انا في البيت

(woman pointing to the ground) *I am in the house.***Slide Six**

انا هنا

(woman pointing to the ground) *I am here.***Slide Seven**

الراجل هناك

(pointing to the man) *The man is there.***Slide Eight**

الشمس في السما

(woman pointing to the sun) *The sun is in the sky.***Slide Nine**

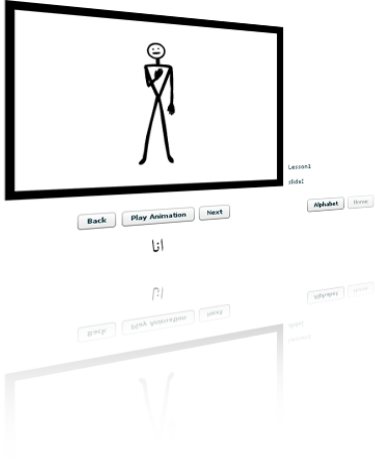
الشمس هناك

(pointing to the sun) *The sun is there.*

Words introduced: Hunaa, Hunaak

Appendix B: Screen Captures

Capture



Lesson1
الدرس الأول

انا

ا

ا

ا

Hello and welcome to Yusuf's Illustrated Introduction to Egyptian Arabic.

BYU ID

GENDER MALE/FEMALE

YEAR IN SCHOOL

MAJOR

LANGUAGES PREVIOUSLY STUDIED

ON A SCALE FROM 1-10 MY

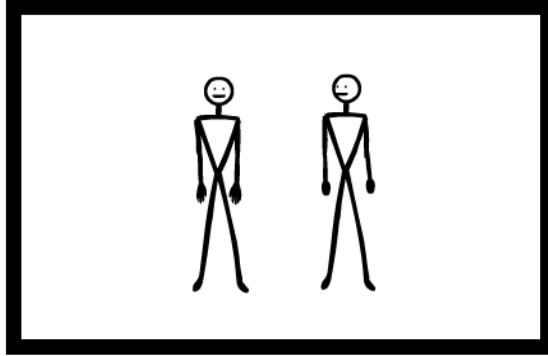
LANGUAGE LEARNING ABILITY IS:

AGE

ا	ب	ت	ة	ث	ج	ح	خ	د	ذ
ر	ز	س	ش	ص	ض	ط	ظ	ع	غ
ف	ق	ك	ل	م	ن	ه	و	ي	ى

The Arabic alphabet is written and read from right to left and consists only of consonants (short vowels are not written in Arabic). Click on each letter to hear its name. Some of the letters represent sounds that do not exist in English or any other languages so you will have to listen closely to the letters' names to hear the sounds they represent.

You may return to this page anytime throughout the lessons and review exercises.



Press "Play Animation" to hear the new words and phrases. Press "Back" to return to the preceding slide and press "Next" to proceed to the next slide.

If you wish to see the Arabic letters in their standalone forms, scroll over the Arabic words and the letters will appear separately. If you wish to review the alphabet at any time press the "Alphabet" button.

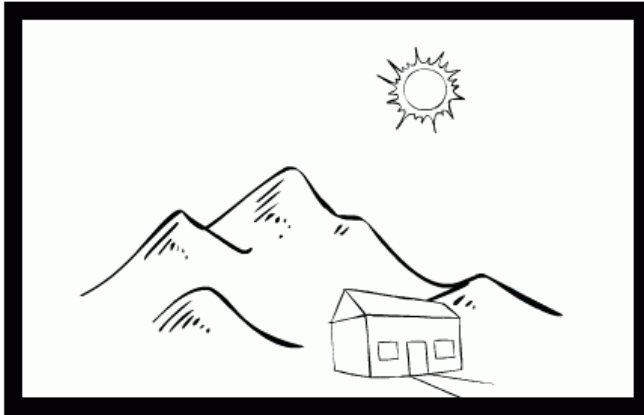
Lesson1
slide4

Back Play Animation Next

Alphabet Home

انتَ

Comments:



Press "Play Animation" to hear the new words and phrases. Press "Back" to return to the preceding slide and press "Next" to proceed to the next slide.

