THE EFFECTS OF ACCOMMODATIONS ON THE ACHIEVEMENTS OF

STUDENTS WITH HEARING LOSS IN ONLINE COURSES

IN SCIENCE AND VARIOUS SUBJECTS

by

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ABSTRACT

Most of the students with hearing loss believe online courses from various universities lack visual aids and accommodations. This led me to analyze the students' overall experiences and attitudes regarding the accommodations of online courses from eight different hearing universities nationwide. The purpose of this study was to determine if the accommodations in online courses were adequate for the students with hearing loss and if the accommodations benefitted these students. Universities offering online courses are becoming more common and widespread, and it is imperative for these universities to ensure online courses are accommodating the needs of students with hearing loss. The data from the online students was gathered during the third week of November 2014 and again during the spring 2015 semester. Data from the instructors and service providers was collected at intervals during the spring 2015 semester. The structured interviews with the students were conducted by using the Student Interview Questions. Data about the participants were collected by administering the Student Accommodation and Online Learning Course Pre and Post-Survey to the students with hearing loss. The post-survey results were compared to the pre-survey results for improvements in students' attitudes toward online classes. The purpose of these interviews was to determine if there would be any correlation between instructor and service provider responses and the responses from the students from the pre and post-survey. The results of the Student Accommodation and Online Learning Course Pre-Survey from the fall and springs semester revealed the students' responses generally were positive. Responses slightly shifted between the pre and post-surveys. The result of the study revealed an increase in the average in the accommodation improving the learning from the online course from the beginning of the semester to the end of the semester. The students with hearing loss provided suggestions on how to make online courses more accessible. Overall, the results of my study were generally positive, but different institutions need to continue improving their technologies to make it more deaf friendly for the future students with hearing loss.

INTRODUCTION AND BACKGROUND

This Capstone project is based on the action research model and is an investigation on the needs of students who receive accommodations for hearing loss while enrolled in online courses. While my personal experience as a deaf student had an impact on my choice of project, it is also my professional and educational experiences in assisting those with hearing loss that played an important role in motivating this study. My goal was to assist future students with hearing loss as they take online courses by identifying areas of accommodation that might be improved.

Because of the nature of this investigation, I will draw heavily on my personal experiences. My type of hearing loss is moderate to severe, but hearing aids are sufficient for daily living. I can speak and read lips well, but utilize sign language for communication when socializing with individuals who can sign. When I attended elementary and middle school, accommodations such as a sign language interpreter and closed-captioned films were not provided in the classrooms. Instead, I relied heavily on Frequency Modulation (FM) systems and lip-reading to keep up with classroom lectures and activities; however, these types of accommodations were not adequate due to my severe hearing loss. Due to the Americans with Disabilities Act of 1990 (ADA), a sign language interpreter and closed-captioned films were finally provided after I entered high school. Because of many years of attending schools without these necessary accommodations, my reading comprehension and development of vocabulary were delayed compared to the students with normal hearing. As a consequence, I understand

the struggles most students with hearing loss face when attending school without receiving necessary accommodations.

I later took one science-related online course as an undergraduate student at a local university that lacked visual aids and only utilized study guides, notes, and tests. Most students with hearing loss, including myself, are visual learners. Because this online course lacked visual aids, it did not enhance my learning of the class subject. As a result, I withdrew from this online course two weeks after it began and took the same course on campus later. I have also taken online courses from Montana State University, and they provided somewhat more sophisticated accommodations than my first online course. One of the reasons these courses were better is because the technology for online courses has come a long way since I took the first online course. In addition, the disability services coordinator and instructors ensured that closed captioned was included with podcasts and videos ahead of time. However, there is still room for improvement for future students with hearing loss. For example, some students may need to have the videos or podcasts interpreted by a sign language interpreter in American Sign Language (ASL), their primary language, due to their struggles with the English language.

I have experience as an instructional assistant in a class for the students with hearing loss at a local school district. I had the opportunity to tutor and teach students with hearing loss in both special education and mainstreamed classrooms. In addition, I tutored a college student with hearing loss with her astronomy course when I was employed as a student assistant at the Columbus State University's Coca-Cola Space Science Center. Through these experiences, I learned that teaching some of the students

with hearing loss requires starting from scratch and using examples during instruction

because English is not their primary language. The English language is as much a

foreign language to some of the students with hearing loss as it is to Spanish speaking

students. Students with hearing loss have typically missed information over the years.

On the other hand, students without a hearing loss naturally absorb information from the

radio, television, and conversations from different settings beginning in infancy. As the

students without hearing loss learn new information using terms they have heard

previously, they can easily grasp new concepts. However, students with hearing loss are

obligated to heavily rely on visual aids and reading to learn about a new concept. Most

students with hearing loss can also easily grasp information, there is just an immense

discrepancy between their learning methods. They face challenges that require them to

work harder to succeed in a system often designed for hearing students. Teaching these

students requires more visual aids and hands-on materials in order for them to grasp

abstract concepts effectively. For example, teaching the concept of telescope parts to the

students requires utilizing different types of telescopes as a visual reference. Therefore,

when students with hearing loss take an online astronomy course, they will need more

telescope visual aids and demonstrations through closed-captioned or interpreted

podcasts to enhance their learning.

Another reason I chose this topic relates to my job experience as an advocate for a

non-profit organization, Georgia Council for the Hearing Impaired, Inc., which serves

individuals with all types of hearing loss and the agencies that provide services to them.

Through this organization, I have had opportunities to assist students with hearing loss in

the universities. One of my responsibilities includes educating the universities regarding

the ADA and then suggesting how they might provide accommodations to meet the needs

of the students. All of the students who requested my assistance have taken, or are

currently taking, online courses from various colleges or universities. These students

shared their experiences with online courses, which were both positive and negative.

Some of these students expressed concerns regarding the types of accommodations they

received. They felt they were not learning effectively in their online courses. However,

some of the students explained they were not receiving accommodations at all. For

example, the videos included in the online class were without closed captioning. Overall,

the experiences they shared revealed most hearing universities lack familiarity with

making online courses more accessible for these students.

Based on the limitations I have observed in online courses, this Capstone Project

was conducted with 10 students with hearing loss with two replications, which

constituted 12 observations. The students' ages ranged from 20 to 60. In addition, five

instructors and five service providers were involved in this study. These students took

online courses from universities in California, Colorado, Georgia, Montana, New

Hampshire and Virginia. The general purpose of this study was to determine if the

accommodations in online courses from different universities were adequate for the

students with hearing loss and if the accommodations benefitted these students.

Because the number of online courses is rapidly increasing, I wanted to seek

every opportunity to give suggestions to institutions for enhancing online tools for the

future students. I believe improving these accommodations will provide an effective

learning experience for the students with hearing loss enrolled in online courses.

My main research question was, *Does the use of accommodations significantly impact the academic success of students with hearing loss when taking online courses?* I have prepared four sub-questions to supplement this main question.

1. What are the advantages and disadvantages of using accommodations in online courses for students with hearing loss?

2. Does the use of accommodations improve the students' learning of the material in online courses?

3. Does the use of accommodations improve the attitudes of students with hearing loss when taking online courses?

4. What types of accommodations benefit the students with hearing loss the most in online courses?

CONCEPTUAL FRAMEWORK

There are many accommodations available to students with hearing loss in hearing universities. The term *hearing universities* refers to universities where the majority of students have normal hearing (Komersaroff, 2005). Universities offering online courses are becoming more common and widespread, and it is imperative for these universities to ensure online courses are accommodating the needs of students with hearing loss. According to Slike, Berman, Kline, Rebilas, and Bosch (2008), students with hearing loss are visual learners and their visual needs must be met during an online course. If the students do not have their visual needs met, they could fall behind

academically in their classes. Most students with hearing loss tend to rely on pictures, signed English texts, graphics, animations, movies, and sign language videos when reading instructions or learning new materials, because it enhances their comprehension and memory skills (Nikolaraizo, Vekiri, and Easterbrooks, 2013). Therefore, including visual multimedia tools in online courses would be valuable for the students with hearing loss.

Based on the ADA and Section 504 of the Rehabilitation Act Amendment of 1973, universities receiving federal financial assistance must ensure that all students with disabilities have equal access to information in classes. This means students with hearing loss must be able to obtain similar types of information that are available to regular students (U.S. Department of Justice, 2009). In addition, students in elementary schools and colleges are protected by the No Child Left Behind Act of 2002. The purpose of this act was to ensure students with disabilities, including those with hearing loss, receive appropriate accommodations in order to have a high quality education meeting the state academic standards (U.S. Department of Education, 2002). If universities do not ensure students with hearing loss or other types of disabilities receive the same access to information as other students in class, these students have a right to file a Title II ADA/Section 504 of the Rehabilitation Act of 1973 complaint with the Department of Justice. The Department of Justice then steps in and educates the universities on how to be in compliance with the ADA laws (U.S. Department of Justice, 2014).

However, this issue can be prevented if the students with disabilities notify the instructors and the universities' Office of Disability Services to make them aware the

students' needs are not being met in the classrooms. According to the U.S. Department of Education (2011), the Office for Civil Rights strongly recommends students with hearing loss be familiar with their responsibilities and those of the postsecondary schools under Section 504 and ADA because they will have a better chance of succeeding when they enter colleges or universities. When students with hearing loss enroll in courses at a university, they have the responsibility of immediately contacting the disability services coordinator and making a request for accommodations for each class if they want their courses to be accessible. First of all, the student must provide documentation to the disability services coordinator to support the need for each requested accommodation. One example of the documents presented is a hearing test evaluation from an audiologist. The disability services coordinator is responsible for notifying the students' professors regarding the students' hearing loss and type of accommodations needed for the class. The student can provide a letter from the disability services coordinator to the instructor that includes the list of requested accommodations.

