ASL ONLINE:

THE DESIGN AND IMPLEMENTATION OF A WEB-BASED AMERICAN SIGN LANGUAGE COURSE

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Abstract

American Sign Language can be of use as an effective mode of communication for deaf children. This study examined the development and implementation of an Internet-based introductory-level course in American Sign Language. Caretakers of deaf children and other children who communicate visually are often unable to attend traditional American Sign Language courses and can benefit from an online course. Student opinions and suggestions for improvement were collected. Demographic information, pretest scores, and posttest scores were compared with those of students in a traditional classroom-based American Sign Language class. An independent-samples t-test found no significant difference in receptive vocabulary test scores between the two groups of students. Online instruction is well suited for the development of receptive skills acquisition. A higher percentage of male students participated in the online course than participated in the traditional course. Students who registered for the online course tended to be older and nearer to completing their degree programs than students who registered for the traditional course.

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Introduction

Few things have as much impact on the quality of life of a child as her ability to communicate effectively with those responsible for her care and education. According to the National Institute on Deafness and Other Communication Disorders, approximately 1 out of 1,000 infants is born deaf (Communication Options for Children Who Are Deaf or Hard-of-Hearing, 2000). About 90 percent of deaf children have hearing parents. This means that 9 out of 10 deaf children are born into households where they will likely experience severely limited access to language (Schein, 1984).

A visual-gestural language such as ASL can provide a readily accessible mode of communication which deaf children can use to develop an early linguistic foundation which will in turn support their cognitive development and later educational achievement. (Emmorey, Lane, Bellugi, & Klima, 2000).

The Problem

Acquisition of ASL is often a challenge for parents of deaf children. Many parents express a desire to learn ASL but find themselves unable to attend traditional classroom-based ASL courses. These parents would benefit from being able to participate in courses offered via the Internet. Some of the reasons why traditional class attendance is difficult include:

1. Lack of class availability. This is especially true in rural areas.

2. Scheduling conflicts. Many parents work in the evenings or weekends. The time that is convenient for the teacher is not likely to be convenient for the parent.

3. Cost. Putting food on the table and keeping the kids clothed takes precedence over the costs involved with attending in-person classes: Course tuition, book fees, videotapes, gas for the car, wear and tear on the car, plus lost work hours.

4. Lack of time. Driving to and from sign language classes can take up precious time that many parents simply do not have. In-person classes tend to require a block of time of an hour or more. Whereas many parents are able to squeeze in 15 minutes of time here and there, it is difficult for them to carve out the large blocks of time it takes to "go to class." It takes about 15 minutes to get ready to go out, 20 minutes to travel to the class, arrive 5 minutes early to be polite, sit in class for an hour, chat with other students for five minutes to be polite, travel 20 minutes to get home, then take a couple of minutes to put your books away and get settled. That is over two unbroken hours of time just to be exposed to approximately 20 new vocabulary words and a few grammar concepts.

5. Limited exposure to the language model. Seeing an instructor once a week is not enough for some parents to successfully internalize new material.

6. Speed of learning. Due to diverse learning styles and abilities, instructor led multi-student courses generally progress at a pace that is too fast for some and too slow for others. This leads to frustration and increased attrition rates.

7. Critical time frame. The first few years of life provide a critical window of language learning during which children's brains are optimized for linguistic and cognitive growth. Any delay of language input during these first few years of life is likely to result in a lasting negative impact on future cognitive development and educational attainment (Emmorey et al., 2000).

8. Instructor Qualification: Even if a class is available, another problem arises in that not all instructors are qualified.

Delimitations

Employing a paper-based dissertation to examine a technology-based approach to ASL delivery is akin to taking a picture of a river. By the time you release the button your subject has changed. The river is still there, but the water is new. Technology is progressing at such a pace that by the time this dissertation is complete, it will also be obsolete.

The purpose of this study is not to establish whether a web-based course is needed. The problems and issues listed above and discussed in the literature below are sufficient to warrant a course. There is no point in further researching the effectiveness of distance education compared with traditional classroom instruction. Numerous studies and well-established programs have already shown that distance education is effective, (Jones, 2000). What is needed is an actual functioning online ASL course. This type of research is not historical, descriptive, correlational, causal-comparative, or experimental. Although it will involve some of the above, this project is mainly developmental, thus fitting squarely into the branch of educational research known as "research and development." More specifically--since the researcher will also be an active participant--the project will be a type of "Action Research" resulting in the development of a specific product.

Research Question

How does one go about developing a program of study in which parents, educators, and caregivers of deaf and other visually communicative children will be able

to learn American Sign Language at their own pace from the convenience of their home Internet connection? What would the design and implementation of an online ASL course entail?

Key Variables

In order to create and successfully offer such a course, we must consider a number related questions and variables:

1. ASL is a "high motion" activity. To deliver high motion video over the Internet requires either a large amount of bandwidth or highly sophisticated compression techniques. What technologies and approaches are currently available to deal with this? Can two or more existing technologies be combined into a newer, more effective approach?

2. ASL is expressive as well as receptive. Students need to be able to sign back to the instructor for evaluation and feedback. Is it feasible at this time? If so, how is this best accomplished?

3. Taking an online course requires a certain level of computer literacy. What computer-related skills and knowledge are prerequisite for successfully participating in an online ASL course?

4. Video files take up a relatively large amount of space. Which media-formats are appropriate for storing, transporting, and presenting a virtual ASL course? Which formats are the most cost effective?

5. What sort of compression/decompression methods are available that will best allow existing bandwidth to be leveraged. How will the sheer volume of information be managed?

6. What software programs could be used to develop, and manage the course?

7. What type of computer hardware is necessary to develop, deliver, and participate in the course?

8. What technical, pedagogical, language skills and knowledge must a teacher possess in order to teach such a course?

Anywhere/Anytime Learning

Any instructional delivery approach that does not require a teacher and a student to be in the same place at the same time could fall under the umbrella of "distance education" (Steiner, 1995). In the past, this process has consisted mainly of mail-based correspondence. Modern technology has provided many options for delivering educational content to students. Examples include: recorded audio, recorded video, audio bridges (teleconferencing), television, video conferencing, and computer networking (Simonson, Smaldino, Albright, & Zvacek, 2000). Distance education that takes place over a computer network is called online training or *e-learning* (Hall, 2002). Regardless what it is called or how it is delivered, a primary goal of distance education ist to move learning to the student instead of moving the student to learning (Gonyea, 1995).

Trends in Online Training

Online training is quickly becoming ubiquitous. Currently 12 percent of the nation's schools use some kind of online curriculum to augment or replace some of their traditional curriculum (Manzo, 2002). There are nearly 1,600 K-12 teachers teaching online. That number is projected to increase by about a third within two years (Blair, 2002). According to a recent survey of State Technology Coordinators, 17 states have established online high school programs or are in the process of developing them. E-

learning initiatives are underway in 32 states, and 25 states permit cyber charter schools (Rebora & Deutsch, 2002).

The amount of money that has been directed to the development of the Internet in the recent past is another indicator that online learning is here to stay. In 1997 Congress allotted $2.25 billion for connecting libraries and schools to the Internet (Hirschbuh & Bishop, 2000). According to Infotech Trends, an organization that researches technology market data, U.S. industries spent approximately 13 billion dollars on Internet services last year. By 2005 that amount will be close to 31 billion (Forecast spending, 2001). Business and industries spend money to make money. They are investing in Internet technologies and e-learning systems because of the financial advantages inherent in electronic communication: low cost data reproduction, transmission, and storage, real-time communication, and automatic documentation (who sent what, when). These same financial advantages apply to electronic learning systems used for distance education. The benefits are even more pronounced when you consider the cost savings to students who no longer have to afford a lengthy full-time residence while participating in a traditional education program (Perraton, 2002).

Cyber-charter Schools

The combination of cost effectiveness and societal readiness has led to the creation of a new type of educational institution termed "cyber charter schools." These organizations charge school districts from $5,000 to $15,000 tuition per each student enrolled (Cook, 2002). In addition to paying teacher salaries the cyber charter schools use this money to provide books, computers, software, printers, and other equipment at no cost to the student. Schools can afford to expend substantial amounts of money on

student perks and still make a profit because they do not have to worry about traditional school overhead. Online schools do not have to worry about extensive facilities, food services, or providing extracurricular activities. The Electronic Classroom of Tomorrow (eCOT), a cyber school based in Ohio reported $1-million profit the second year operation, and has over 5000 students on a waiting list to enroll (Cook, 2002).

The numbers become large quickly. In 2003 the Philadelphia Department of Education will be reimbursing its 442 school districts $53 million to help cover the approximately $176 million the districts will spend on students attending charter schools (Hanak, 2002). With this kind of potential profit it is easy to anticipate a growing trend toward the establishment of cyber schools utilizing online instruction.

New Technology

Advances in technology are opening doors to topics which previously were difficult or nearly impossible to teach via distance education. Not all methods of distance education delivery are well suited for all topics. This is especially true in the case of sign languages. ASL is a visual-gestural language. This means information is received by the eyes and it is expressed via the hands and body. Recorded audio and telephone-based audio bridges would be of little use in teaching this language. Also, since ASL is not readily converted to nor conveyed through text alone (Sutton, 2002), email, text-based chat rooms, and instant messaging systems do not provide a suitable delivery system. Videoconferencing provides an excellent direct delivery path for visual-gestural instruction as it allows for two-way real-time video communication, but at a cost that is prohibitive to many schools (How can teleconferencing be useful? 2002).