If you wish to see the Arabic letters in their standalone forms, scroll over the Arabic words and the letters will appear separately. If you wish to review the alphabet at any time press the "Alphabet" button.

Lesson9
slide9

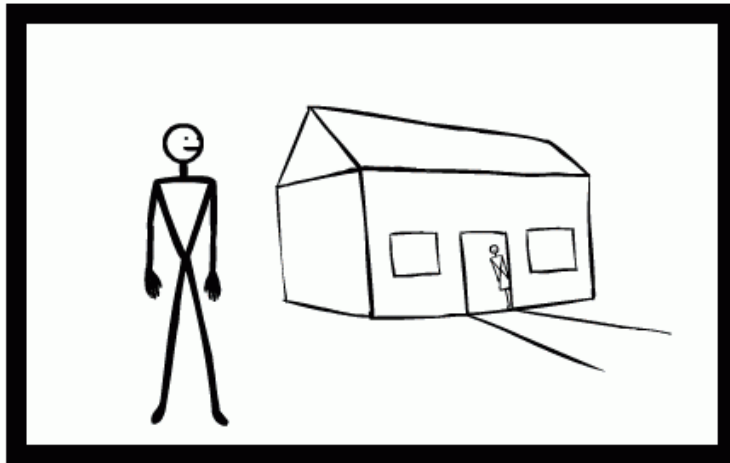
Back Play Animation Next

Alphabet Home

الشمس فوق الجبل والبيت

Comments:





Press "Play Animation" to hear the new words and phrases. Press "Back" to return to the preceding slide and press "Next" to proceed to the next slide.

If you wish to see the Arabic letters in their standalone forms, scroll over the Arabic words and the letters will appear separately. If you wish to review the alphabet at any time press the "Alphabet" button.

Lesson10

slide7

Back Play Animation Next

Alphabet Home

الرجل هناك

Comments:

Lesson: 1
Card: 1

The next lesson item will contain user interaction instructions for the Arabic-to-English flash cards and audio items that are displayed in the subsequent series of lessons.

- Alphabet
- Lesson 1
- Lesson 2
- Lesson 3
- Lesson 4
- Lesson 5
- Lesson 6
- Lesson 7
- Lesson 8
- Lesson 9

Hello and welcome to Yusuf's Introduction to Egyptian Arabic.

BYU ID

GENDER MALE/FEMALE

YEAR IN SCHOOL

MAJOR

LANGUAGES PREVIOUSLY STUDIED

ON A SCALE FROM 1-10 MY LANGUAGE LEARNING ABILITY IS:

AGE

اهلا

Lesson: 2
Card: 5

Each flash card has three buttons: Audio, go back, and check/go forward. You can use these buttons to see and hear the Arabic vocabulary words as often as you wish.

Alphabet
 Lesson 1
 Lesson 2
 Lesson 3
 Lesson 4
 Lesson 5
 Lesson 6
 Lesson 7
 Lesson 8
 Lesson 9
 Lesson 10
 Final Assessment

انتَ راجل
 you are a man

Audio, Back, Forward

Lesson: 4
Card: 2

Each flash card has three buttons: Audio, go back, and check/go forward. You can use these buttons to see and hear the Arabic vocabulary words as often as you wish.