The requested accommodations in a letter from the disability services coordinator may include extended time for exams, closed-captioned videos, sign language interpreter, and a note taker. Once the professors become aware of the students' need in the class, the professor should allow students to have access to these accommodations, including extended time for exams. The student could ask the instructor for assistance in finding a good note taker in the class if it is necessary. Lastly, the student can help ensure the interpreter gets copies of the notes, PowerPoint slides, or an extra textbook from the professor. The purpose of the interpreter having these materials is for him or her to get

familiar with the vocabulary of the course and be able to sign effectively during the class lectures. In this case, it is important for the students, interpreters, disability services coordinator and instructors to work together as a team. The more they work together as a team the more successful students become (Lartz, Stoner, & Stout, 2008).

I am a deaf student and have been enrolled in three different colleges since 1996. In all three of the colleges, I received accommodations in order to gain access to information from each class. These accommodations included transcriptions, closed captioned videos, FM systems, note takers and sign language interpreters. Closed captions are the typewritten display of conversations shown at the bottom of the television or computer screen, and it is for those who are deaf and hard-of-hearing (Lewis & Jackson, 2001).

When I first started attending a community college, only FM systems, sign language interpreters and volunteer note takers were used in my classes. Note takers were used because it is often difficult to simultaneously view the interpreter while taking good notes. These types of accommodations were insufficient for many reasons. Student note takers may exclude important information because the students taking notes were familiar with the information and therefore do not value its importance. According to Elliot, Stinson, McKee, Everhart, and Francis (2001), handwritten notes have limitations because most of the valuable information is excluded and the notes can be difficult to follow. FM systems contain both the receivers and microphones. Usually, the teacher wears the transmitter with a microphone and the student wears the receiver to help understand the teacher better (Elliot et al., 2001). I tried using the FM systems in my first

course but I was not able to hear all of the information from lectures. Elliot et al. (2001) pointed out one of the disadvantages of the FM systems was the students who use these devices had difficulties hearing the classmates' questions or comments.

     Sign language interpreters were not interpreting everything the professor said during lecture. Because some deaf individuals do not use the English language as a primary language, some sign language interpreters tend to summarize sentences, and use ASL. ASL is a unique language with its own set of grammar and syntax rules developed by individuals with hearing loss. This language was originated at the first school for the deaf, the American School for the Deaf, which was established by Thomas Gallaudet and Laurent Clerc in 1817. Laurent Clerc, a French deaf educator, was hired by Thomas Gallaudet to educate American students with hearing loss. This circumstance led teachers and students with hearing loss at the American School for the Deaf to develop ASL with French Sign Language influences as they interacted with each other. Therefore, ASL does not have a similar sentence structure to the English language (Belt, 2013). This type of sign language exclude words such as a, an, the and the verb endings such as -s, -ing, -ed, and -en (Gustason, 1997). In ASL, the subject of the sentence comes first and then pronouns come next, for example, "ASL teacher you?" with the eyebrow up instead of using sentences in proper English order such as, "Are you an ASL teacher?" ASL tends to be more expressive with face and hand gestures with fewer words than English, and in turn helps most individuals with hearing loss who know ASL to effectively grasp new concepts in their visual mode.

I am not fluent in ASL because I was first taught by teachers using Signing Exact English (SEE) at a local pre-school for students with hearing loss in my early childhood. SEE I was originally described and developed by a deaf educator, David Anthony in the late 1960s. Then SEE I was modified into SEE II or SEE, which was developed by an educator, Gerilee Gustason in the United States in 1972 (Luetke-Stahlman & Milburn, 1996). SEE follows English word order and it include words such as a, an, the, and verb endings. This type of sign language has been widely utilized by educators and parents of young children with hearing loss in public schools. The purpose of using SEE was to assist students with hearing loss to learn the English language in order to become proficient in reading, writing, and communicating with parents and other individuals who were not familiar with ASL (Gustason, 1997).

The first sign language interpreters were family members, friends, and coworkers with normal hearing who had no formal training available to them. Most of these untrained interpreters were CODA (children of deaf adults). The non-profit organization for the ASL interpreters, The Registry of Interpreters for the Deaf in the United States was established in 1964 and incorporated in the early 1970s. This organization established interpreter certification standards and ethics that helped interpreters to become professional and certified. ASL was not recognized as a legitimate language in the United States until the 1960s, when a linguist, William Stokoe published the first book about his formal study of ASL. As a result, the Interpreter Training Program was established in the 1970s, which is designed to train sign language interpreters to work at various locations such as hospitals, courtroom, schools, etc. from six to eight weeks. It

now typically takes two to four years or more to complete the formal training before an individual becomes a certified interpreter (TerpTopics, n.d.).

However, when I transferred to a local university, it provided me with more accommodation options. During lecture courses, the lectures were recorded digitally and then the audio files were sent to a transcriptionist at the university's Office of Disability Services. The transcriptionist listened to the class lectures from the audio file and typed them in their entirety. Then the transcriptionist sent the notes to me within 24 hours. However, in lab courses, sign language interpreters were utilized since there were group discussions involved.

Because I am still learning how to use ASL, I am more comfortable with transcriptions. I understood the lectures from transcriptions better than from the interpreters. Relying heavily on the transcriptions instead of the interpreter helps me to remember the information better, and it made me feel more independent. This is true because when the interpreters were available in my classes, it often times put me in a vulnerable position to where it enticed me to rely heavily on the interpreters for assistance with questions from classes or course assignments. Additionally, using transcriptions usually helps improve my English skills. When visual information is provided to the students who rely less on interpreters, these students feel more independent, and also they retain and process the information better (Lartz, Stoner, & Stout, 2008).

When I became a part of the Master of Science in Science Education program at Montana State University, some of my accommodations had to be modified because the

program contained mostly online courses. Most of the online courses include podcasts and audio lectures. Once instructors discovered I was taking their courses, they were responsible for ensuring all of the podcasts, videos and audio lectures included closed captions. However, the Office of Disability, Re-entry and Veteran Services was responsible for making arrangements to have someone add closed captions to the podcasts and videos if the instructors did not have the captioned versions.

Before taking the first online course at Montana State University, I was apprehensive because I thought the university's online courses might lack visual aids. However, after taking several online courses, I learned most of them were very visual, accommodating, and engaging. Research has revealed most of the students with hearing loss in their study were very positive about the quality of learning and interaction with their instructors and classmates when taking online courses (Long, Vignare, Rappold, & Mallory, 2007; Long, Marchetti, & Fasse, 2011).

The majority of students with hearing loss have different needs and perspectives on accommodations in universities. Lartz, Stoner, and Stout (2008) described how students with hearing loss might use one type of assistive technology that works well for them but may not be as beneficial to other students. For example, most students with hearing loss who use ASL as a primary language prefer to use an interpreter rather than real-time captioning. Real-time captioning is a technology that converts the spoken words into text verbatim on the computer and then appears on the large screen for the students to view (Lartz, Stoner, & Stout, 2008). Students who attend schools for the deaf are more likely to prefer an ASL interpreter (Elliot et al., 2001). Jagodzinski and Wolski

(2012) investigated the effect of showing chemistry videos with interpreters to the students with hearing loss from mainstream junior high and high school. The results of this study revealed the chemistry videos without sign language interpreters were not helpful in teaching the students. Their findings showed that sign language included in the chemistry videos was very useful and effective in improving student understanding of the experiments in labs. Slike et al. (2008) revealed how online tools such as PowerPoint lecture material, text chats opportunities, and videos with sign language interpretation are effective tools in engaging students in learning. However, there were pros and cons with the online courses in this study identified by the participants. One of the pros included the live streaming of video, and having an interpreter, closed captions, and spoken lecture at the same time. One of the cons included the glitches in the system which can lead to technical difficulties. Overall, the students with hearing loss in their study reported finding more positives than negatives in the online courses.

Some students with hearing loss favor more closed captions, real-time captioning, or C-Print rather than the sign language interpreter. C-Print is also a technology that converts speech to text on the computer similar to real-time captioning. However, C-print interprets and condenses the spoken words while real-time captioning captures speech word for word (Davis, Francis, & Harlan, 2000). Elliot et al. (2001) discussed how students responded more favorably to the C-Print than they did to sign language interpreters. The results of this study revealed students with hearing loss who came from mainstream high schools, but have proficiency in writing and reading English, can comprehend the lectures from transcriptions more effectively than from interpreters.

Stinson, Elliot, Kelly, and Liu (2009) focused on the effectiveness of transcriptions and interpreters for the students with hearing loss. The research revealed high school students who used transcriptions retained lectures better than students who used an interpreter. However, the author described how this study revealed there was no difference in how much college students retained the lecture material when using either the transcriptions or interpreter. Lewis and Jackson (2001) examined whether the closed-captioned films influenced the comprehension skills in the students with hearing loss. Their findings revealed the comprehension test scores of students with hearing loss were the highest when viewing the closed-captioned videos.

Some students with hearing loss perceive online courses to be more accommodating and engaging than the traditional classroom (Long, et al., 2007; Long, Marchetti, & Fasse, 2011). Long, et al. (2007) focused on the effectiveness of online courses and interpreters in the traditional classrooms for the students with hearing loss. The authors described how students with sign language interpreters in the traditional classroom reported feeling academically behind and isolated from their instructors and peers. The students from this study reported inaccurate or delayed messages signed from the interpreters during lectures or group discussions. When the messages from the sign language interpreter were delayed, it would often lead to students feeling hesitant to ask questions. As a result, the students were not actively engaged in the communication and dialogue. Long, et al. (2007) discussed how the online experiences increased the opportunity for the students to post their opinions and questions on the discussion board instead of relying on the sign language interpreter in the classroom. The result of this

study revealed students with hearing loss were more engaged in the online classes than the traditional classroom with the sign language interpreter (Long, et. al. 2007).