A cost-effective alternative to traditional videoconferencing is "desktop videoconferencing" (Hewitt, 1997). This technology uses a relatively low cost digital camera, a computer, and an Internet connection to allow users to see each other in real time.

ASL on the Web

The world's largest online directory of e-learning courses is the "International Distance Learning Course Finder." This site, available at www.dlcoursefinder.com allows users to search a database of 55,000 online distance education courses from 130 countries (International Distance, 2002). A search for the keyword "ASL" and then again for "American Sign Language" returned a total of four relevant listings: two courses at University of Maine, and two courses from New River Community College in Dublin, Virginia. According to the online course listing, the Dublin course is not an online class, but rather an independent study course with materials that students pick up from an office at the beginning of the semester (New River, 2002). Likewise, the University of Maine's course is also not an online course, but rather an interactive television-based course (University of Maine, 2002).

The Oregon Public Education Network offers a series of ASL courses through its "COOLSchool" program. The COOL stands for "Cyber Oregon OnLine." Students choose a local adult mentor, then register through the COOLSchool website. Students study at home from a book and a videotape, guided by an online syllabus. Eventually the program plans to use interactive desktop video for testing, but at the present time students use a video camera to videotape themselves and mail it to the instructor of the course (Coolschool, 2002).

A "find all words" search for "American Sign Language" on Google.com (arguably one of the largest and most advanced web search engines available) returns one-and-a-half million results. An exact phrase search finds links to over 200,000 pages with the phrase "American Sign Language." Of those 200,000 pages, over 73,000 have been updated at least once during the last three months of 2002. Narrowing it down even further, an exact phrase search for sites containing the phrase "American Sign Language online" returns 212 hits. Many of those 212 sites show up because they simply contain a link to one of the approximately 20 sites that contain a substantive amount of actual ASL content.

Not only are people linking to and posting information about ASL on the web, they are also talking about it in electronic news groups. A Google-based "search by group" for the phrase "American Sign Language" returns 151 recent postings from various online bulletin boards. These postings are mainly from three groups: "alt.usage.English," "sci.lang," and "k12.chat.teacher." The "alt" designation refers to one of the alternative newsgroups available for subscription through most Internet service providers. The "sci.lang" label represents a language subdivision of science, while the k12 represents elementary through high school teachers. This paper is not the place to get into a protracted discussion of newsgroups, but the indication is that ASL is of definite interest to people who scientifically study language, teachers, and those who want to understand how ASL and English influence each other.

ASL and Second Language Acquisition

Learning ASL is difficult for many hearing adults. Part of this has to do with being beyond the critical language learning period during which our brains are disposed

to acquiring language (Chamberlain, Morford, & Mayberry, 2000). Another part of the challenge though has to do with attitude. Hearing people have traditionally experienced a position of social dominance over Deaf people (Kemp, 1998). This has lead to attitudes and patterns of thinking that can interfere with the second language acquisition process. When a hearing person encounters grammatical and cultural differences between his native language and ASL, he or she will tend to dismiss the new information in favor of what is familiar or comfortable.

Often hearing people are under the impression that ASL can be mastered after only one or two courses (Smith, Z., personal communication, January 15, 2003). Others mistakenly believe ASL is English on the hands. American Sign Language has its own grammar, culture, and lexicon (Baker-Shenk, & Cokely, 1980).

Much of a student's success in acquiring any second language has to do with his or her motivation for learning. According to Archibald (1997), there are two major types of motivation: instrumental and integrative. Instrumental motivation has to do with wanting to learn a language because you have a particular task or goal in mind. For example, you may want to learn ASL because your new co-worker is deaf. Another example of an instrumental reason for learning ASL would be a waitress at a restaurant where a group of deaf people have decided to hold their weekly get-together. People who have an integrative motivation to learn ASL are those who are interested in Deaf people and want to get involved with the Deaf community because they are fascinated by it. Students who are motivated to integrate with the Deaf community tend to have a high degree of success in acquiring a second language (Kemp, 1998).

Even more important than the type of motivation though, is the degree of motivation. Archibald (1997) points out that learners who are offered a cash reward for getting a certain score on a language test do as well as students who are integratively motivated.

Since the typical ASL instructor, whether online or not, is not in a position to motivate students via cash rewards, it is important to give considerable attention fostering integrative motivation within students. This would include helping students develop respect for the Deaf community and Deaf culture, (Kemp 1998). Meeting deaf people and attending Deaf community events requires a substantial amount of time and may be difficult or nearly impossible for students living in rural areas with a limited Deaf population.

Technology and Language Learning

Natural language acquisition is for the most part an incidental process (Groot, 2000). Beyond a knowledge of grammar, language proficiency requires mastery of a large number of words. This is a natural process for children. As they grow up, children are exposed to many thousands of hours of incidental language samples. These language samples are presented in context. There simply is not enough time in a classroom environment to duplicate the natural language acquisition process. The alternative is direct or intentional acquisition of new grammar skills and vocabulary. One way to do this is to use bilingual sentence lists. This process pairs grammatically correct target sentences with sentences in the student's native language. According to Groot, bilingual lists produce excellent short-term results and take less time than contextual presentation, but students tend to quickly forget what they have learned.

Huckin and Coady (1999) found that direct language learning enhanced incidental language learning. They also point out that when using computer-aided second language instruction, glosses with the text alone are less effective than text-plus-picture glosses. Computer-based ASL instruction can present new lexical items and grammar concepts with accompanying contextual information such as pictures and video.

According to Brandon-Hall.com, a consulting organization that specializes in E-learning research and development, instruction delivered via computers requires 35-45% less learning time (Six Steps to Implementing E-Learning, 2001). Bradley and Lomicka (2000) did a case study focusing on language students who were learning French and Spanish via a computer lab. The students felt the technology-based environment was more relaxing than participating in a traditional classroom environment. There is no reason to believe this would not also be the case for students learning American Sign Language.

A study of college-level students learning French found that technology-enhanced language learning was both feasible and desirable. A treatment group attended three days of regular instruction followed by a fourth day of technology-delivered instruction. The control group followed a four-day schedule of regular classroom attendance. The group that participated in the hybrid course did as well as the control group on speaking and listening tests and outperformed the control group on reading and writing tests (Adair-Hauck, Willingham-McLain, & Youngs, 2000).

On the Internet, Nobody Knows You are a Dog

During the early days of the Internet, cartoonist Peter Steiner drew a cartoon for New Yorker magazine. The cartoon depicted a dog sitting at a computer telling another dog, "On the Internet, nobody knows you're a dog (Steiner, 1993)."

In a text-based chat room the teacher and students do not know much about one another. At the outset they don't know each other's gender, ethnic background, facial features, age, clothing style, height, weight, or any other physically defining characteristic. This anonymity provides a playing field that is much more level than that afforded by a traditional classroom.

A certain degree of perceived anonymity exists in a typical online class. People tend to feel more safe when communicating from behind a keyboard and a screen-name. One of the earliest studies regarding e-learning was conducted by Jerome Bump who used collaboration software and networked computers to study discussion participation of English students. He found that, overall, students participated more in a networked environment than they do in a regular classroom situation. Even more importantly, he observed that students who have traditionally been marginalized were much more participative than they were in traditional environments (Bump, 1990). This could be a factor for parents of Deaf children who desire to take an ASL class. An older student might feel intimidated about attending a college ASL class with others who are substantially younger. Attending an online course may provide a sufficient level of anonymity to enable an older or non-traditional student to feel comfortable participating and thus increase the likelihood of their successfully acquiring ASL.

Anonymity can also work against students. Removing faces from the classroom can lead to “deindividuation” (White & Weight, 2000). Teachers who only interact with words on a screen tend to lose sight of the fact that students are individuals. When that happens, teachers begin treating all students as if they are the same.

Copyright and E-learning

In designing an online ASL course, or any online course for that matter, serious consideration needs to be given to copyright issues. President Bush signed the "Technology, Education and Copyright Harmonization Act" (the TEACH Act), into law on November 2nd, 2002. Copyright law prior to the TEACH Act was very strict in regard to distance education (Crews, 2002). Previously that distance education teachers could only transmit portions of copyrighted material to students who were in a physical classroom environment. Now teachers can transmit content to their students wherever the students might be. The previous law also excluded broad categories of copyrighted materials from being used in e-learning. Now, an instructor can use portions of almost any type of copyrighted work (Trotter, 2002). Note that the law only allows for portions of works, not whole works. This means that a teacher cannot upload items that he or she would normally put on reserve at the library or require students to purchase at the bookstore. For example a teacher shouldn't digitize and upload an item which a student will be using on their own or repeatedly. The general idea is that a teacher may use copyrighted works in web-based courses similar to the way such materials are used in a traditional classroom. An instructor would not (or at least should not) show up in class with a stack of 25 videos onto which he or she has copied a half-hour professionally produced documentary about the topic being taught that week. Nor should a teacher

distribute a 100-page anthology of chapters from various works without getting specific permission from the publishers.