Alphabet
 Lesson 1
 Lesson 2
 Lesson 3
 Lesson 4
 Lesson 5
 Lesson 6
 Lesson 7
 Lesson 8
 Lesson 9
 Lesson 10
 Final Assessment

انتو
 you (speaking to more than one person)

Audio, Back, Forward

Appendix C: Students' Comments

TESOL 200 Students' Comments

Student 1

I did the Arabic lesson. It was interesting because I used the letters to identify the different things rather than the sounds. I made up different meanings in my head about whether the little dot in a certain spot meant it was feminine or not. I didn't know what everything meant for sure as far as an English translation so I just memorized the sounds, images, and writing. I understood when I took the final test what everything meant exactly (you had to match the English translations at that point with the Arabic). The first few lessons were easy to memorize but the farther along the more I started to confuse all of the new words and symbols. The whole tutorial was a lot of information to memorize. I really feel like I might have memorized things if I had known what exactly they meant. Also, some of the things they taught us were really random; they used a sun, mountain, home, cat, and the prepositions they used were a little confusing as well. It was enjoyable, though, and I'm proud to say a few different words in Arabic.

Student 2

For my Exam I decided to do option number 2. I would say that it was a very educating process to go through. I took the test where everything was explained by animated pictures. I would watch and listen to the picture in Arabic. The spelling was also showed to me in Arabic. I noticed that the lessons were much easier in the beginning and the animations were much less complicated. I was doing well but lesson three gave me troubles. I wasn't sure what the pictures were representing anymore. I was getting more and more frustrated throughout the process and doing worse on my assessments. For the Final assessment I only got 25 out of 58 right. Since the e-mail he sent us says "Note that this whole program has not been designed to test you, but rather, to test which of the two programs is more effective for Arabic instruction", I decided not to take the test again, even though I was tempted to. Overall I would say that the test did expose me to Arabic, but this form of testing is not 100% effective.

Student 3

In doing the assessment I found it difficult to pay attention to the writing. The vocabulary and the actions were presented well. I found it easy for me to realize what was occurring when I saw examples and was able to contrast them. I could pick the correct writing and begin to accommodate its meaning with the movements or pictures. However, when writing was given and I had to translate the material, I found myself lost. The hardest part was to read and understand. I also realized halfway through the lessons that I was reading from left to right still. I began to read from right to left, as it instructed in the beginning, and that made a large difference. I noticed many patterns and began to use strategies to remember them. Multiple choice questions helped me narrow the choices by eliminating incorrect answers, but also it made it difficult because they were so similar as well. I began to see what strengths I had in learning a language as I saw the different presentations of the vocabulary and sentence structure. I also began to see how whole language was important in developing skills for comprehension. Through this experience, I realize that it is important to stress multiple ways of accessing content by using background knowledge. Something peculiar I found once again is that they continue to use a cat to build vocabulary and understanding. Everyone seems to think cat is universally neutral and most every culture knows what it looks like. I was also impressed to see that the rest of the practices were culturally neutral and that Egyptian culture wasn't used to teach in the beginning because that could have caused some confusion. I believe that if I was given the option to write, with assistance from the computer, I could have committed more of the words to memory.

Student 4

It was very interesting to participate in Brother Smith's computer program for Arabic language instruction. I am unsure whether I was in the control group or the experimental, but I found the whole experience interesting because I had absolutely zero background in any Arabic language (or even a language that doesn't use the Roman alphabet).

At the beginning of the tutorial, I was having an extremely difficult time differentiating the Arabic words with their sounds. I would see the animation and hear the word, but I wasn't linking the word with the script below. Because of this, I did very well when having to match the sound with the script, but I couldn't match the script to the animation. However, as we progressed, I began to see the subtle differences between the words. I began to recognize the configurations and was able to guess if something made a somewhat "h" sound. I really liked how my tutorial built on the prior knowledge. First we learned the person pronouns, then the words for man/woman/boy/girl. I ended with being able to recognize the script and pronunciation for sentences such as "The cat is in front of the house" and "The sun is above the small house."

While taking the final assessment, I had some technical difficulties where the sounds wouldn't play for a couple of questions. So I had to just put something and move on. But in the end, I received a 52/58. Yay me!

Student 5

This experience was amazing! I learned a lot about how I learned a new language and how some people feel when learning a new language. I enjoyed the one with the pictures. That one helped me learn more than the first one just going through the characters. The pictures helped me understand the characters a little bit better. I actually understood it. When it came to listening to the words spoken I didn't do so well, but the characters and pictures helped a lot. I would take more of these if anyone wanted me to. This was a great experience. Now I have Arabic sayings in my head and I can't get them out.