METHODOLOGY

The primary focus of this study was to analyze students' opinions, attitudes and achievements in their online courses with accommodations from eight different universities nationwide. In my Capstone project based on the action research model, the students with hearing loss voluntarily participated after I sent mass e-mails with brief descriptions of the study. I used 10 students with hearing loss with two replications, constituting 12 observations in this study. All of these students are deaf and I was one of them that participated in this study. In addition, five service providers from the Disability Service Departments and five professors who worked with students taking online classes from their universities participated in the study. The service providers and professors were included to compare and contrast with students' data. Due to the small sample size in this study, this research is more of a case study, a form of descriptive qualitative research.

The data from the online students was gathered during the third week of November 2014 and again during the spring 2015 semester. The data from the instructors and service providers was collected at random times during the spring 2015 semester. Eight students participated in the study during the fall semester, while four students participated during the spring semester, but two students from the fall semester participated again during the spring semester. Both of these students were enrolled in an online course during the fall and spring semester, and two more students were enrolled in

an online course during the spring semester. The rest of the students from the fall

semester had graduated from college and took an online course between the years of 2002

to 2013. These students shared their experiences with me retrospectively. These students

took online courses on subjects such as science, science education, social science, math,

deaf education, communication, business and wellness. During the fall semester, one

student was taking a deaf education course online, while one student was taking a science

education course online. During the spring semester, one student was taking a business-

related course, one student was taking both science education and oceanography course,

and two students were taking a deaf education course online.

The intention was to collect data from all of the instructors and service providers

that worked with each student in this study were intended to be collected. However,

some of the students either did not recall the names and contact information of their

former instructors or the instructors no longer teach at the particular institution.

Additionally, some of the instructors and service providers proved more difficult to

contact than anticipated. During the spring semester, I attempted to collect a large

quantity of data from the students with hearing loss, but either some of them were not

currently taking an online course or did not follow through with the study. Therefore, the

numbers of instructors, service providers and students who participated in this study had

to be reduced.

Before this study was conducted, each interested student was asked to sign an

informed consent form to ensure they clearly understood it was entirely voluntary to

participate, and had a right to withdraw from the study (Appendix A). The research

methodology for this project received an exemption by Montana State University's

Institutional Review Board, and compliance for working with human subjects was

maintained (Appendix B).

A variety of data were collected to investigate the students' overall experiences

and attitudes regarding the accommodations of online courses from different hearing

universities. Multiple forms of data were collected in order to increase the credibility and

reliability of the results for this capstone project.

First, qualitative data was collected by conducting structured interviews with the

students at the end of the fall 2014 semester and again at the beginning of the spring 2015

semester by using the Student Interview Questions (Appendix C). The interview was

formatted to address the research questions. During the interview process, 11 questions

were asked regarding their overall experiences with online courses, the type of

accommodations they received, which accommodations benefitted them the most and

what the courses lacked. Each structured interview session lasted approximately 20 to 45

minutes. The students were interviewed using Video Phone or in person in an office

setting. The mode of communication during the interview was determined by student

preference. The types of communication included ASL, SEE, spoken English, or any

combination. The researcher translated questions and asked for clarification of responses

as needed during the interview. Each interview session was video recorded with an iPad

and then digitally transcribed for data analysis. Additionally, field notes were taken

during the interview for later reflection. When the students used ASL during the

interview, their responses were translated to the English language in the field notes. The data were analyzed for comparisons and contrasts.

Both quantitative and qualitative data about the participants were collected by administering the Student Accommodation and Online Learning Course Pre-Survey to the students with hearing loss at the end of the fall semester and again at the beginning of the spring semester through e-mail (Appendix D). The purpose of creating and administering those surveys was to receive feedback from students regarding their thoughts and feelings about their overall experiences with online courses and accommodations. Survey questions were modified from other surveys to meet the needs of this study (Lartz, Stoner, & Stout, 2008; California State University Stanislaus, 2010; Tabrizi, Wuensch, Ozan, Kishore, & Aziz, 2006). At the end of the spring semester, this process was repeated collecting both quantitative and qualitative data. The Student Accommodation and Online Learning Course Post-Survey was administered with a similar format to the Student Accommodation and Online Learning Course Pre-Survey (Appendix E). This survey did not ask students for demographic information. The post-survey results were compared to the pre-survey results for an impact on students' attitudes toward online classes during the spring semester.

The Student Accommodation and Online Learning Course Pre-Survey was divided into five sections. The first section of the survey asked students questions regarding their college rank, type of hearing loss, education, and preferred accommodations. The purpose of collecting background information from the students was to determine if their history affected their accommodations preferences. For this

section, each response was categorized and tallied based on their demographic information. For example, the responses from the question on type of hearing loss were classified as *deaf*, *hard of hearing*, *late-deafened* and *other*. The second section of the survey asked students questions regarding their online education experiences such as the number of online courses taken, type of course, and accommodations received. The reason these questions were asked of the students was to investigate if their previous experiences with online courses affected their attitude toward online education. The responses from this section were classified in a similar manner as the responses from the first section but based on the answer choices from the surveys. The third section of the survey contained twelve Likert-style questions that asked students about their experience with the online course, what they liked, and how they might make the online course more helpful. In this survey, the students were asked to rank from one to five, with one meaning they *strongly disagree* and five indicating *strongly agree*. For the responses from the online course with accommodation evaluation section from both pre and post-survey, I tallied the frequency of responses such as *strongly disagree*, *disagree*, *neutral*, *agree* and *strongly agree*. The fourth section of the survey had five Likert-style statements that asked students questions about their feelings regarding different types of accommodations they received in their online course. This survey asked students to rank from one to five, with one meaning they were *very dissatisfied* and five indicating that they were *very satisfied*. I tallied up the responses from the accommodation evaluation section and these responses were classified as *very dissatisfied*, *dissatisfied*, *neutral*, *satisfied* and *very satisfied*. Due to the small sample size in this study, only descriptive

statistics were analyzed to compare the students' number of responses or mean of each question, and bar and pie graphs were used in Excel to present this comparison. The last section had five open-ended questions asking for feedback and opinions from the students. From this section, the student responses were recorded and organized into specific and common themes. The data from the interviews was used to supplement the data gathered from the open-ended questions from the Student Accommodation and Online Learning Course Pre-Survey.

The Student Accommodation and Online Learning Course Post-Survey was divided into four sections. The first section of the survey asked students questions regarding their online education experiences such as the number of online courses taken, type of course, and accommodations received. The responses from this section were classified in a similar manner as the responses from the first section in The Student Accommodation and Online Learning Course Pre-Survey but based on the answer choices from the surveys. The second section of the survey contained twelve Likert-style questions that asked students about their experience with the online course, what they liked, and how they might make the online course more helpful. In this survey, the students were asked to rank from one to five, with one meaning they *strongly disagree* and five indicating *strongly agree*. For the responses from the online course with accommodation evaluation section from both pre and post-survey, I tallied the frequency of responses such as *strongly disagree*, *disagree*, *neutral*, *agree* and *strongly agree*. The third section of the survey had five Likert-style statements that asked students questions about their feelings regarding different types of accommodations they received in their

online course. This survey asked students to rank from one to five, with one meaning

they were *very dissatisfied* and five indicating that they were *very satisfied*. I tallied up

the responses from the accommodation evaluation section and these responses were

classified as *very dissatisfied*, *dissatisfied*, *neutral*, *satisfied* and *very satisfied.* The

reason all of these questions were asked of the students was to investigate if their

experiences with online courses affected their attitude toward online education compared

to their responses from The Student Accommodation and Online Learning Course Pre-

Survey during the spring semester. Descriptive statistics were analyzed to compare the

number of students' responses or mean of each question, and bar and pie graphs were

used in Excel to present this comparison. The last section had five open-ended questions

asking for feedback and opinions from the students. From this section, the student

responses were recorded and organized into specific and common themes. The data from

the interviews was used to supplement the data gathered from the open-ended questions

from the Student Accommodation and Online Learning Course Post Survey.

Structured interviews were conducted with instructors and service providers

separately. The instructors responded to the Faculty Interview Questions (Appendix F)

and the service providers responded to the Service Provider Interview Questions

(Appendix G) through e-mails. The questions were asked of the professors and service

providers regarding their observations and experiences with students who have taken

online courses. The purpose of these interviews was to determine if there would be any

correlation between instructor and service provider responses and the responses from the

students from the Student Accommodation and Online Learning Course Pre and Post-

Survey.

A data collection matrix has been included below that contains the main focus

research question and four sub questions as they relate to the collection instruments. The

matrix also includes five methods of data collection used in the action research-based

study. As described earlier, multiple forms of data were chosen in order to increase the

validity of the study (Table 1).