In a traditional classroom a teacher might stand in front of the students and show them a video clip or play a part of a song. That is an "in class" type of presentation-mediated by the instructor. In the same vein, the law precludes posting copyrighted works to a storage area on the net where students can come back after the course is over and still have access to the material. A teacher can use limited portions of copyrighted materials during the semester in a class that he or she is actually teaching via an accredited educational institution. Permanently storing the material in a general "resource web" that is open to the public is not permitted (Crews, 2002). Also, if a digital version of whatever analog materials the teacher is planning to use already exists, he or she should use the existing version rather than converting the analog. For example, using the above guidelines it is okay to scan and post written material, or convert a few seconds of a VHS-format video clip to an AVI file, but if a DVD version of the clip already exists, the DVD should be purchased instead of converting the VHS tape (Trotter, 2002).

General Issues

One of the issues faced when designing an online course is the need to minimize the time a student spends mastering course-related technology versus time spent actually learning the topic or completing course assignments, (Palloff, & Pratt, 2001). Some students lack the technological skills to readily participate in an online course. An online student who cannot log on to class because he cannot set up a connection through an Internet service provider is analogous to a traditional student who goes to class and finds the building locked (White & Weight, 2000). Technical problems will become less of an

issue as Internet use becomes more commonplace. At one time keyboarding was a problem. Now keyboarding is considered an ordinary and expected part of everyday life for most students. Basic computer operational skills will be as natural to students of the future as using a pencil is to students today. In fact, some students are to the point now where using a pencil seems somewhat archaic.

The technology involved in teaching online tends to be a double-edged sword. For example, technology has the capacity to provide us with incredible amounts of both information and entertainment instantly. This was an obvious issue in a class the author recently observed. The course was being taught onsite at a university technology center to take advantage of an available LCD projector, a smartboard, and an Elmo (a device that allows for easy rendering and transmission of images from books or similar media). Each of the students happened to have before them a computer with access to the Internet and thereby to their email accounts. For many students the opportunity to check their email was simply too great of a lure. Upon logging into their mail servers their computer speakers would ring out, "You've got mail!" The instructor would then tell all the students to turn off their computers, thus denying some of the more focused students the opportunity to use Internet access as an adjunct to classroom instruction. Such a problem is much more pronounced in courses that are fully online. An instructor who offers an online course is in effect choosing to compete with millions of provocative web sites for his or her student's attention. The problem of students surfing instead of studying can be controlled by using sophisticated course management tools. For example, www.DefensiveDriving.com offers an online course that is taken by a large number of disinterested and reluctant students. They take the course because it allows them to have

traffic violations dismissed. Given the opportunity, many students would choose to log on to the course, then go surf elsewhere while pretending to "attend" class. The course designers have dealt with this in a number of ways. If a student opens a separate window with which to browse, the website automatically logs the student off. Periodically the website opens a dialog box and asks the student to answer certain questions, like "What is your drivers license number?" Also, students must remain relatively active when taking the course. The website automatically logs students off after 7 minutes of inactivity (Defensive Driving, 2002).

Conflicting software formats are another problem. Oftentimes students and teachers use different word processing software (Gardner, 2002). For example, a student might submit an assignment that was created using Microsoft Works to a teacher who uses Word 2000. There are a number of solutions to this problem. The teacher can require the students to turn in their projects using a specific word processing program. This is not a good solution because it is not practical. The teacher could require students to upload their assignments as a web page to a server. That would require a level of sophistication beyond many students' abilities. A relatively simple approach is to save and exchange documents using "rich text format (.rtf)" which is readable in most word processors.

Approaches to Instructional Design

There are a number of established approaches to the systematic and effective creation of training courses. According to Clark (2000), some of the more popular approaches include: Performance-Based Training (PBT), Criterion-Referenced Instruction (CRI), and Instructional System Design (ISD). These systems all share a

similar emphasis on the importance of tying instructional objectives to the knowledge, skills and abilities that a learner needs in order to accomplish the job or task he is preparing to do. Instructional models based on these approaches promote the logical development of sequential lessons using material that can be tracked, evaluated, and updated to reflect current information and best practices.

The ISD method of instructional development (analysis, design, development, implementation, and evaluation) first became popular during World War II when the United States government needed to train huge numbers of people quickly and efficiently (Ivers & Barron, 1998). Since then, models based on the ISD approach have provided a systematic and reliable method of designing curriculum, materials, and content delivery systems.

The DDD-E Model

A type of ISD model that has worked well for multimedia projects is the Decide, Design, Develop, and Evaluate (DDD-E) model. This model, developed by Karen Ivers, an Assistant Professor at California State University, Fullerton, California, and Ann Barron, an Associate Professor of Instructional Technology at the University of South Florida, provides a good scaffold for multimedia projects and is flexible enough to adapt to today's rapidly changing technology (Ivers & Barron, 1998).

Method

Action research is a term for research that involves the researcher as an active participant in the data generation/collection process and is particularly suited to education-related projects (Greenwood & Levin, 1998). This online ASL project utilized an action research approach grounded in an established research and development model outlined by Charles (1988) The following steps were followed:

1. Identification of the problem or need
2. Collection of information
3. Planning of the project
    a. formulation of objectives
    b. selection of activities
    c. creation or collection of materials
    d. selection of procedures
4. Preparation of the course
5. Preliminary testing in an educational setting to identify errors, difficulties, omissions and shortcomings
6. Revision of the project to correct problems
7. Implementation of the revisions

It is important to recall that the purpose of this research was not to compare one teaching methodology with another, but rather to develop a new product. The *research and development* approach was in line with the Decide, Design, Develop, and Evaluate (DDD-E) model proposed by Ivers and Barron (1998) for the creation of multimedia projects in education. The DDD-E model provided a systematic and reliable approach for

the design and implementation of the curriculum, materials, and delivery system of the online ASL course.

General Process

The researcher developed a web-based, 25-lesson American Sign Language Course. This course was posted to the Internet site www.Lifeprint.com and made available for public use and feedback under the title "ASL University." As a pilot study, during Fall Semester of 2002 the researcher taught a course which met in a traditional classroom, but which used the online ASL University curriculum as the course text. This allowed an opportunity to "test out" the curriculum and make adjustments prior to the official evaluation phase. Then during Spring Semester 2003 the course was offered to college students via a combination of Lifeprint.com and Lamar University's WebCT program. WebCT is an online course hosting system that initially provided structure for the administrative aspects of the online course, including attendance monitoring, classroom (chat-room) space, a bulletin board, a listserv, testing facilities, document sharing, and an address book. The Lifeprint website provided course content, reference, and practice.

Data Sources

Project data came from the following sources:

1. Researcher documentation: "Field notes." Observations of which approaches and techniques provided the maximum efficiency and economy while maintaining acceptable resolution and compatibility. This included notes concerning software choices and reasons for selection; hardware configuration; web host provision, Internet access provision, codec suitability, storage format selection, and related issues.

2. Qualitative feedback from the public: During its development, the general content of the course was posted on the Internet and submitted to major search engines including Google and Yahoo. An email link was provided for general public feedback, comments, and suggestions regarding the course.

3. Qualitative feedback from registered students: During the evaluation phase of this project, registered students were queried regarding what they liked and did not like about the course.

4. Survey and pretest: At the beginning of the course, students took a survey and a pretest to gauge their familiarity with ASL. These are described in the instruments and measures section below.

5. Graded testing: During the course, students took a full compliment of graded quizzes and tests (27 in all, including testing of grammar skills) comparable to that which they would have received in a traditional course.

6. Posttest and end-of-course survey: Upon completion of the course, students filled out a course evaluation and took a post test. The posttest is described in the instruments and measures section below.

Participants

Participant selection: Students self-selected by registering via the established Lamar University Registration process. The course was advertised in the Lamar University schedule.

Setting: Online environment with physical office available for in-person advisement.

Participant Criteria: Any Lamar University student who was able to register for the course was welcome to participate. Feedback from all students who participated was included in the qualitative analysis. Scores from all students who completed the course were included in the quantitative analysis.

Procedure

The following procedures were used in the design and implementation of the online course:

Phase 1: Gather data regarding what ASL-related information will be the most useful to parents and/or other primary caregivers of children who are deaf. Review the literature. Ask parents and caregivers what signs and information do they need to know to communicate effectively with their deaf children regarding daily routines and events?

Phase 2: Design an online ASL curriculum based on the researcher's 15 years of ASL instruction experiences, frequency of use lists, and data gathered from the parents and other informed sources.

Phase 3: Implement the curriculum as a web-based course and make it available to parents and others via the Internet.

Phase 4: Incorporate feedback from the public into the developing website.

Phase 5: Use the ASL University curriculum as the course material for a traditional ASL course taught in a brick and mortar classroom.

Phase 6: Incorporate feedback from the traditional students into the online course.

Phase 7: Teach the course via distance education to registered college students.

Phase 8: Gather, analyze, and evaluate the data.

Phase 9: Disseminate information regarding the existence of the course via direct submission to Internet search engines, e-mail to directors of deaf-related organizations, article submissions to appropriate publications, and in-person presentations at seminars and conferences.

Materials

The course was designed and delivered using a personal computer, html editing software, and WebCT course creation tools. The course was posted to the web via dial-up Internet connectivity.

Student Participation

Students needed access to an Internet capable computer with a CD ROM, a minimum of a Pentium class computer with 32 MB (megabytes) of RAM, a CD ROM player, Internet Explorer version 5, and a 56K dial-up connection. Plus students needed access to video recording equipment in order to record and submit the expressive component of their midterm and final. Students were allowed to submit their videos in mini-dv format, CD ROM, or VHS.