Student 6

I was able to participate in the study for the online Arabic lessons. I thought the use of flashcards was effective even though I have never used them in the past. They allow the learner to see the Arabic character, hear the pronunciation and translate the meaning. I had a hard time trying to learn the alphabet because I had no strategy to use to remember the character and sound. I did feel that I did learn some basics like hello and I am (name). The final assessment caught me off guard because I didn't know I would be tested on my knowledge of word meaning by looking at the characters. However, I think I did a lot better on the questions that gave me the audio, then required me to choose the correct written form and vice versa. Overall with more time to learn each lesson I believe it would be a successful method for learning the Arabic language.

Student 7

I chose to learn Arabic for my test option. There were several different ways that they could have had us learn the language. First we looked at the alphabet and they were said out loud to us as we clicked on the different letters. There were ten lessons that we went through with about 8 note cards each. The writing was displayed at it was read aloud to us, after we clicked on the check mark, the translation was displayed in English. I would repeatedly click on the sound with the translation up to learn what the verbal meant. I hardly looked at the written words; they made no sense to me. We learned about house, mountain, sun,

man, boy, girl, woman, words such as behind, in front, in, on, under, us, we, I and them. It was interesting to me and I learned quickly the way that I like to learn languages and what works for me the best.

Student 8

I chose to be part of the study. It was very interesting to participate in this study. I found myself doing a lot better on the listening sections. I did get frustrated when the pictures were the same, but there was 2 ways of saying something and I didn't know which to choose. I also found myself using the process of elimination. I think that it was interesting to see how a student learning a new language feels. I know at times I felt successful, and others I felt dumb.

Student 9

Well for the exam I participated in the Arabic language study. I am someone that loves languages and I love to learn them. For this particular study I found his program really effective, at least for me. I am a very visual learner and to have animations along with words and phrases helped me immensely. I didn't do well at the end but I think that if I was really truly trying to learn Arabic this would be the best way for me. I also noticed that when I am learning a language using the audio visual tool isn't always the best. I can't sit in front of a computer for 40 minutes straight without wanting to kill myself! I get bored! Perhaps the best way to learn a language is using both the audio and cooperative learning together. Overall I had fun with this exam.

Student 10

I took the lessons and found it really interesting. I had a hard time differentiating the different sounds. A lot of it sounded the same to me. It really helped being able to repeat it all and go back to the alphabet. It was really interesting how they organized the groups for us to memorize. It was done in a pattern like way so that there was enough repetition and order in what they were teaching us that we could follow. It was important to have the voice to listen to as I read the writing. Overall I think it was a good exercise, but of course in a classroom there would have to be more exercises to help it be retained. There would need to be more output opportunities.

Student 11

This was a very interesting activity to participate in. I felt like I learned a little more about language in the process of doing it. There is a lot to learn from this one interaction of a foreign language alone. I noticed that I would pay attention to the symbols as a whole and match them with the sounds I heard and/or the pictures I saw. I believe anyone learning a new language will jump to doing this process. It is memorization and guesstimating at its best. There is a lot to take in and a lot of symbols and sounds you have never heard of or seen. Therefore it takes a lot for the brain to process. My head was starting to hurt by the end after that short amount of time trying to make some connections with the words, sounds, pictures, and with my language. I think new language learners are constantly trying to make connections with their L1 to better understand their L2 even if there really is no connection what so ever. The sounds and writing was so different from English that it was nearly impossible to make connections but with the pictures I found that I comprehended more than I had expected. This helped me realize a little better that foreign languages are tough especially for the languages that are less common and unique in comparison to English.