Table 1
Data Triangulation Matrix

Focus Questions	Data Source 1	Date Source 2	Data Source 3
Primary Question: 1. Does the use of accommodations significantly impact the academic success of students with hearing loss when taking online courses?	Accommodation and Online Learning Course Pre and Post Survey	Service Providers structured interviews	Faculty structured interviews
Sub-Questions: 2. What are the advantages and disadvantages of using accommodations in online courses for students with hearing loss?	Student structured interviews administered at the beginning of the course	Service Providers structured interviews	Faculty structured interviews
3. Does the use of accommodations improve the students' learning of the materials in online courses?	Accommodation and Online Learning Course Pre and Post-survey	Student structured interviews administered at the beginning of the course	Faculty structured interviews
4. Does the use of accommodations improve the attitude	Accommodation and Online Learning Course Pre and	Student structured interviews administered at the	

of students with hearing loss when taking online courses?	Post-survey	beginning of the semester	
5. What types of accommodations benefit the students the most when taking online courses?	Accommodation and Online Learning Course Pre and Post-survey	Student structured interviews administered at the beginning of the semester	

DATA AND ANALYSIS

The results of the Student Accommodation and Online Learning Course Pre-Survey from the fall and springs semester revealed both differences and similarities in the responses from the students with hearing loss ($N = 10$). The students were asked to choose their types of accommodations they had received in their online courses. I analyzed the different types of the responses from the students such as *closed-captioned podcasts/videos*, *sign language interpreter, extended times for exams, transcriptions*, and *other* that apply. The results of the pre-survey indicated a discrepancy in the N=28 responses from 10 students. According to the surveys, the most common types of accommodations the students received in their online courses were *closed-captioned podcasts or videos*. The responses to the pre-survey revealed that seven students chose *closed-captioned podcasts/videos*, while four chose *sign language interpreter* in their online courses. One student said, "For online courses, I had closed-captioned podcasts or videos, live captioning for webinars and extended exam times." One student who used a sign language interpreter said, "If my class have videos without closed captions or if they cannot find any videos with closed captions, the disability services counselor sometimes

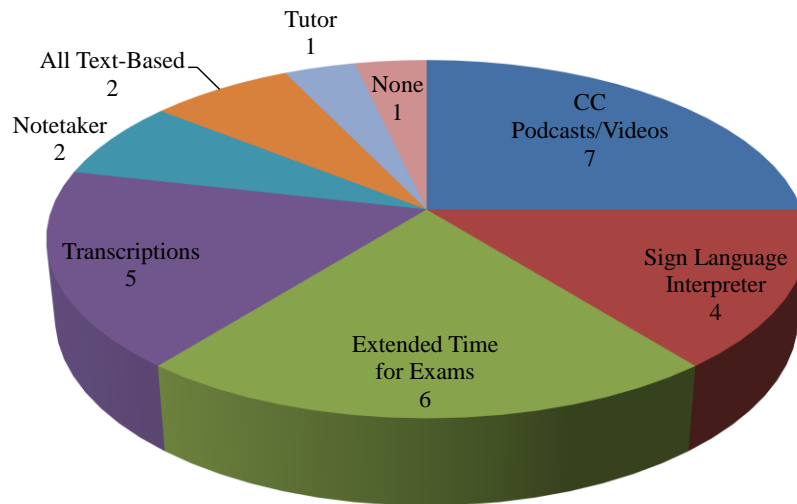sent a sign language interpreter to meet with me to interpret the videos for me" (Figure 1).

Figure 1. Number of students' responses on the type of accommodations for online courses, (*N*=28).

The students were asked how they communicated with their instructors and classmates in online courses on the Student Accommodation and Online Learning Course Pre-Survey. They were asked to choose responses such as *emails*, *texts*, *discussion board*, *chat room*, and *other* that apply. The results of the pre-survey revealed a differences in the *N*=29 responses from 10 students. Ten students used *emails*, while 11 used the *discussion board*. One of the students who reported taking all text based online courses said, "None, I only used emails and group discussion board to communicate with my instructors and students. To me, I considered them to be accessible even if I did not have an interpreter" (Figure 2).
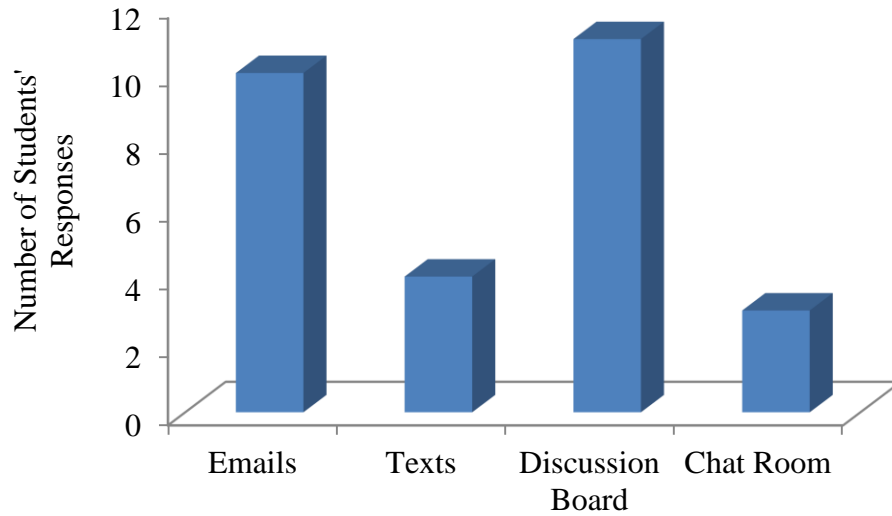
Figure 2. Students' responses on the communication method with instructors and peers, (*N*=29).

Students were asked the advantages and disadvantages of online courses with

accommodations. Data is presented in this table to provide insight as to why a variety of

accommodations were helpful or not helpful to them in their online courses (Table 2).

Table 2
Student Responses from Structured Interview

Advantages	Disadvantages
Real-time captioning helped me to understand the information better, kept me from getting lost and helped me to stay caught up.	Interpreter is not always reliable, may not show up.
They were all helpful. If no accommodations, I will drop the class.	Closed captions was not helpful because the video was on YouTube and closed captions was not accurate and hard to follow.
Having closed-captioned podcasts and live captioning for webinar were beneficial because it fills in gaps and helped me to grasp concepts effectively.	I have to wait 2-3 days to get transcriptions if I have no closed captions or interpreter.
Closed captions on videos helped expand Information.	Closed captions helped me to understand the materials better but I still needed a tutor. I still did not pass GACE because of my English language.
Using discussion board and emails are helpful Because they are visual.	Closed captions can be too fast to read, voice in the video is faster than closed captions so the closed captions can be delayed.
	It lacks visual aids. Lack of face-to-face interactions.

The Student Accommodation and Online Learning Course Pre-Survey asked the students if they feel face-to-face contact is necessary to learn. Five students *strongly agreed* and one of them responded, "I find myself always wanting to get clarifications on assignments or wondering if I am doing my assignments in a right way. I use emails to communicate with my instructors or use texts to communicate with my classmates. It is not easy for me to text my classmates because I do not know them or their faces. When I need clarifications about class work assignments, it is easier for me to get from face-to-face interactions" (Figure 3).
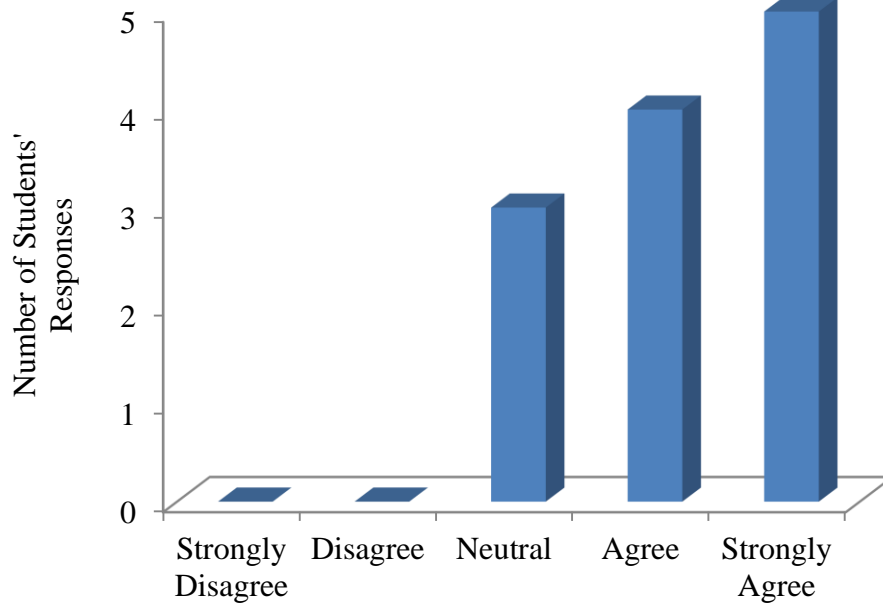
Figure 3. Students' response about face-to-face contact being necessary to learn, (*N*=12).

During the interview, the students were asked what things they would change to make the online classes more accessible for students with hearing loss. Numerous suggestions were identified within that data (Table 3).

Table 3
Student Suggestions from Structured Interview

Fall Semester	Spring Semester
The university needs to add closed captions to the videos ahead of time.	If an online course will be all text-based, I think instructors should add more graphics and videos with closed captions about abstract concepts.
If no videos with closed captions, give students Alternatives and still give credits.	If closed captions is on video, the class need to also put an interpreter in the small screen on the videos.
Online courses should not have a group discussion board. It should be done in person. Convos has been used for communication in ASL and can send it to instructors and students.	It would be nice if my professor would post pictures of all of my classmates and I online so we can see our faces.
Get transcriptions and syllabus from professors ahead of time.	Using Skype as a group discussion would be easier to use than chat rooms for communication because it is more visual and easier to understand.
Contact FCC to give them suggestion to improve closed captions on YouTube videos shown in class.	
Give more guidelines with due dates, explain Concepts clearly, and give more simple steps.	