Instruments and Measures

The course used 25 quizzes to test students' grammar and receptive skills. Each quiz corresponded to one of the 25 lessons in the curriculum. Each quiz contained at least 20 signed phrases incorporating ASL grammar. The quizzes were administered via CD ROM and/or videotape. Student submitted their quiz answers via email. In addition to the quizzes, a midterm and final were administered. The midterm and final each tested students' expressive skills. Both the midterm and the final were proctored and required students to sign grammatically correct ASL phrases. Students were allowed to submit

their midterm and final either in person or as recorded media. Additionally, students were required to submit a 500 word research paper on an ASL-related topic. The quizzes, midterm, final, and research paper were used to determine student grades. The researcher also administered a beginning-of-course survey, a pretest, and a posttest. The survey consisted of demographic information and questions to determine the participant's familiarity with the grammar and lexicon of ASL. The pretest and the posttest each consisted of 25 ASL lexemes (one from each lesson) presented sequentially on a web-page as static JPEG-format images. This approach was chosen for its simplicity and its similarity to the lexicostatistical process commonly used in language research (Woodward, 2000).

Control Group

A group of traditional ASL 1 students being taught during the same semester by an instructor other than the researcher were used as a control group. The control group received a pre-course survey, pretest, and posttest. The pretest and posttest for the control group were similar in length and format to those of the experimental group. For equivalency, questions for the control group's pretest and posttest were drawn from their own curriculum rather than the curriculum being used by the experimental group.

Results

The results of this study are presented in four sections that correspond to the research and development model upon which this project is based. Key results are discussed in terms of the (a) design, (b) development, (c) implementation, and (d) evaluation of an online ASL course. Data gleaned from surveys, student feedback, course evaluations, and the researcher's field notes are presented in this section and expanded upon in the discussion section. Data gathered from the pretest and posttest results of the two groups were analyzed using a mixed design analysis of variance and are presented in the section on evaluation.

The primary observable result of a research and development project is a new product. The product resulting from this research is a functioning online course titled "ASL Level 1." As of this writing, the course is available to the public on the Internet at www.Lifeprint.com.

Design

The researcher designed an introductory level ASL course covering 18 grammar concepts, 500 vocabulary concepts, the manual alphabet, numbers, and basic information related to Deaf culture and history. The above content was organized into 25 sequential lessons. Each lesson focuses on a general theme and includes corresponding grammar concepts, vocabulary, and practice sentences.

Course assignments included 25 receptive quizzes, a 500-word research paper, an expressive midterm, and an expressive final. To facilitate the administration of quizzes, the 25 lessons were divided into five units. A CD ROM was designed for each unit. Each CD contained five quizzes presented in full-motion video.

A section of the website was designed to hold the syllabus, lessons, practice quizzes, course messages, guidelines for completing the research paper, and instructions for taking the midterm and the final. A second website was used to post a survey, a pretest and a posttest. Spreadsheets were devised to organize the results.

Development

The Lifeprint curriculum was developed using "word frequency" research. Word frequency lists indicate which words in a corpus are most commonly used. The presentation order for the ASL grammar and vocabulary concepts used in the curriculum was developed by using concordance software (Nation, 2000) and by surveying and comparing existing word frequency lists (Carroll, Davies, & Richman, 1971; Jensema, & Rovins, 1997; Maynard, Walls, & Ryan, 1998). Of particular use was Kilgarrif's (1998) work on the British National Corpus (BNC). The BNC is a database of computer-readable modern-day English words drawn from a wide cross-section of both spoken and written language samples (Hodges, 1995). Once the presentation order was established, corresponding ASL equivalents were selected and arranged into various lessons.

The curriculum was developed to function both online and in the classroom. When used in a traditional classroom, new vocabulary concepts are embedded in grammatically correct ASL phrases and introduced via discourse. For the online version, each vocabulary item is presented as a hyperlink leading to a page containing relevant grammar notes and examples of the various ways in which the concept can be signed. For example, the link "ALL" leads to a page which shows the traditional sign "ALL," the lexicalized sign #ALL, and an inflected, two-hand version of the lexicalized sign.

The individual sign pages consist of stop action pictures of signs. These pictures are in JPEG (Joint Photographic Experts Group) format. Some of the pages also contain full motion video clips to clarify the movement of particular signs. Initially AVI (Audio Video Interleaved) files were used for the video clips but were too large to be effective for dial-up connectivity. The AVI files were converted to animated GIF (Graphic Interchange Format) files and hand edited to remove unnecessary frames. The files were then cropped to remove any unnecessary space in the background. This allowed for a huge reduction in file size, but was time and labor intensive.

To provide full motion video of complete sentences the AVI files were converted to WMV (Windows Media Video) Format and placed on five CDs. The WMV files on the CDs were relatively large, ranging from 557 MB to 130 MB. The first two CD's in the course were created at a resolution of 320 by 240 pixels and compressed with the Media Player version 8 codec. Students used Windows Media Player and/or Real.com's RealOne player to access the video files.

In an effort to provide a better quality image, the third CD in the series was created at a resolution of 640 by 480 and used a newer Media Player 9 series codec. This substantially increased the hardware processing requirements for the students and necessitated a round of downloads by the students to upgrade their systems to the newer codec. Many of the students who were able to use the first two CDs on their computers found that their computers couldn't render the new format. In the majority of cases this was solved by having the students download the latest version of Media Player and configure it to automatically obtain the necessary codec. A few of the students were not able to upgrade their systems. As an alternative, the video files were converted to VHS

format and placed on videotapes for backward compatibility and ease of use. The last two CDs returned to the former 320 by 240 pixel resolution.

Of the available video formatting and compression approaches, several stood out above the rest: Windows Media Video, QuickTime Video, Sorenson, and various MPEG formats. Windows Media Video was selected for its combination of low cost, wide availability, ongoing product development, and numerous support channels. The Windows Media Video files were created using Windows Movie Maker which comes free with Windows Millennium Edition and Windows XP operating systems.

Specific Tools

The curriculum was developed on a PC with a Pentium IV processor, 768 MB (megabytes) of RAM, 168 GB (gigabytes) of hard drive storage space, Marvel Matrox g450TV video card, and a Sony 40X CD burner. Software included Windows XP, Microsoft Word 2000, Microsoft Excel 2000, Paintshop Pro version 7, Microsoft Front Page 2000, Internet Explorer, Flash Renamer version 3, WS_FTP light edition, and Xara Webstyler version 3.0.

The videos were shot with a Panasonic PV-DV102 digital video camcorder and a Panasonic VHS camcorder. Video files were ported to the computer several ways including through a Dazzle Hollywood DV-Bridge, 1394 “firewire”, and a Matrox video card. After being captured to the hard drive, the files were edited using Animation Shop version 3 and Matrox PC-VCR. Several programs including ULead’s VideoStudio and MGI’s Videowave were tried but rejected due to personal preference, editing style, and best-fit compatibility with the existing computer video card.

At the outset, an IBM Aptiva PC with a 250 Mhz Intel processor and 96 MB of RAM was used to begin creating the website. This computer proved inadequate to the task and was abandoned in favor of the newer configuration.

Instructional Skills

Developing this course required a knowledge of ASL, Deaf culture, instructional methodology, second-language acquisition theory, computer networking, file formatting, email processes, computer installation and maintenance, software installation, video and photography skills, web page design, HTML, JavaScript, and spreadsheets.

Implementation

Initially the researcher began uploading the course to the university's online course management system known as WebCT. The WebCT course creation tools proved to be very cumbersome compared to Microsoft's FrontPage software. Adding files, renaming files, managing links, changing web navigation paths, and removing unwanted features consumed large amounts of time via the WebCT system. Eventually it was decided to host the course at Lifeprint.com and use the WebCT site for registration and as a pointer to a course homepage at the Lifeprint.com website.

The value of using a web management tool such as FrontPage became evident as the website grew larger. FrontPage automated and completed many tasks in minutes that would otherwise have taken hours. For example, the website has numerous lines called "horizontal rules" that divide information and help make the site aesthetically pleasing. These rules are created in HTML by using the <hr> tag. As time went on, the took on somewhat of a "purple" accent theme. The researcher found that the horizontal rules could be made to appear purple by changing the tags from <hr> to <hr

color="#800080">. To make this change for the whole website by hand would have required several days work. Using FrontPage it only took a few minutes to replace 4,102 occurrences of the <hr> HTML tag in 1,273 pages.

Student Access

The majority of the students accessed the website via 56K dialup lines from home. Several had broadband connectivity. Two students did not have Internet connectivity at home. One of those students used a combination of her work computer, a friend's computer, and a computer lab. The other student used a computer at his local library.

One particular student had an extremely slow Internet connection. This was dealt with in two ways: The first way was to teach the student how to download the Lifeprint.com website to her personal computer for offline viewing. The second accommodation was to provide the student with a copy of the website on a CD ROM. The site was copied using the "Nero Burning ROM" software program.

At the beginning of the course a chatroom session was scheduled for each Monday evening. The chatroom session was phased out after three weeks due to disuse. The original intent was to provide a forum for students to ask questions and receive clarification regarding course assignments. Students preferred to ask questions throughout the week via email rather than waiting for Monday evenings. The instructor composed answers to questions posed by individual students and then emailed the answers to the whole class. The questions and answers were then archived at the website's "course messages" area for future reference.

Computer literacy was somewhat of an issue during the first two weeks of the course. The main problems encountered were log on issues related to WebCT, and computer configuration issues. Resolutions to these issues included downloading current versions of Internet software, installing appropriate codecs, and using proper capitalization while typing in the right passwords.