Appendix D: Participants' Data

Data for Various Groups of Participants

Posttest Scores of All Participants

Groups	N	Mean	Std. Deviation	Std. Error Mean
Control	76	35.45	13.346	1.531
Experiment	61	35.52	11.138	1.426

($p = .600$)

Combined Posttest Scores for All Groups

Groups of Volunteers	N	Mean	Std. Deviation	Std. Error Mean
BYU Arabic Students	39	43.28	10.410	1.667
BYU-Idaho Sociology Students	47	32.23	11.063	1.614
BYU-Idaho TESOL Students	14	32.29	13.697	3.661
BYU-Idaho Coworkers	30	34.03	12.901	2.355
Boy Scouts	7	26.43	4.826	1.824
Total	137	33.65	12.031	1.112

The largest group consisted of 47 volunteers and the smallest consisted 7. For the entire 137 participants the analysis of variance resulted in a mean square of 912.086 between groups and 129.953 within groups ($p = .000$). An analysis of variance of just the control treatment group yielded a mean square of 763.316 between groups and 145.148 within groups ($p = .001$). The experiment treatment yielded a mean square of 214.642 between groups and 117.583 within groups ($p = .137$).

Analysis of Variance of All Participants

	Sum of Squares	df	Mean Square	F	Significance
Between Groups	3648.343	4	912.086	7.019	.000
Within Groups	17153.861	132	129.953		
Total	20802.204	136			

College Students Only

Groups	N	Mean	Std. Deviation	Std. Error Mean
Control	37	29.38	12.026	1.977
Experiment	45	33.58	11.604	1.730

($p = .113$)

Participants with Login Data

Groups	N	Mean	Std. Deviation	Std. Error Mean
Control	48	29.77	11.690	1.687
Experiment	51	33.84	10.997	1.540

($p = .077$)

Participants without Login Data

Groups	N	Mean	Std. Deviation	Std. Error Mean
Control	14	44.50	11.030	2.948
Experiment	4	39.75	8.539	4.270

($p = .441$)

Even though the test in general does not demonstrate a significant statistical difference between the two treatments, comparisons of sub scores in the posttest show some interesting and significant data. The posttest consisted of four different question types: match Arabic text to English translation, match Arabic audio to English translation, match Arabic audio to Arabic text and match Arabic text to Arabic audio. A comparison of the scores of the four question groups between the control and experimental groups shows the following: For Arabic text to English translation the mean score was 7.74, the standard deviation was 4.008 ($p = .087$) for the control group. For the experimental group it the mean score was 9.00, the standard deviation was 3.844. The scores for the Arabic audio to English show that higher mean scores for the control test group. The mean score was 16.74 with a standard deviation of 6.207 ($p = .489$). The mean score for the experimental group was slightly lower at 16.00 with a standard deviation of 5.246. Arabic audio to Arabic text mean score was higher for the experimental test group: 4.15 with a standard deviation of 1.660 ($p = .131$). The control group's mean score was 3.63 with a standard deviation of 1.977. The mean score for the experimental group in the Arabic text to Arabic audio was 5.24 with a standard deviation of 2.449 ($p = .649$) and the mean score of the control group was 5.02 with a standard deviation of 2.779.

Combined Group Statistics for All Participants

Question Type	Groups	N	Mean	Std. Deviation	Std. Error Mean
Match Arabic text to English	Control	76	8.39	4.109	.471
	Experimental	61	9.30	3.904	.500
Match Arabic audio to English	Control	76	17.61	6.128	.703
	Experimental	61	16.69	5.393	.691
Match Arabic audio to Arabic text	Control	76	3.99	2.056	.236
	Experimental	61	4.23	1.667	.213
Match Arabic text to Arabic audio	Control	76	5.49	2.840	.326
	Experimental	61	5.39	2.445	.313

We examined the sub scores for the largest groups of participants: BYU Arabic students, BYU-Idaho coworkers, BYU-Idaho TESOL students, and BYU-Idaho sociology students. Mean scores for the Arabic students were higher for the control treatment groups in the Arabic text to English, the Arabic audio to Arabic text, and Arabic text to Arabic audio, but lower in the Arabic audio to English.