The topic about how the use of accommodations improves the learning of the

class materials from the Student Accommodation and Online Learning Course Pre-

Survey was analyzed. In order to focus on the attitude in the students, the data were

further analyzed to see which responses revealed the students *strongly disagree*, *disagree*,

neutral, *agree*, and *strongly agree* to the pre-survey. When students were asked if the

accommodations improved the learning of the course materials, five students *agreed*,

while two students *disagreed*. One of the students who *agreed* stated, "Podcasts with

closed captions helped me to understand the materials better because it includes all of the

words and I can see the whole picture of the ideas or concepts. It also helped me to

improve my English skills." One of the students who *disagreed* closed-captioned videos

improved the learning of the course said "I had to have a tutor and I needed more time
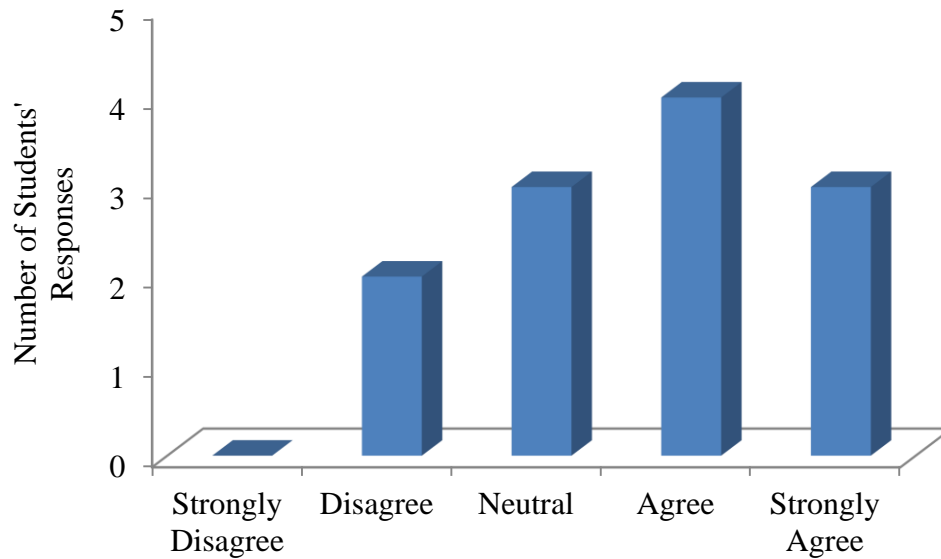
with the tutor" (Figure 4).

Figure 4. Students' responses about accommodation improving the learning of the
course, (*N*=12).

Another topic I investigated was how online courses with accommodation impact

the attitude of the students. In order to focus on the attitude in the students, the data were

further analyzed to see which responses revealed the students feeling *very dissatisfied*,

dissatisfied, *neutral*, *satisfied*, and *very satisfied* to the pre-survey. When students were

asked how satisfied they felt about accommodations in their online courses, the result

revealed there were increases in the average in satisfaction of closed-captioned videos

and extended exam time compared to other accommodations. One of the students who

felt satisfied with CC videos responded with statement such as, "Closed captioned video

and transcription helped me to understand the topic and lecture and anything related to

the topic." Another student who felt content with extended exam time commented, "I struggle with the English language and it gives me extra time to think about the questions and how to answer it effectively without feeling rushed" (Figure 5).
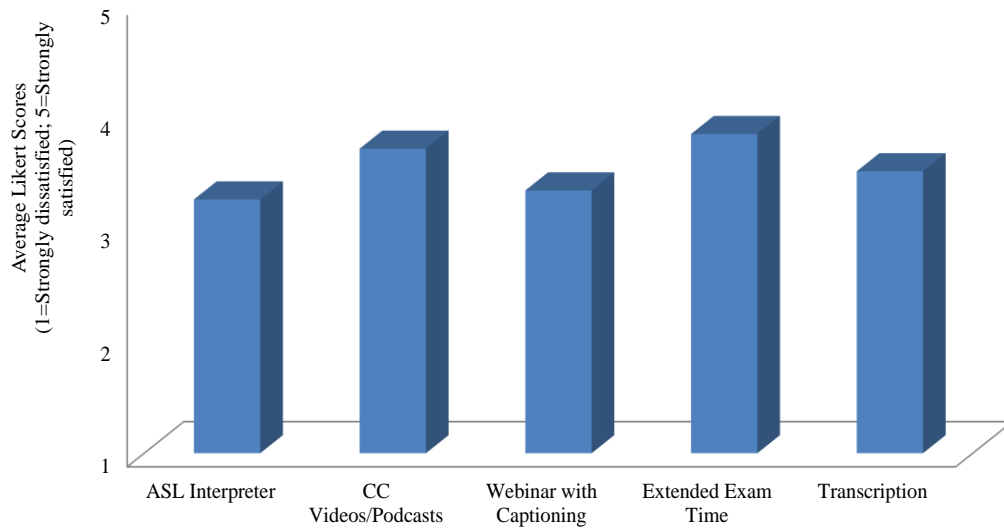

Figure 5. Students' attitude about accommodations in online courses, (*N*=12).

In order to ascertain what types of accommodations student prefer to receive in their online course, I used the student responses from the open-ended questions from the Student Accommodation and Online Learning Courses Pre-Survey. The results of the pre-survey indicated a variation in the *N*=22 responses from 10 students. Six students prefer to use sign language interpreters, while six students prefer to use closed-captioned podcasts and videos. One student who reported favoring sign language interpreter responded with statement such as, "Live interpreter since ASL is my natural language." One student who preferred to use closed-captioned podcasts and videos said, "Closed

captioned videos would be better accommodation to receive when I'm taking online classes. It can be more accurate and probably more descriptive while I can read and watch the show at the same time" (Figure 6).
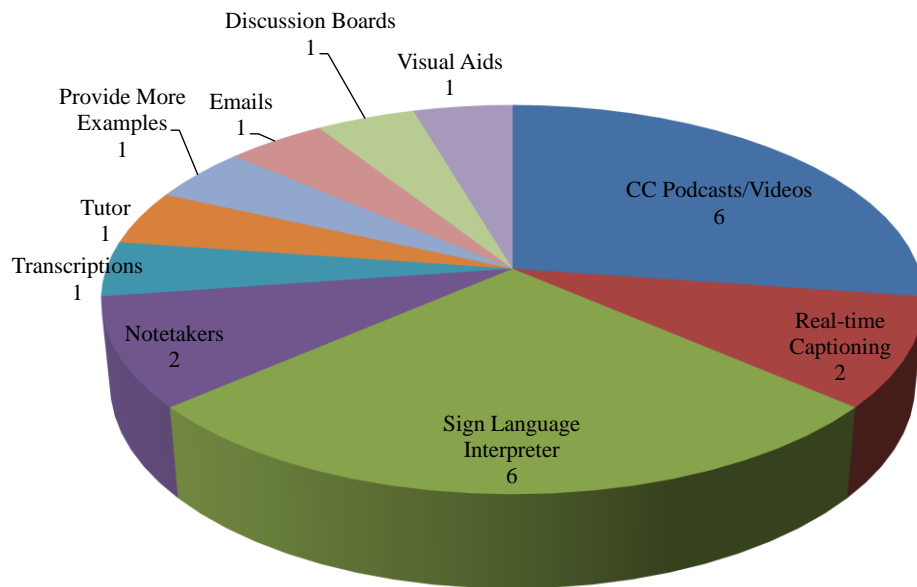

Figure 6. Number of students' responses about preferred accommodations in online courses, (*N*=22).

One factor that seems to influence the student preference for accommodations was what type of accommodations they received at their previous schools. According to the Student Accommodation and Online Learning Courses Pre-Survey, the most common types of accommodations the students received in their high school education were sign language interpreter or all of their teachers used ASL in deaf institutions. Five students utilized sign language interpreters, while four had all of the teachers who knew ASL in deaf institutions. One of the students who attended a deaf institution wrote on the survey, "All teachers used sign language."
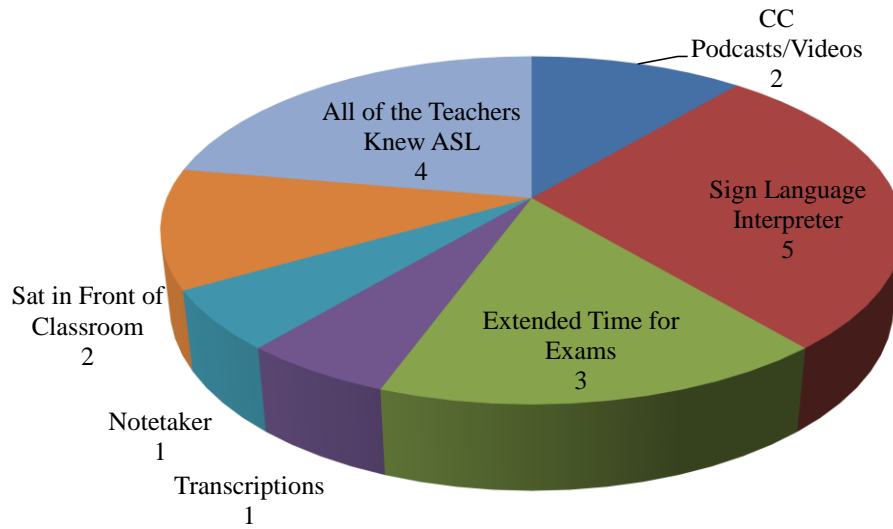
Figure 7. Students' responses about the types of accommodations they received in high school education, (*N*=10).

The results of the Student Accommodation and Online Learning Course Pre and Post-Survey from the spring semester revealed the students' change in responses when asked if the accommodations improved the learning of the course (*N* = 4). The mean of the Likert scale scores for the Pre and Post-Survey were calculated and compared (Table 1). The Pre-Survey mean was in slightly above *neutral* (3.25) range. The mean of the Post-Survey was in the *agreed* (4.00) range (Figure 1).