The website was hosted at www.Featureprice.com. Featureprice was selected based on its advertised "no bandwidth" restrictions, transmission speed, 5GB storage area, and reasonable price. During the semester in which the course was offered, Featureprice began having serious management and technical problems which led to the closing of their online helpdesk and support services. Several times during the semester Featureprice's servers went offline. To deal with this the researcher mirrored the Lifeprint.com site to a different Internet host provider named Ehostsource.com and provided a private link for students to the new site. A few weeks later, Featureprice went out of business.

While setting up the course it was found that Featureprice's FrontPage Server Extensions were either incorrectly installed, or corrupted. FrontPage server extensions are a collection of programs that provide functionality for a variety of advanced web page functions. Of particular importance was the ability to use forms to gather data. Several free Internet Host Providers (IHPs) were considered and two were selected that provided FrontPage Server Extensions: Angelfire.com and Netfirms.com. Small websites were setup through these IHPs to host the demographic survey, the pretest and the posttest. The pages were configured to store the results in html format on the server and to also send the results in the body of an email directly to the researcher.

Web Statistics

Placing the course on a publicly accessible web server provided an opportunity to gather data about what types of ASL information people are seeking. From Figure 1 we see that more people visited the website on Wednesdays than any other day. The fewest number of people visited on Saturdays.

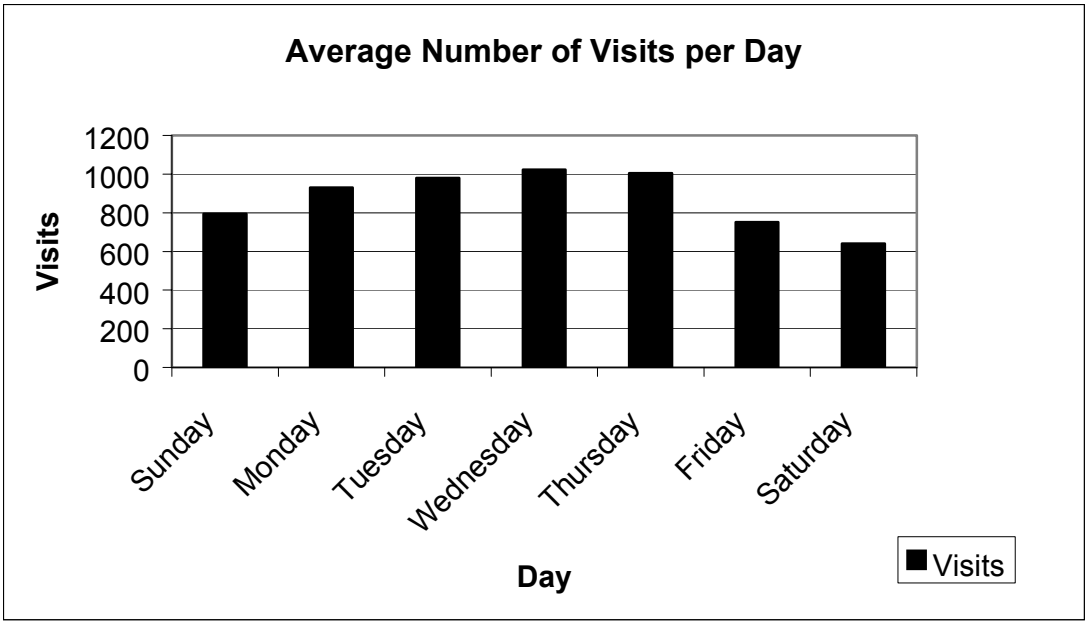

Figure 1. Average number of visits per day.

One of the benefits of online courses is that they are accessible 24 hours a day. The most popular time for visiting the website was at lunch time. The least popular time was between 4:00 a.m. and 5:00 a.m. More people accessed the website from midnight to 1 a.m. than accessed it from 8 to 9 a.m. For more information see Figure 2.

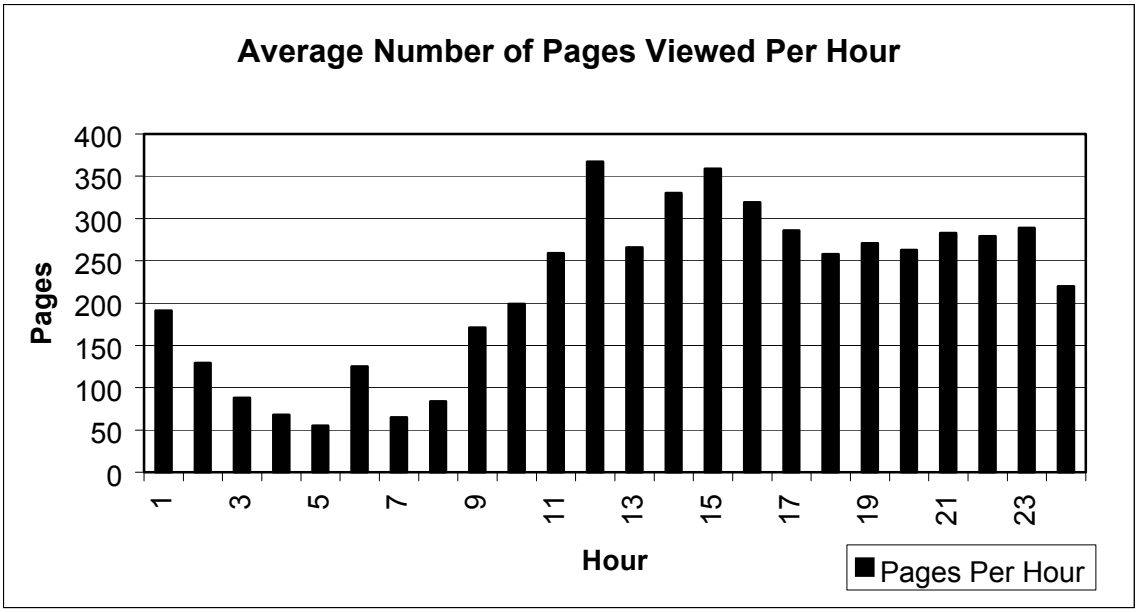

Figure 2. Average number of pages viewed per hour.

Most public users of the course found the website by using an Internet search engine such as Google.com. The text a person types type into a search engine is referred to as a "search string." People located the Lifeprint.com website using 2,749 different search strings. See Table 1 for a listing of the top 20 strings people used.

Table 1

Top 20 of 2749 Total Search Strings

Rank	Percentage	Search String
1	8.96%	American Sign Language
2	4.36%	ASL dictionary
3	3.67%	sign language
4	2.55%	American Sign Language dictionary
5	1.06%	history of American Sign Language
6	0.78%	fingerspelling

7	0.73%	ASL university
8	0.59%	finish touch
9	0.57%	American Sign Language history
10	0.57%	sign language love
11	0.54%	learning sign language
12	0.47%	basic sign language
13	0.47%	signed English
14	0.44%	ASL sign language
15	0.39%	how to brush teeth
16	0.39%	sign language thank you
17	0.39%	Thomas Hopkins Gallaudet
18	0.38%	numbers
19	0.36%	Gestuno
20	0.36%	oralism

Note. Data from February, 2003

People access the Internet through various web access providers. Information regarding the location of the web access provider can be gleaned from the provider's "dot extension" as in .com, .net, .org, etc.. This allows webmasters to get a feel for the location of users who are accessing a site. Users accessed the online course from 76 different countries. See Table 2 for the top 30 locations or extensions from which people accessed the course website.

Table 2

Top 30 of 76 Total Countries or Extensions

Rank	Files	Country or Extension
1	33.48%	Network (.net)
2	32.08%	US Commercial (.com)
3	18.30%	(unresolved)
4	5.94%	US Educational (.edu)
5	2.46%	United States (.us)
6	1.71%	Canada (.ca)
7	1.72%	Non-Profit Org (.org)
8	1.03%	South Africa (.za)
9	0.72%	US Military (.mil)
10	0.50%	US Government (.gov)
11	0.34%	Japan (.jp)
12	0.18%	Dominican Republic (.do)
13	0.23%	Slovak Republic (.sk)
14	0.18%	United Kingdom (.uk)
15	0.18%	Mexico (.mx)
16	0.17%	Thailand (.th)
17	0.13%	Australia (.au)
18	0.13%	New Zealand (.nz)
19	0.09%	India (.in)
20	0.10%	The Netherlands (.nl)

21	0.09%	Italy (.it)
22	0.07%	Brazil (.br)
23	0.07%	Singapore (.sg)
24	0.06%	Finland (.fi)
25	0.04%	Poland (.pl)
26	0.04%	Belgium (.be)
27	0.03%	Cyprus (.cy)
28	0.03%	France (.fr)
29	0.02%	Estonia (.ee)
30	0.02%	Denmark (.dk)

Note. Data from February, 2003

The amount of information downloaded from a website is a strong indicator of its growth. A "virus effect" is taking place with the Lifeprint.com website. As more and more people discover the site, they are posting links to it from their own web pages. The more links on various other people's web pages, the higher the site's search rating is on search engines such as Google.com and others. As of this writing, Lifeprint.com is ranked number 20 out of 1,580,000 websites. Figure 3 shows a record of sustained growth of the site's bandwidth usage over an eight-month period.