Group Statistics for BYU Arabic Students

Question Type	Groups	N	Mean	Std. Deviation	Std. Error Mean
Match Arabic text to English	Control	27	10.78	3.672	.707
	Experimental	12	10.42	3.579	1.033
Match Arabic audio to English	Control	27	20.07	5.038	.970
	Experimental	12	20.83	2.657	.767
Match Arabic audio to Arabic text	Control	27	5.33	1.641	.316
	Experimental	12	4.75	1.485	.429
Match Arabic text to Arabic audio	Control	27	7.30	2.554	.492
	Experimental	12	6.75	2.221	.641

The BYU-Idaho online learning coworkers who were in the experimental control group had higher mean scores in all the question categories except for Arabic audio to English (See Table 9). The difference between the mean scores of both the treatment groups for the Arabic- text-to-English questions does show statistical significance. The mean score for the control group was 7.96 with a standard deviation of 3.948. The mean score for the experimental group was 11.29 with a standard deviation of 2.430 ($p = .045$).

Group Statistics for All BYU-Idaho Coworkers

Question Type	Groups	N	Mean	Std. Deviation	Std. Error Mean
Match Arabic text to English	Control	23	7.96	3.948	.823
	Experimental	7	11.29	2.430	.918
Match Arabic audio to English	Control	23	16.91	7.440	1.551
	Experimental	7	15.00	4.830	1.826
Match Arabic audio to Arabic text	Control	23	3.61	1.852	.386
	Experimental	7	3.86	1.676	.634
Match Arabic text to Arabic audio	Control	23	4.87	2.702	.563
	Experimental	7	6.29	1.604	.606

The BYU-Idaho TESOL students who participated in the experimental treatment had higher mean scores than the control group for all four categories of questions.

Group Statistics for BYU-Idaho TESOL Students

Question Type	Groups	N	Mean	Std. Deviation	Std. Error Mean
Match Arabic text to English	Control	3	8.00	5.568	3.215
	Experimental	11	8.45	3.698	1.115
Match Arabic audio to English	Control	3	13.33	7.767	4.485
	Experimental	11	16.45	6.203	1.870
Match Arabic audio to Arabic text	Control	3	2.00	2.646	1.528
	Experimental	11	3.91	1.921	.579
Match Arabic text to Arabic audio	Control	3	3.67	2.887	1.667
	Experimental	11	5.00	2.683	.809

The BYU-Idaho sociology students who participated in the experimental treatment received higher mean scores than the students in the control group in the Arabic-text-to-English, the Arabic-audio-to-Arabic-text, and Arabic-text-to-Arabic-audio questions (See Table 11). The control group received a higher mean score for only the Arabic-audio-to-English questions. The difference between the mean scores for both groups in the Arabic-text-to-English questions was

nearly statistically significant. The mean score for the control group was 6.24 with a standard deviation of 3.597 and the mean score for the experimental group was 8.67 with a standard deviation of 4.310 ($p=.055$).

The difference between then mean scores of the two groups in the Arabic-audio-to-Arabic-text, however, was significant. The mean score for the control group was 3.06 with a standard deviation of 2.045 and the mean score for the experimental group was 4.27 with a standard deviation of 1.680 ($p=.034$).

Group Statistics for BYU-Idaho Sociology Students

Question Type	Groups	N	Mean	Std. Deviation	Std. Error Mean
Match Arabic text to English	Control	17	6.24	3.597	.872
	Experimental	30	8.67	4.310	.787
Match Arabic audio to English	Control	17	16.94	5.043	1.223
	Experimental	30	15.53	5.494	1.003
Match Arabic audio to Arabic text	Control	17	3.06	2.045	.496
	Experimental	30	4.27	1.680	.307
Match Arabic text to Arabic audio	Control	17	4.29	2.544	.617
	Experimental	30	4.90	2.412	.440