Table 4
Student Responses from Students Accommodation & Online Learning Course Surveys

Survey Question	Likert Choices					Average
The accommodations improve the learning of the course.	5	4	3	2	1	
Pre-Survey	0	2	1	1	0	3.25
Post-Survey	1	2	1	0	0	4.00

Note. 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree, (*N*=4).
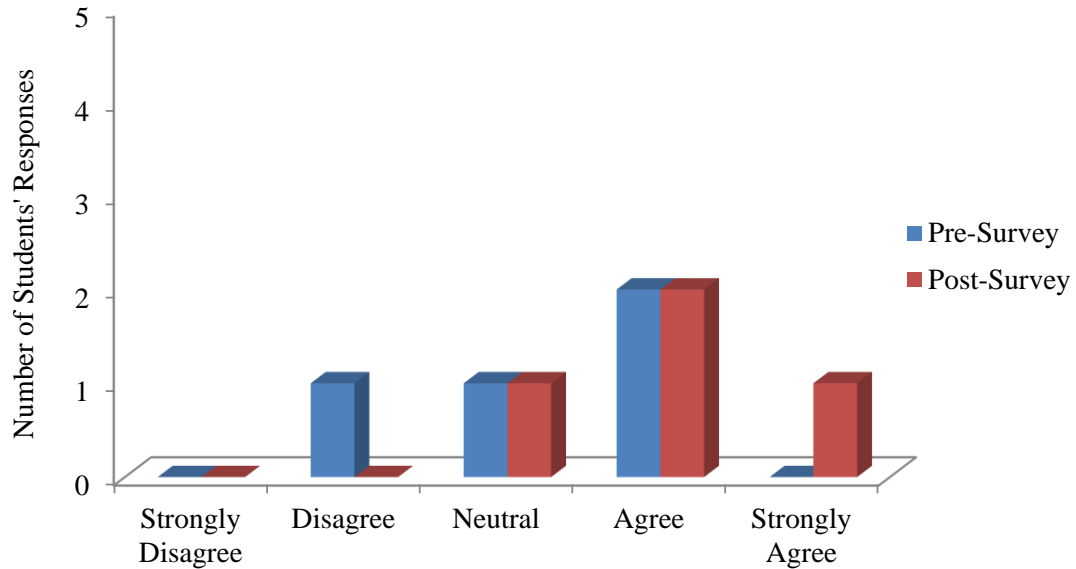
Figure 8. Students' responses about the accommodations improving the learning of the course during the spring semester, (*N*=4).

In order to focus on the attitude about a particular type of accommodations in the students, the data was further analyzed to see which responses revealed the students feeling *very dissatisfied*, *dissatisfied*, *neutral*, *satisfied*, and *very satisfied* to the survey. Likert scale scores revealed a slight average decrease in the satisfaction of the closed-captioned videos and podcast on the post-survey. One student who felt discontent about the closed-captioned podcasts and videos said, "Instead of adding closed captions on the videos, put sign language interpreter on a small screen in the video." However, Likert scale scores indicated a minor average increase when students were asked how satisfied they felt about extended exam time. One of the students who felt extended exam time was satisfactory said, "Extended time for exams were helpful because it gave me time to think about the questions thoroughly" (Figure 7).
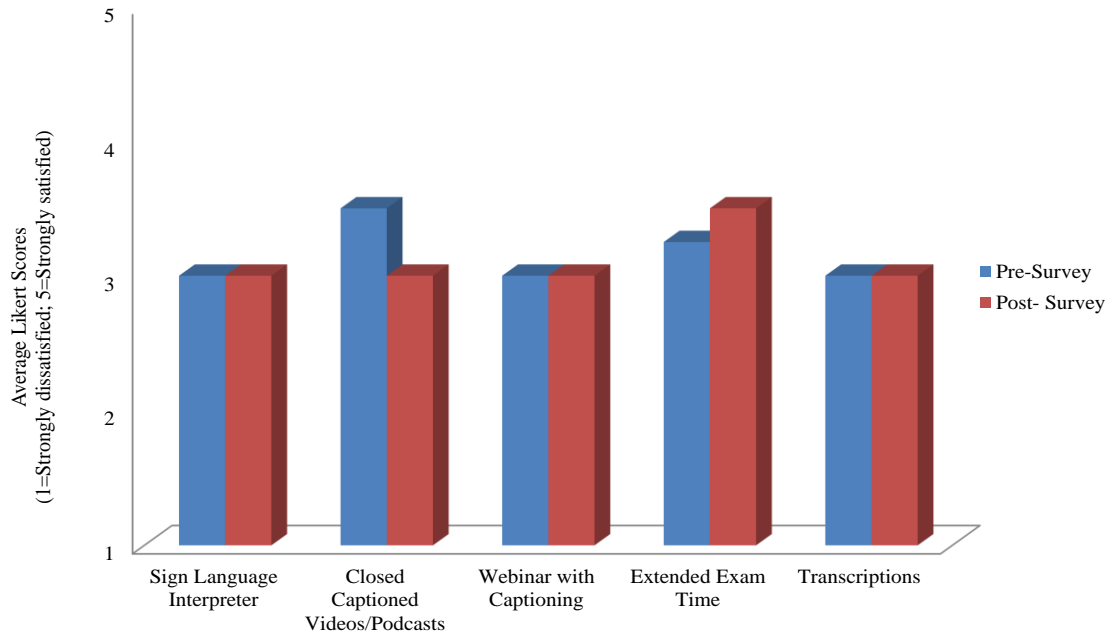
Figure 9. Students' attitude about various types of accommodations in online courses, (*N*=4).

In order to determine what types of accommodations benefit the students the most, we can look at the student responses from the open-ended questions from Student Accommodation and Online Learning Courses Pre and Post-Survey. Three students either did not receive any or did not think accommodations benefitted them. One of the students in all text-based online course said, "None…..so far, it's been reading on our own." One student thought emails and discussion board were the most beneficial. One student who thought discussion boards and emails were most helpful stated, "They're more accessible for communications" (Figure 8).
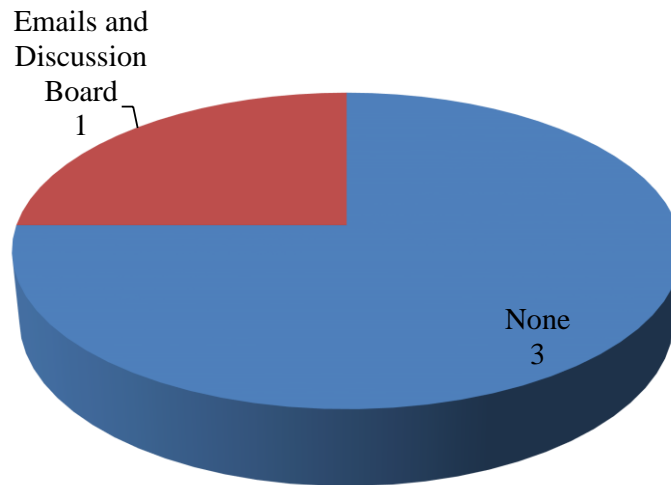
Emails and
Discussion
Board
1

None
3

Figure 10. Students' thoughts about which type of accommodations were the most beneficial, (*N*=4).

Faculty Interview

During the faculty interview, the instructors were asked to explain the type of accommodations their students with hearing loss received in their online courses. One of them stated, "Courses provide text for video and other multi-media material that contains sound." Another instructor commented, "Caption for online videos; alternate methods of assignments submission for spoken English assignments."

Instructors were asked what things they did to make their online courses more accommodating for their students with hearing loss. One instructor commented, "I have included closed captions in podcasts used in courses I have HI students enrolled. I'm also redoing all my podcasts to include closed captions. In addition, I have made arrangements with disability services to include closed captions in webinars." A different professor explained how her online courses are deaf friendly remarked, "My online

course is unique in that I am fluent in ASL, so not many accommodations were required.

I ensured that any spoken English videos were captioned. Students had one presentation

that most presented in spoken English, but I allowed deaf students to present in ASL."

Instructors were asked to explain the least challenging experiences for them when

facilitating online courses with students with hearing loss. One instructor remarked, "I

think the communication barrier is less apparent in an online course. Even though it is

not an issue for me here, I think the student had more opportunities to interact with her

classmates directly through email and online discussions than if it had been a face-to-face

course, where many interactions would be facilitated through an interpreter." Some

instructors reported not being aware they had students with hearing loss in their class.

One said, "Many times I do not even know if a student has a hearing loss in my classes.

Since I follow Universal Design [the design of products and environments usable by all

people, to the greatest extent possible, without the need for adaptation or specialized

design], every assignment is accessible to every

student" (http://www.ncsu.edu/ncsu/design/cud/pubs_p/docs/poster.pdf).

A few instructors remarked how challenging it can be to make online courses

accessible for the students with hearing loss. One explained, "Personally, the biggest

challenge for me is to make the material accessible for both students who are fluent in

ASL and those who are not. The Interpreting and Deaf Education program has some deaf

students and some students who are simply learning ASL. Any spoken English materials

that are used to accommodate the hearing students' lack of ASL fluency must be

accessible to the hearing students. I think the other challenge is not knowing that a deaf

student will be in my course until immediately prior to, or sometimes after, the start of

the semester. Front-loading the accessibility preparations is important, but sometimes

overlooked." A different professor described how he wanted his students to feel

comfortable in online courses noted, "Making sure the student is comfortable in the

course. In courses that require group interaction accommodating a student is more

difficult because the group who may do conference calls will not be able to do so.

However, group members will need to use other methods of sharing information such as

chat as well as collaborative web sites." Lastly, another instructor remarked how the

most challenging experience for them when facilitating online courses with students with

hearing loss said, "Having them letting me know what they need."

Some of the instructors provided suggestions as ways to improve the accessibility

of online courses for the students with hearing loss. One instructor remarked, "I would

like to add live video occasionally instead of text."

Instructors described how a variety of accommodations impacted the students'

performance on assignments or tests. One of the instructors noted, "Students with

accommodations do just as well as students who are not receiving accommodations."

<p style="text-align:center">Service Providers Interview</p>

During the service provider interview, some of them described different types of

accommodations were used by the students with hearing loss in online courses. One

explained, "Accommodations are provided on a case by case basis and are different for

every student, but here are some examples of accommodations provided to students

taking online courses in the past. Test accommodations are provided, such as, extended

time which is typically one and half times the regular allotted times. All online audio

components (videos, lectures, voice threads, etc.) must be in an accessible format.

Preferred method for various online audio components accessible format: Video Remote

Interpreting for live class sessions done online, text threads as an alternative for voice

threads, captioning for all video materials, interpretation and/or transcript or captions for

all lectures. Any other accommodations that provide equal access, and are deemed

reasonable to individual students' needs."