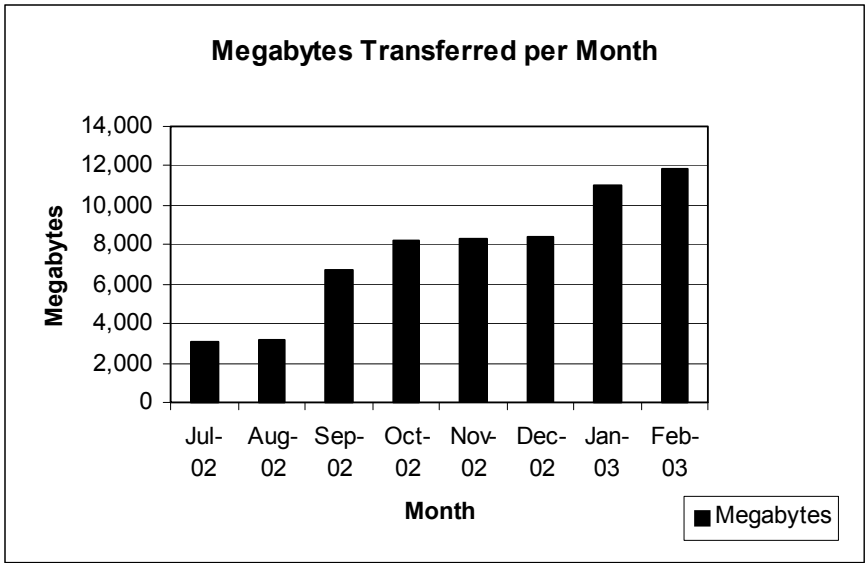

Figure 3. Megabytes transferred per month.

Another indicator of a site's popularity is the number of visitors it receives. This is indicated by the number of unique IP (Internet Protocol) addresses from which people access the site. The pattern shows a combination of general growth, and influence from public school schedules. Figure 4 shows a major increase in visits in September.

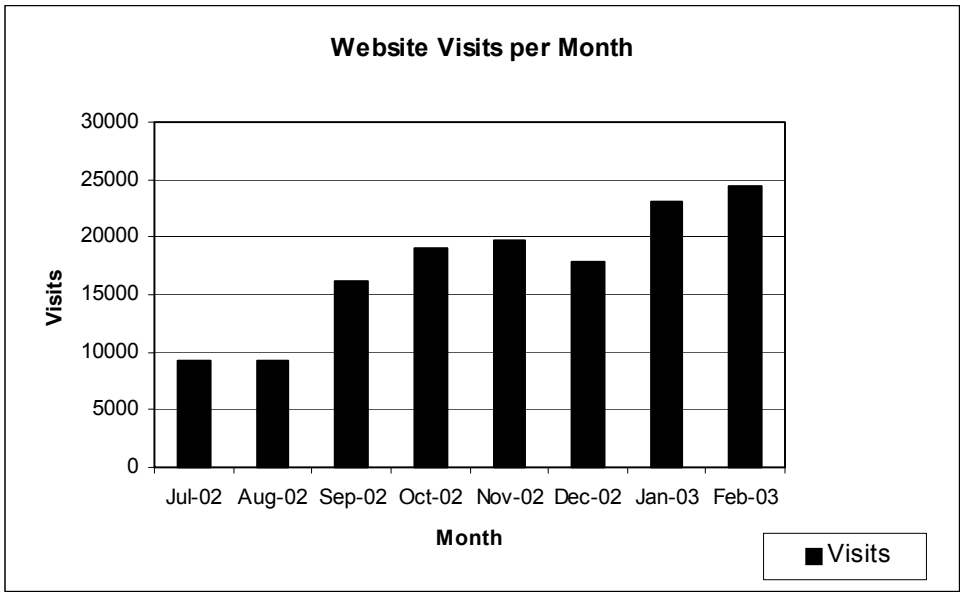

Figure 4. Website visits per month.

Cost

The website for the online course had two main expenses. The first was a $35 name registration fee. The second was a $203, 12-month web hosting fee. The name registration fee was paid to a registration company, called a registrar, for setting up the name and dot extension. In this case, the registrar was NetworkSolutions.com. The site name was Lifeprint. The extension was ".com." The site was hosted at FeaturePrice.com and later transferred to IPowerweb.com.

Normally a third cost would be involved and it would be the largest of various expenses. That would be the cost of a webmaster to design and maintain the site. To hire a webmaster for a site as large and complex as Lifeprint would have cost a considerable amount of money. Since the researcher functioned as the webmaster for the site, this expense was spared.

Evaluation

Participants in the course were given a pretest, 25 receptive quizzes, an expressive midterm, an expressive final, a posttest, and they completed a 500-word research paper. "Receptive" refers to the observance of signing and is analogous to listening. "Expressive" refers to the act of signing and is analogous to speaking. All total the students were tested 29 times, 27 of which involved ASL grammar and sentence-length phrases.

Each of the 25 receptive quizzes consisted of 20 full-length sentences using ASL grammar. The quizzes also included a varying number of individual vocabulary items. Students were allowed to turn in their quiz answers in whatever format was convenient

for them. Most students emailed their quiz answers, but on occasion answers were faxed or hand delivered to the instructor's office mail slot.

The midterm and final exams required students to sign a list of grammatically correct ASL sentences. Students were allowed to take the midterm and final at a time and place of their choosing using a responsible proctor. After students chose a proctor, the instructor sent the proctor a list of sentences to be used as a script for the video. The proctors printed off the sentences. When students were ready to take the test, they closed their books and other sources of help, turned their sentence sheets right side up, and rehearsed signing the sentences for up to 15 minutes. Then the proctors made video recordings of the students signing the sentences. The videos were placed in sealed envelopes and submitted to the instructor via mail or hand delivered prior to the due date.

Video recordings were accepted in a variety of formats including VHS, Mini-DV, Hi-8, Hi-8 digital, Compact VHS, and CD. The instructor reviewed the submitted video, graded it, typed up feedback, and emailed the feedback and the score to each student. This process took an average of 50 minutes for each test submission.

In addition to using a proctor, students were allowed to take the midterm and final in person from the instructor. Approximately half of the students used this option. The instructor made notes regarding each student's signing and then provided feedback directly to the students in their native language. This process took approximately 20 minutes per student.

Control Group

Demographic information, pretest scores, and posttest scores were compared to a control group consisting of a traditional ASL level 1 course being taught at Lamar

University the same semester as the experimental course. The traditional course used the text "Learning American Sign Language" (Humphries, & Padden, 1992).

Participant Data

Initially 32 people registered for the online course. Of these 32, seven dropped, leaving 25 graded students. Three of those 25 did not functionally participate in the course, leaving a total of 22 participants in the experimental group. The control group had 20 participants.

Gender. Of the 22 participants in the experimental group, 8 (36%) were male and 14 (64%) were female. In the traditional course, 2 (10%) were male and 18 (90%) were female.

Age. The average age of the experimental group was 27. The average age of the comparison group was 23.

Class rank. Of the experimental group, 1 student was a freshman (5%), 3 students were sophomores (14%), 6 students were juniors (27%), 8 students were seniors (36%), and 4 were graduate students (18%).

Of the comparison group, 7 students were freshmen (35%), 6 students were sophomores (30%), 7 students were juniors (35%), none were seniors, and none were graduate students.

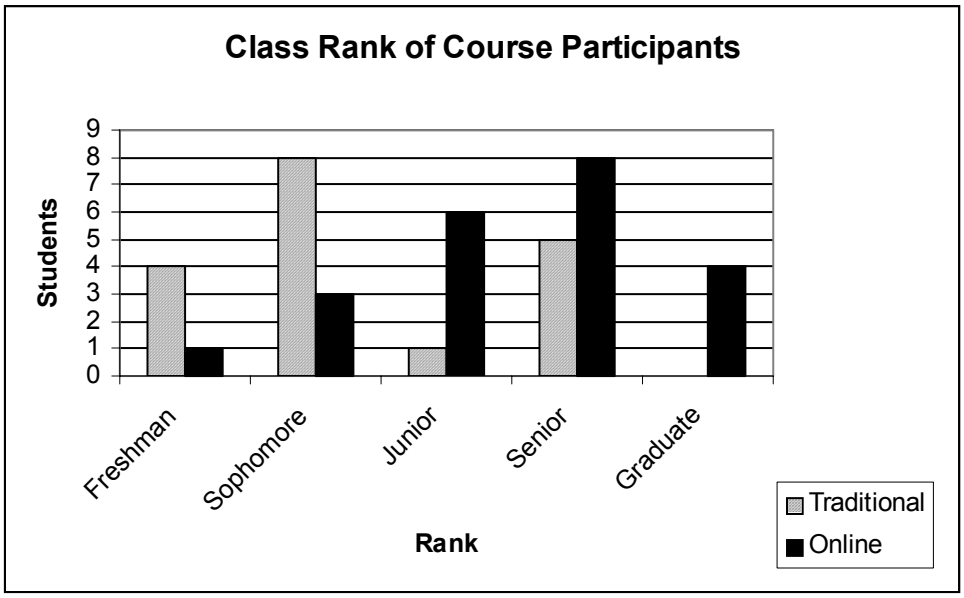

Figure 5. Class rank of course participants.

Previous ASL Experience

Prior to taking the online ASL course, approximately a third (36%) of the students knew a few signs (fewer than 50), but no ASL grammar. The remaining two thirds were total beginners. One student had previously taken part of an ASL course.