Service providers were asked to explain how they help make online courses more

accessible for the students with hearing loss. One service providers described, "Each

semester, we check schedules of students who may require specific accessibility

accommodations, and ask the student if they think they will need accommodation, and

follow-up with the instructor to make sure materials are accessible." Another service

provider described how they educate instructors remarked, "Our office educates faculty

about the need for accommodation in online courses as well as providing captioning

services."

Service providers commented about how challenging it can be for them when

assisting students to make their online courses more accommodating. One said, "Getting

professors to realize the need to have all videos used in course captioned, whether or not

they have the hearing impaired students in the class. Getting the students to sign up for

classes in Priority Registration and then notifying my office that they have registered for

online courses." A different service provider remarked, "Providing accommodations can

be challenging when either the student or the instructor are not following through with

their responsibilities in a timely manner. For example, in the case of instructors, sometimes it is difficult to get them to follow through with captioning their materials, or providing notes in a timely manner. In the case of the students, it is the student's responsibility to seek assistance from disability service department if there are any accommodation related issues. Sometimes, we are not notified of an issue until midterm or the end of the semester and at that point it is very challenging to retroactively assist with the issue."

Some of the service providers explained the least challenging experiences for them when assisting the students to make online courses more accessible. Service providers commented how instructors already have made their courses more accessible saying, "A lot of the materials is already text-based, not audio/visual at all. Some professors add videos that are already captioned." Another service provider remarked, "Communication might be the least challenging aspect, in that I have found both students and instructors to be very interactive and engaged in the process of providing reasonable accommodation."

Service providers remarked how a variety of accommodations impacted the students' performance on assignments or tests. One service providers mentioned, "If they can't access the content at the same time as their peers, then cannot learn equitably. This can affect their scholastic performance as well as their emotional response to learning."

Service providers also shared their opinions of how to make online courses more accessible to the students. One service provider remarked, "Make all online software and courses accessible based on Universal Design before a deaf and hard of hearing student is

registered for the class. Retrofitting and other reactive measures are not as effective as simply having everything set up in the first place." Another service providers recommended all of the videos in classes should have closed captions pointed out, "If I were a professor, I'd never use a video or lecture audio in an online class that is not captioned. As a Disability Service Provider, if I had the authority, I would make it policy for all classes to be accessible." One of the service providers suggested the students, disability service coordinator and instructor should communicate with each other. She noted, "Once the students register for an online class, they should inform the accommodations office. Often the students don't think about this until there is a problem in the class such as the videos are not captioned. Once the accommodation office is notified that a Deaf and Hard of hearing student has registered for an online class, they can reach out to that instructor to ask about the course content and if it is full accessible."

INTERPRETATION AND CONCLUSION

A wide variety of quantitative and qualitative data were collected and analyzed to answer all of my research questions on the effects of accommodations on the achievements of students with hearing loss in online courses. It is recognized the answers to my research questions varied depending on the students and their background experiences. Overall, the results of my study generally were positive, but different institutions need to continue improving their technologies to make it more deaf friendly for the future students with hearing loss.

The results of this study revealed the students' preferences on the type of accommodations vary because it depends on type of their hearing loss and background

experiences in education. This supports the findings in the previous studies conducted by

Lartz, Stoner, and Stout (2008). The findings in this study indicated the students'

preferences of sign language interpreter and closed-captioned videos in online courses

were significantly equal.

The finding of this study revealed the use of various types of accommodations

improved the students' learning of the materials in online courses. Data from student

structured interview revealed one of the benefits of closed captions and sign language

interpreter was it helped the students to stay caught up or understand the materials better

or otherwise, they would fall behind academically. Closed-captioned videos have an

ability to include all of the words, which helps students to understand the whole picture

of the concepts. This supported the findings of the previous studies conducted by Lewis

and Jackson (2001). Sign language interpreters have the capacity to make the content of

a lecture more visual by using facial expressions and hand gestures, which helps students

who know ASL to understand the course materials effectively.

One of the most common themes about the disadvantage of online courses, even

with accommodations, was it lacked visual aids such as videos, graphics including

examples for instructions, and face-to-face interactions with instructors and peers. One

student said, "For science related online courses that is text-based, for example, biology

should have more visual aids such as animations, podcasts with closed captions, and

graphics. It would be nice if instructors developed more brief videos of himself teaching

abstract concepts including drawing pictures or writing on more examples on the board."

Another student said, "It lacks visual aids. It has the lack of face-to-face interactions."

The importance of visual aids for students with hearing loss supported the findings in the studies conducted by Slike et al. (2008) and Nikolaraizo, Vekiri, and Easterbrooks (2013). The data from the student structured interview suggested online courses should have more Skype sessions for group discussion.

Interestingly, the responses about accommodations improve the learning of the course from the pre-survey and post-survey changed from the beginning to end of the course during the spring semester. The result of this study showed various accommodations positively impacted the students' learning experiences in their online courses. One possible explanation to this was the students' instructors had experiences working with students with hearing loss and have familiarity to make their online courses accessible. However, the responses about the attitude of various accommodations particularly closed-captioned videos and podcast slightly decreased from the beginning to end of the spring semester. Based on the results of this study, one disadvantage of closed captions is for students that used ASL as their native language because they had difficulties understanding the English language in the closed captions. These findings mirror previous studies conducted by Elliot et al. (2001) and Jagodzinski and Wolski (2012).

There were some issues with the data collection for this project that could be improved upon in the future. The first would be making more connections with faculties and service providers from various universities ahead of time in order to recruit more interested students with hearing loss taking online science courses to participate this study. I would make a few changes to make the data collections more effective. Student

survey and interview questions would be tweaked to focus more on the academic achievement of students including their attitude about online courses. In addition, I would shift one of the research questions to focus on comparing the difference between online course and blended online course with accommodations. Does the use of accommodations improve the students' learning of the materials in blended online courses? It would be interesting to examine which type of online courses impacted the students' learning of the materials positively or negatively.

VALUE

As a result of this action-based research project, my perspective about students with hearing loss taking online courses changed. I have learned a great deal from the feedback from the students with hearing loss, faculty members and service providers, as well as my personal experience as a graduate student. It was interesting to see how they all had different viewpoints about how to make online courses more accessible and how their responsibilities as students, professors, or service providers can make a difference.

Prior to taking online courses at Montana State University, I had uncertainty if online courses are effective for the students with hearing loss. After taking several online courses at MSU, I had positive experiences, but I still believe we can always find ways to make it more effective in the future for students with hearing loss. Some of the students, myself included, felt most online courses lacks visual aids and face-to-face interactions with instructors and peers, but we are hoping most institutions would include more Skype sessions for group discussion and questions relating to assignments down the road.

I have discovered students with hearing loss have different point of views about online courses. Some of them prefer to take online courses because it is more convenient and flexible with their schedule. However, some of them prefer to take traditional classes because of more interactions with the students and instructors. Honestly, I prefer to take science or math related courses in traditional classrooms because professors tend to use illustrated examples on the board, and I can actually see and learn from him or her. I am a visual learner and it would help me to understand the materials better. I also enjoy socializing with the students and instructors in a traditional classroom. However, I have taken science-related courses such as astronomy and oceanography online at MSU and performed much better than I anticipated. I had to work extremely hard to succeed in those online courses though. My personal experience as a graduate student made me realize if I can take online courses successfully, other students with hearing loss can do it as well, just as long as they are motivated and willing to dedicate their time to work hard.

The most challenging experiences for me in my online courses were getting involved with the discussion group by posting comments. It was required for me to carefully think about what to post on the discussion board and ensure it was effective for other students to read. Sometimes it took me one to two hours to work on only one post in science-related courses. This is true because I had to start from the scratch to teach myself about a particular topic, for example, the chemistry of the ocean water. I had to do a great deal of research but at the same time, it helped me to overcome barriers and learn new concepts. Other students with hearing loss had similar experience with the discussion board. Some of them think the discussion board should be removed from

online course, and we should have face-to-face interactions instead. I have mixed feelings about this topic because I think writing posts challenges us to become better learners and writers, even if it required more time to write effective posts. However, I prefer having more face-to-face interactions with instructors and students. It would be nice to have both of these experiences in online courses.

As for my capstone courses, I felt it was as accessible as the traditional classrooms. My instructor included closed captions in all of his podcasts and ensured the webinars included live captioning. Those accommodations were very beneficial to me. In these courses, my interactions with the students and instructor through the discussion board and emails were generally positive experiences for me. My instructors and I, including my service providers worked well together as a team and ensured my needs were met in all of my classes. I understand it is important for all of the students with hearing loss to communicate with their instructors and service providers to get the accommodations they need for their courses.

It is my goal to help the students learn how to self-advocate and overcome obstacles in order to become more successful in their future online courses. Based on the results of this case study and my personal experience, it is my hope hearing universities nationwide will add more videos with closed captions, graphics or examples of abstract concepts, and possibly more Skype sessions in online courses because it would enhance the learning environment for the future students. It would be advantageous if institutions would begin including closed captions in the videos or podcasts ahead of time. It also would be beneficial if the institutions would include both interpreter and texts in the

small screen in videos for the students who are fluent in ASL. This way, these students can learn the English language, while viewing the ASL interpreter simultaneously.

From my experience, I am aware technology for online courses is improving each year and I believe different universities will continue to discover different methods to make it effective for the future students with hearing loss. I think more students with hearing loss will take online courses down the road so it is critical to make it more accessible for them. I have learned a great deal from my research project and it has been a valuable experience for me. This research project truly impacted me positively and helped me overcome more obstacles as a deaf student. It is my hope these suggestions will positively influence the decisions of different faculty members and service providers from other institutions when they work with students with hearing loss. Additionally, it is my hope the students with hearing loss will learn from this Capstone project. I am sincerely thankful for the opportunity to conduct this research project through Montana State University.

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APPENDICES

APPENDIX A

STUDENT CONSENT FORM

MONTANA STATE UNIVERSITY MSSE

STUDENT/SUBJECT CONSENT FORM FOR PARTICIPATION IN HUMAN RESEARCH

The purpose of this research project entitled "The Effects of Accommodations on Achievement of Students with Hearing Loss in Online Courses," examines the feedback from the students regarding the advantages and disadvantages of online courses with accommodations. You are being asked to participate in a research study that has a goal of determining of impact online courses with accommodations on students with hearing loss. For this project, students will be asked to complete Accommodation and Online Learning Course Survey. All of these data collection instruments fall within the area of common classroom assessment practices.

Identification of all students involved will be kept strictly confidential. Most of the students involved in the research will remain unidentified in any way, and their levels of environmental interaction will be assessed and noted. You will be selected for interviews to answer questions regarding your experiences and feelings about your online courses. Nowhere in any report or listing will students' last name or any other identifying information be listed.

There are no foreseeable risks or ill effects from participating in this study. All treatment and data collection falls within what is considered normal classroom instructional practice. Furthermore, participation in the study can in no way affect grades for this or any course, nor can it affect academic or personal standing in any fashion whatsoever.

There are several benefits to be expected from participation in this study. Your feedback regarding online courses with accommodations will assist the university to make their online courses more accessible for the students with hearing loss.

Participation in this study is voluntary, and students are free to withdraw consent and to discontinue participation in this study at any time without prejudice from the investigator.

Please feel free to ask any questions of Jodie Hood via e-mail, phone, or in person before signing the Informed Consent form and beginning the study, and at any time during the study.

Student signature: _____
Date: _____

APPENDIX B

INSTITUTIONAL REVIEW BOARD APPROVAL

INSTITUTIONAL REVIEW BOARD
For the Protection of Human Subjects
FWA 00000165

MONTANA STATE UNIVERSITY

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MEMORANDUM

TO: Jodie Hood and John Graves

FROM: Mark Quinn, Chair *Mark Quinn CQ*

DATE: November 7, 2014

RE: *"The Effects of Accommodations on Achievement of Students with Hearing Loss in Online Courses"*
[JH110714-EX]

The above research, described in your submission of November 6, 2014, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

_X_   (b) (1)   Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

_X_   (b) (2)   Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.

_____   (b) (3)   Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

_____   (b) (4)   Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.

_____   (b) (5)   Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

_____   (b) (6)   Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.

APPENDIX C

STUDENT INTERVIEW QUESTIONS

Interview Questions for the Students with Hearing Loss

1. When did you take the online course for the first time?

2. What kind of accommodations did you receive when taking an online course?

3. How did those accommodations benefit you?

4. Were any of these accommodations not helpful? If so, why?

5. Explain what you do when you are not satisfied with your accommodations.

6. How have those accommodations improved your communication with instructors and classmates?

7. How have those accommodations improved your understanding of class materials?

8. What was the most challenging experience with the online class?

9. What things would you change to make the online class more helpful?

10. Do you prefer taking traditional classroom courses or online courses? Why?

11. Is there anything else you'd like me to know about your experiences with your online classes?

APPENDIX D

STUDENT ONLINE LEARNING COURSE PRE-SURVEY

Student Accommodation and Online Learning Course Pre-Survey

Please answer each of the following questions. Your responses are *confidential* and will not be used against you in any way. Your answers are important, and will be used to help the universities' online courses to become better for future students with hearing loss. Make sure to respond to all the questions. Check all of the answers that apply and write any handwritten responses legibly. Participation is voluntary and you have a right to withdraw if you prefer not to participate.

Section I. Information About You.
1. College Rank:
   a. Freshman
   b. Sophomore
   c. Junior
   d. Senior
   e. Graduate
   f. Other:_____

2. Indicate your type of hearing loss
   a. Deaf
   b. Hard-of-Hearing
   c. Late-Deafened
   d. Other: _____

3. Check all of the answers that describe where you received your high school education.
   a. Deaf institution
   b. Special education class with a hearing impaired teacher
   c. Mainstreamed into regular education classes with an interpreter in a public school
   d. Mainstreamed into regular education classes without an interpreter in a public school
   e. Other:_____

4. What types of accommodations did you receive when you were in high school? Check all that apply.
   a. Closed captioned podcasts/videos
   b. Sign language interpreter
   c. Extended time for exams
   d. Transcriptions
   e. Other:_____

Section II. Your Online Education Experience

5. Including this course, how many online courses have you taken?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5 or more

6. For what subject was this course taken? Check all that apply.
   a. Math-related course
   b. Science-related course
   c. Other:_____

7. Please indicate the accommodations you receive. Check all that apply.
   a. Closed captioned podcasts/videos
   b. Sign language interpreter
   c. Extended time for exams
   d. Transcriptions
   e. Other:_____

8. How do you communicate with your instructor and peers? Check all that apply.
   a. Emails
   b. Texts
   c. Discussion board
   d. Chat room
   e. Other:_____

Section III. Online Course with Accommodation Evaluation

9. This course with accommodation was helpful.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

10. This course without accommodation would be challenging.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

11. I would take another online course if it were taught in a similar style.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

12. I am comfortable communicating electronically.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

13. The accommodations made the materials easier to understand.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

14. The accommodations improve the learning of the course.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

15. The instructor and facilitator were available to help.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

16. The instructor/facilitator made the course more accessible.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

17. I would recommend online courses to other students with hearing loss.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

18. I feel that face-to-face contact is necessary to learn.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

19. Learning is the same in class and at home on the internet.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

20. I prefer interaction with other students and instructors.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Section IV. Accommodation Evaluation: Please rate your satisfaction with the accommodations you receive.

21. Sign language interpreter

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied

22. Closed captioned videos/podcasts

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied

23. Webinar with captioning services

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied

24. Extended Time for Exams

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied

25. Transcriptions

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied

Section V. Open Ended Questions:

26. If your accommodation was not mentioned from above (Section IV.), what type of accommodations are you receiving?

27. Which accommodations benefit you the most? Explain.

28. Which type of accommodation do you prefer to receive? Explain.

29. Explain what you do when you are not satisfied with your accommodations.

30. If you are dissatisfied with your accommodations, what things would you change to make it more helpful?

Thank you for your time in answering the questions. Your responses are important because it will help the universities to make their online courses more accessible for the future students with hearing loss.

APPENDIX E

STUDENT ONLINE LEARNING COURSE POST-SURVEY

Students Accommodation and Online Learning Course Post-Survey

Answer the following as best you can. Check all of the answers that apply and write any handwritten responses legibly.

Section I. Your Online Education Experience
1. Including this course, how many online courses have you taken?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5 or more

2. For what subject was this course taken? Check all that apply.
   a. Math-related course
   b. Science-related course
   c. Other:_____

3. Please indicate the accommodations you receive. Check all that apply.
   a. Closed captioned podcasts/videos
   b. Sign language interpreter
   c. Extended time for exams
   d. Transcriptions
   e. Other:_____

4. How do you communicate with your instructor and peers? Check all that apply.
   a. Emails
   b. Texts
   c. Discussion board
   d. Chat room
   e. Other:_____

5. What type of accommodations did you receive when you were in high school? Check all that apply.
   a. Closed captioned podcasts/videos
   b. Sign language interpreter
   c. Extended time for exams
   d. Transcriptions
   e. Other:_____

Section II. Online Course with Accommodation Evaluation

6. This course with accommodation was helpful.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

7. This course without accommodation would be challenging.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

8. I would take another online course if it were taught in a similar style.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

9. I am comfortable communicating electronically.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

10. The accommodations made the materials easier to understand.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

11. The accommodations improve the learning of the course.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

12. The instructor and facilitator were available to help.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

13. The instructor/facilitator made the course more accessible.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

14. I would recommend online courses to other students with hearing loss.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

15. I feel that face-to-face contact is necessary to learn.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

16. Learning is the same in class and at home on the internet.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

17. I prefer interaction with other students and instructors.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Section III. Accommodation Evaluation: Please rate your satisfaction with the accommodations you receive.

18. Sign language interpreter

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied

19. Closed captioned videos/podcasts

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied

20. Webinar with captioning services

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied

21. Extended Time for Exams

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied

22. Transcriptions

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied

Section IV. Open Ended Questions:

23. If your accommodation were not mentioned from above (Section III.), what type of accommodations are you receiving?

24. Which accommodations benefit you the most? Explain.

25. Which type of accommodation do you prefer to receive? Explain.

26. Explain what you do when you are not satisfied with your accommodations.

27. If you are dissatisfied with your accommodations, what things would you change to make it more helpful?

Thank you for your time in answering the questions. Your responses are important because it will help the universities to make their online courses more accessible for the future students with hearing loss.

APPENDIX F

FACULTY INTERVIEW QUESTIONS

Faculty Interview Questions

1. What specific accommodations are used by the students with hearing loss in your online course?

2. In what ways did you make your online course more accommodating for your students with hearing loss?

3. How does the accommodation impact the students' performance on assignments or tests?

4. What is the most challenging experience for you when facilitating online courses with students with hearing loss?

5. What is the least challenging experience for you when facilitating online courses with students with hearing loss?

6. In what ways you would change to make the online course more accommodating for the students with hearing loss?

APPENDIX G

SERVICE PROVIDERS INTERVIEW QUESTIONS

Service Providers Interview Questions

1. What specific accommodations are used by the students with hearing loss in an online course?

2. In what way did you help make the any online courses more accommodating for the students with hearing loss?

3. What is the most challenging experience for you when helping students with hearing loss and instructors to make the online courses more accommodating?

4. What is the least challenging experience for you when helping students and instructors with hearing loss to make the online courses more accommodating?

5. How does the accommodation impact students' performance in an online class?

6. In what ways would you change to help make the online course more accommodating for the students with hearing loss?