Of the control group, one (5%) student knew 100 to 200 signs and quite a bit of grammar, one (5%) knew 50 to 100 signs and no grammar, nine (45%) knew a few signs but no grammar, and five (25%) were total beginners. One (5%) had previously taken an ASL course.

Reasons for Taking an ASL Class

Participants in the control group listed typical instrumental or integrative reasons for taking an ASL course (Archibald, 1997). Integrative reasons were those in which a student wanted to integrate into a community for purposes of enjoyment or self-fulfillment. Instrumental reasons included learning ASL as an instrument to accomplish some utilitarian objective. The typical instrumental reason was to fulfill degree plan

requirements. Several were learning it to use in their work as teachers. In total, seven of the comparison group's reasons for taking an ASL class were strictly instrumental. The other 13 listed either integrative reasons or a combination of integrative and instrumental.

Participants in the experimental group had reasons similar to those of the control group for taking an ASL class. They additionally gave reasons for taking the class online rather than in a classroom. The majority (73%) indicated convenience in scheduling as a factor in their choice. See Appendix A for a listing of both groups reasons in their entirety.

Pretest

Both groups received a 25 item vocabulary pretest. Of the experimental group, 16 students didn't get any right, five understood one sign, and one understood three signs. In the traditional class, 11 didn't get any right, seven understood one sign, one understood two signs, and one knew 10 signs. On average, neither class understood more than one out of the 25 signs at the beginning of the semester.

Posttest

The same 25 item test was given again at the end of the course. An independent-samples "t" test was conducted to determine whether there was a significant difference in vocabulary test scores between the two groups of students. The mean vocabulary score was 11.25 for students in the online course and 10.11 for the traditional course. With an alpha level of .05, the difference between the means was not statistically significant: $t(22) = .71$, N.S. See Appendix C for the data set and related information.

Discussion

This was a research and development project. The goal of the project was to explore the design and implementation of an online ASL course. Neither distance education nor ASL classes are new. It was expected that the students would learn, and they did. The main benefit of this project was *not* an addition to distance education theory and knowledge. Nor do we now know appreciably more about how distance education compares to traditional education than we did before. The real benefit of this research is that there now exists a 387 MB website that is being accessed over 24,000 times a month by students, teachers, and parents.

Timing the Technology Curve

While innovation is certainly to be admired, online instructors might do well to focus less on implementing this year's technical innovation and instead use last year's technology as a foundation for good teaching. Using the latest technology has pros and cons. It is good in the sense that oftentimes new technology allows us to do things we haven't been able to do before. Cutting edge technology is risky however in the sense that it is almost always expensive and often "buggy." Time spent troubleshooting software conflicts could be better spent developing relationships with students.

As time goes on the cost of technology goes down. Or rather, as today's technology becomes yesterday's technology the cost goes down. For example, soon the price of recordable DVDs will likely become minimal. The next revision of the ASL University curriculum will place the video files on a single DVD instead of several CDs. Materials for future versions of the course will be built around an intuitive graphic user interface (GUI) allowing students to quickly navigate to specific questions, signed

phrases, individual vocabulary items, and grammar explanations. For example, an HTML (hypertext markup language) frame with two or more panes will feature a contents pane with links that open video files in larger viewing panes.

Dealing with Limited Bandwidth

The course was uploaded over a 56K dialup connection using America Online as the Internet access provider. Having a slow dialup connection was a major factor in choosing to not host the course via WebCT. The WebCT course design process relies on a realtime, online, secure login system. Each minor change to the curriculum or course navigation paths required a significant wait time to upload and see the results. A high bandwidth connection would have minimized the upload time. If uploading were the only factor then it might have been feasible to use the WebCT system, but FrontPage was the clear leader in ease of use and efficiency. The impact of a slow connection on design and implementation was minimized by creating the course on a local hard drive and uploading the pages overnight.

As it turned out, implementing the site over a common dialup line was extremely useful in terms of creating a course accessible to students with older machines and dialup connectivity. Using a faster connection for viewing the completed pages would have masked a 3-minute timeout on a critical page used for pretesting. That particular page contained many graphics which would have downloaded cleanly over a cable or DSL connection. When viewed over a 56K connection however, the page stopped loading after three minutes and thus was missing many important graphics. This brought to light a need to preload the graphics while on a previous page so that the graphics would be

available for viewing. This problem and solution would have been overlooked had the course been designed using a high bandwidth Internet connection.

Public Access

As more and more courses are placed online, educators need to be careful about assuming that everyone has Internet access. The attitude of an enthusiastic instructor might very well be, "Students can use a computer at public library to access the course." This type of thinking is not based in reality. A typical library computer is generally very restricted. Library patrons are allowed to log on only with limited privileges which prevent them from making any configuration changes to the operating system. This includes not being able to download and install new programs.

Web courses are becoming more complex and often require special plugins or the latest codecs. Students end up frustrated when they try to download the latest plugin or codec only to be told that "Installation is not allowed" because they do not have administrator privileges. Often libraries install special software that prevents users from composing email or accessing chatrooms. Library network administrators sometimes adjust the computer's Internet security features to reject "cookies" (snippets of information stored on a user's computer and made available to the website) which in turn makes the computer unable to access web-based courses that use cookies. Furthermore, many libraries limit the amount of time a patron can be online. Students might inappropriately sign up for an Internet-based class assuming they can use the library for access. If the class requires a certain browser, plugin, codec, or other special software, it is up to the instructor to make this clear in the class schedule or advertisement.

Effective Use of Bandwidth

ASL is a "high motion" activity. High motion video over the Internet requires a large amount of bandwidth, a huge reduction in image quality and size, or highly sophisticated compression techniques. The emerging leader in web video compression technology appears to be Sorenson Media, available on the net at www.Sorenson.com. Most of the video files used at the course website were simply animated GIF files. These are files with the ".gif" extension. GIF files are one of the webs oldest cross-platform compatible image files. File sizes were kept small by removing unnecessary frames from the animations.

Documentation

Traditional colleges and larger educational institutions have well established transcript systems. One of the goals of ASL University is to provide opportunities for people in rural communities to learn ASL. The typical small town community education ASL instructor may or may not have a way to provide documentation for students. Or perhaps a student would like to document their own progress. ASL University has made available to the public a free documentation system called LETS (Lifeprint Extended Transcript System).

The LETS documentation system started out as a form that the researcher developed to track attendance and participation at various training events in order to get credit for participation. As part of this project the form was redesigned to provide a versatile documentation template for individuals participating in various ASL seminars, workshops, and courses—both online and traditional. It is a "one-size-fits-all" certificate

of completion which draws its validity from the specificity of the documentation and from the authority of an acknowledging signature. For an example, see Appendix D.

Curriculum Design

Language curriculum designers are able to take advantage of word frequency research to maximize the effectiveness of their lesson plans. For example, in English, the 250 most common words account for 68% of language use (Jensema, & Rovins, 1997). English teachers of Deaf students would do well to emphasize those words first, thereby quickly enabling their students to recognize 68% of the words they will encounter in their target language.

Future Research

Word frequency data is abundant for the English Language, but not much data is available for sign frequency in ASL. Future research regarding the most frequently used ASL signs would provide a valuable resource for educators of the Deaf and for ASL instructors.

Many colleges are unable to meet the demand for introductory level ASL courses. In the future, program directors may choose to transform the first two levels of an ASL curriculum into an online self-study receptive-skills course followed by an in-class expressive-skills course. This will enable many more students to take ASL.

Web-based ASL instruction is still in its infancy. Yet because people enjoy the convenience of being able to study anytime, anywhere, and in the comfort of their own homes, this learning modality is certain to grow in scope and application.

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Appendix A

Reasons for Taking an ASL Class

Control group:

1. Required by degree, personal knowledge.

2. To help me understand and to learn the deaf community's language.

3. Required course for audiology.

4. To be able to communicate with people better that cannot hear.

5. Communications credit.

6. Communication requirement.

7. To learn ASL.

8. Because I am an audiology major.

9. I want ASL to be my second language. I always felt that I wanted to learn ASL, so I decided to take the course.

10. I have friends that are deaf and sometimes they come to church. I want to be able to communicate with them. Also I like to have it for teaching purposes.

11. Required.

12. I thought it would be interesting to learn ASL and learn about its culture.

13. I want to learn ASL.

14. I want to learn how to communicate with the deaf community and with my deaf friend.

15. For my speech class.

16. To learn basic ASL for classroom use.

17. More interested in ASL than public speaking, also have a deaf cousin.

18. I have always wanted to learn ASL.

19. To get better at sign language.

20. I am majoring in deaf ed.

Experimental group:

1. Being in graduate school I have to support myself somehow, therefore the web-based course allowed me to continue working without interfering with my job.

2. As a nursing student our school schedules are strict and we have little in the way of choices. This is the only way I could fit it in my schedule.

3. I have always had a desire to learn ASL. I do not know anyone who is deaf, however, I think that I could use this skill in the teaching field.

4. Convenience.

5. I am pregnant with my second child and I am due on April 8th. I did not want to put my education on hold any longer, but I knew that I would not be able to attend regular classes this term.

6. I am taking this Web Based Course rather than a traditional course because I am a working student. I feel that the Web Based course best suits my needs plus I think that it's going to be very interesting.

7. I would like to learn more and I feel it will help me in assisting some of the customers that come in to our office.

8. I work 7 days a week and needed to be home as much as I could.

9. It was the only one that would fit into my schedule.

10. I have a full-time job and two small children. I can't attend classes during the day I work 8-5 M/F. I'm taking this course on-line to be home with my kids and I'm taking a Sociology class on campus in Silsbee after work which only puts me 5 minutes away from them one night a week.

11. Several reasons, one being to utilize the technology which allows one to study and learn from the comfort of home. The other is of course the flexibility it offers when one has a full time job.

12. The convenience of doing it at home

13. I don't need this class for my degree. I needed another class to get my financial aid. I couldn't find any class that I needed. I have always wanted to learn to sign and now is as good a time than ever.

14. I felt that the Internet class would be more suitable to my schedule for the semester.

15. I am a wife/mother, work full time and I wanted the convenience of being able to do all course work at home. I love taking classes for my own personal enrichment but it is hard to spend 1 or 2 evenings a week for 2 or more hours on campus when you have other commitments. I felt that a web based course would work great for me.

16. I am taking 21 hours this semester and thought taking this class and working on my own would be easier on me.

17. I have a son who can not talk well yet so maybe I can teach him as I learn. Then we could communicate better.

18. Well, I work two jobs so the Web Course was a convenience.

19. It fits into my schedule much better.

20. I would really like to get in to this because I believe it will give me a better advantage in my field of study.

21. Everyone takes public speaking for their communications course so I decided to be a little different.

Appendix B

Pretest and Posttest Vocabulary Items

1. nice
2. marry
3. from
4. feel
5. store
6. tomorrow
7. popcorn
8. Gallaudet / glasses
9. bright
10. me-same-as-you
11. for
12. habit
13. put-down-on-paper
14. sunrise
15. farm
16. later
17. pop
18. leave (depart)
19. frustrated
20. fool (deceive)
21. fire (terminate employment)
22. early
23. accept
24. during
25. front

Appendix C

Comparative Statistics

Research Question: Is there a significant difference in vocabulary test scores between the two groups of students?

Null Hypothesis: There is no difference in scores between two groups.

(H_0: $\mu_0 - \mu_1 = 0$)

Alternative Hypothesis: There is a significant difference in scores between two groups.

(H_0: $\mu_0 - \mu_1 \neq 0$)

Independent Variable: Method of instruction.

Dependent Variable: Posttest score.

Data set:

Online: 17, 9, 16, 20, 6, 14, 5, 15, 7, 12, 6, 8

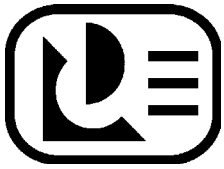
Traditional: 7, 11, 10, 9, 12, 8, 9, 9, 16

Table 3

Independent T-Test Results for Posttest Scores

	Online	Traditional
Mean	11.25	10.11
Variance	25.66	7.11
Observations	12	9
Pooled Variance	17.85	
Hypothesized Mean Difference	0	
df	19	
t Stat	0.61	
P(T<=t) one-tail	0.27	
t Critical one-tail	1.73	
P(T<=t) two-tail	0.55	
t Critical two-tail	2.09	

Appendix D



Lifeprint Extended Transcript System

Continuing Education Unit Documentation Form

Student: SS:

Program, Event or Course Title:

Program Location:

Sponsoring agency:

Agency Contact Information:

Date of event: Contact Hours:

Continuing Education Units: _____

One Continuing Education Unit (CEU) is equal to ten contact hours of participation in an organized continuing education experience under responsible sponsorship, capable direction and qualified instruction.

Name of presenter(s):

Subject Category:

Description:

Acknowledging Signature:

Position or Title:

The person signing above acknowledges that the student attended the program, event, or course listed above.

Appendix E

1. I really appreciate you working with me and my schedule. Juggling a 60+ hour a week job, 4 kids and a wife (I might as well say 5 kids) and going to school full time an hour away from home is killing me. This is the 2nd web class I have taken and found it to be like the 1st web class I took, A LOT OF WORK! When I took these classes I was under the impression that web classes were set up for people in my situation, working full time, family and trying to go to school. I got through them, but they were a lot of work and do take a lot of time. The only thing I thought differently on was the grading of the midterm and final. Don't get me wrong, I know you were very generous on the grading of the daily work and paper and letting me turn them in late but I think the grading of the midterm and final was a little tough. This was just like learning Spanish or German to me. It is going to take me awhile to get this language down. I'm sorry I didn't get some comments in sooner, I have been out of town in Missouri at my in-laws. Glad to be home! Hope I didn't offend you with any of my comments. Take Care.

2. Greetings, I don't mind taking a few moments to reflect back on this course, the Professor, and the guidelines which we were asked to use. First I'd say that for a student who is currently employed such as myself, this course works perfectly. The quiz schedule is certainly in the realm of achievable, and the quiz CD-ROMs are nominally priced and were readily available. The two major exams were clearly announced and expectations expressed. Bill Vicars gave his students the freedom of taping by Proxy at home or signing in person to him on campus. He served his students well. I believe the chat session on Monday evenings is a neat idea and only wish I could have participated in more of them than I did. He communicated promptly and in detail through emails all through the semester which was a big help. I would most assuredly recommend this course and this Professor to a student who needs the flexibility of an off-campus course. Both the material and the Integrity are there. Graduating Senior; May 2003

3. I would just like to say that [my friend] and I really enjoyed taking this class. We learned a lot!! The course content was great. You allowed us to learn a tremendous amount about sign language. The CDs were a good idea, but I think the DVD video you told us about will be even better. The only thing that we thinks needs improvement is the book you provide for us. We think that it would be more useful for the students if all the signs in the course were in the book. This would cut down on website problems and quizzes being turned in late. DO NOT TAKE DOWN THE WEBSITE THOUGH BECAUSE THAT IS EXTREMELY HELPFUL AS WELL. But that's all that we talked about improving. Overall, it's a great course, and if we weren't graduating we would definitely take another on line ASL course. We really enjoyed taking the class, and getting to know you better. Thanks for a great semester and class. Thanks once again.

4. I really enjoyed the class...I had never taken a web-based class before. The only problem I had was with the CD-ROM (I think it was the 3rd one) not working on my computer, but this was solved when you made the lessons available on video tape. As far

as the book, I really didn't use it much, because everything I needed was on the website. Also, I spent a lot of time looking for answers to quiz questions and sometimes never found them.....I don't know if it was just me or if the signs were not on the site.....I'm sure you're aware of that. I would take another class like this because it was convenient for me.

5. [My husband] and I are so excited that we did well... We are really enjoying our sign language. We are finding that having each other to practice with makes such a difference, especially since we are not exposed to the "normal" classroom setting to actually observe others signing. We are hoping that you will be teaching ASL(2) next semester. Can you advise us as to the classes you will be teaching?

6. I would have liked to have been able to search or key in a word for the sign. Like a sign we've learned but when used in a sentence I would have liked to be able to key in the word and the sign for the word be shown. Like sometimes, often and a few other words even girl I had to go back to the previous lessons to review. Thought if possible to input a search engine on the web site it would be useful. :)

7. There are many things I would like to tell you about the course. I did explain at our last meeting that I would not be taking another course like this one, discipline was a major factor here. I didn't find having to go by CDs every few weeks convenient, -- more of a hassle. I like to go by everything I need in the beginning, when I have the money. The cost of the CDs were inexpensive. The instructor was excellent, helped me on more than one occasion. It was definitely more challenging than I had expected. The fact that you learn to recognize signs on the tests was how I learned and it was much easier to do than sign it yourself. If all I had to do was recognize signs I could do that for the final and had a chance in passing. (like you do on the test) I would have done much better. I learned a lot, but it is tough to try to communicate. This was the hardest class I have taken except for biology...hope it helps.

8. What I liked about the course was that we could actually learn without having to show up to class everyday. I do however wish that we didn't have as many technical difficulties, and also have more animations for the signs so we would know how they're really supposed to be done.

9. The curriculum was as good as any foreign language class I have ever taken. I would take another course like this because of its convenience and flexibility with my schedule. I was surprised at how much sign language and especially how much deaf culture I learned through an online course. It was difficult to find places to view the CD-ROM's. Use a media type available on the 7th floor of the library to insure everyone access. I only looked at the book maybe once. The web site was sufficient.

10. This class was a great experience for me and I hope to further it through the next few years of school.

11. I loved the course. I feel that the biggest problem was the CD sometimes not working, but the option of a video seemed to solve that problem. I felt the course was very challenging, we covered a lot of signs in those 2 quizzes per week and you actually cared if we learned the signs and the correct way to learn the signs. I did enjoy having you as the teacher, you were very quick at answering any questions or concerns that I may have had. I was worried about that in the beginning. I feel you went out of your way to try and accommodate each and everyone in the course. I cannot believe you kept up with all of us. I'm sure you need a good family summer vacation!!!! Good luck on your job hunting, God Bless you and your family

12. What I liked about the course was the flexibility that was offered in our quizzes and assignments. It helps to have a professor that understands that some students do have children and a husband at home. The graphics were great and easy to see. The quizzes were fair and covered the material. Things I had a hard time with were the quizzes due two times a week. I don't know why I had such a hard time getting to them (time). I guess with an online class you have to schedule time like a class on campus. The tests were pretty hard for me because there were so many vocabulary words to focus on that I would concentrate more on others. Over all I enjoyed the class and hope later on it is offered for more people that have families and jobs. Thanks.

Biographical Note

[…]