Spring 2017

The effect of gamification on audiology awareness among young adults

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THE EFFECT OF GAMIFICATION ON AUDIOLOGY AWARENESS AMONG YOUNG ADULTS

by

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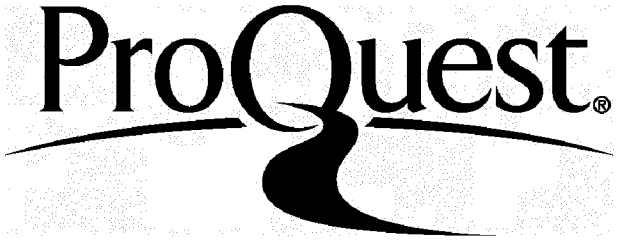
A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Audiology

COLLEGE OF LIBERAL ARTS
LOUISIANA TECH UNIVERSITY

May 2017



LOUISIANA TECH UNIVERSITY

THE GRADUATE SCHOOL

January 18, 2017

Date

We hereby recommend that the dissertation prepared under our supervision by Shenque I. Lester

entitled The Effect of Gamification on Audiology Awareness among Young Adults

be accepted in partial fulfillment of the requirements for the Degree of Doctor of Audiology

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GS Form 13a
(6/07)

ABSTRACT

The profession of audiology is projecting a critical shortage of practicing professionals in the near future. Although there are many potential factors that are contributing to this problem, it is generally agreed that audiology as a profession is not readily identified as a career choice by undergraduate students, nor a recognizable healthcare field/service among the general public. Due to the increased instances of hearing loss in the general population as well as the aging of the population and need for audiological services, it is imperative to find an efficient means to improve the awareness of audiology as a potential career choice among undergraduate students. The purpose of the present study was to examine the effect of gamification on audiology awareness among young adults using a game-based system called *Kahoot!*. Undergraduate students of various classifications and ages at Louisiana Tech University were used in the study. Participants were given a pretest questionnaire to determine how much they knew about the profession of audiology and hearing loss prevention prior to the game. Following completion of the pretest, one session of *Kahoot!* was administered, where a series of questions were asked with the correct answers later explained to reinforce the information presented.

At the conclusion of the study, a posttest questionnaire was distributed to measure how much of the information presented during the game was retained, and to determine whether the gaming exercise had produced interest in the profession of audiology; as well

as hearing loss prevention techniques. Results revealed that utilizing the game-based model significantly affected the interest that undergraduate students had in the profession of audiology, indicating that game-based models or gamification could be an effective way to advocate and educate undergraduate students about the profession of audiology and hearing conservation strategies.

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Author Shenque I. Lester

Date 03/31/2017

DEDICATION

This dissertation is dedicated to several people. First, I immensely appreciate my mother, Marion Cummings; her strength has inspired me to take on the world without a care in mind. Secondly, I want to thank my fiancé's mother, Nanette Foster, for taking me in as a daughter and being such a positive influence for me along this journey. Additionally, I want to dedicate this dissertation to my fiancé Harold Foster Jr., my cousin Ronkisha Thomas, and my sister Teneka Rentrope, for their continuous love, support, and encouragement. Lastly, I dedicate this dissertation to my favorite professor, Dr. Steve Madix. Without your guidance, peculiar insight, connections, and good judgment, I would not be where I am today. I am extremely grateful that you never gave up on me. Most importantly, I want you to know that your courageous fight for both the profession of audiology and the students at Louisiana Tech University has not gone unnoticed. Thank you!

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ACKNOWLEDGEMENTS

I am delighted to acknowledge those who made this dissertation possible. First, I want to acknowledge Dr. Steve Madix. As my dissertation chair, he has guided and supported me throughout the entire process from an idea to reality. Secondly, I want to thank Dr. Brenda Heiman for boldly agreeing to take part in my study and serve as a committee member. Although Dr. Heiman is a Speech-Language Pathologist, she too believes in advocating for the profession of audiology. Additionally, I want to thank Dr. Matthew Bryan for delightfully agreeing to assist me with this study. Lastly, I want to thank all of those who participated in this endeavor by either supplying participants or actively taking part in the study. Without your participation, my idea would simply be a mere thought in my head.

CHAPTER I

INTRODUCTION

Audiology is the study of hearing, balance and related disorders. The profession of Audiology is not as well-known as other health care fields that require equal or fewer educational requirements. According to the U.S. Bureau of Labor Statistics (2014), there were a total of 32,040 Optometrists in 2012 and 10,700 Podiatrists, as compared to a total of 12,762 ASHA-certified Audiologists (ASHA Leader, 2014). Audiology is and has consistently ranked among the top ten professions to pursue in the United States, and according to the American Academy of Audiology (2013) there are currently seventy four Doctor of Audiology (Au.D.) programs in the United States. However, it is not uncommon for undergraduate students to have little to no awareness of audiology prior to graduation. With the advanced aging of the current population, the increased incidence of hearing loss among younger people, and the need for more audiologists being projected, it is essential to find an effective means of generating greater awareness of audiology among college age adults.

To become an audiologist, one must obtain a doctoral degree in audiology from an accredited university. Prior to being accepted into the doctoral program, the necessary prerequisites must be obtained: a bachelor's degree in any field, a passing score on the Graduate Records Exam (GRE), and a minimum GPA of 3.0. According to the Higher

Education Data System (2011), the 2010-2011 Academic Year Communication Sciences and Disorders Aggregate revealed that a total of 3, 755 applications were submitted for graduate school admissions in Audiology; from which 1, 633 were approved for admissions; compared to the soaring rate of 45, 790 applications for the Speech-Language Pathology Master's degree program, in which a total of 11,866 were approved. Although approximately 1,633 students are admitted to Au.D. programs annually, less than half of these students are graduating. Furthermore, this creates a greater need for audiologists to support the demand of baby boomers, young adults, teens, and infants who will need audiological services.

As mentioned earlier, the profession of audiology is not as well-known as other health care fields that require equal or fewer educational requirements. Jeremy Donai, Candace Hicks, and Mallory McCart (2013) investigated entering college students' awareness of the profession of audiology and compared the students' knowledge of audiology to their awareness of roles in two other doctoral-level professions, podiatry and optometry.

Furthermore, Donai et al. (2013) sought to determine if measures should be implemented in terms of increasing the awareness of the field of audiology. The results indicated that college students were more accurate in describing the profession of optometry compared to audiology, but no difference existed between their awareness of podiatry and audiology. However, students with self-reported awareness of the three professions were more accurate in describing the professions of podiatry and optometry as compared to audiology (Donai et al., 2013). Based on these findings, it was concluded

that the awareness of audiology as a potential career path is low relative to that of the professions of optometry and podiatry for those with self-reported knowledge (Donai et al., 2013).

There are few reported efforts used to create awareness of Audiology. On the national level there are three events geared towards audiology awareness and hearing loss. They are: Better Hearing & Speech Month (BHSM) in May hosted by the American Speech-Language Hearing Association (ASHA), the National Audiology Awareness month in October hosted by the American Academy of Audiology (AAA), and the International Ear Care Day in March presented by the World Health Organization (WHO). Additionally, ASHA's Better Hearing and Speech campaign aims to educate the public about the early signs of communication disorders and how early detection can be beneficial.

The purpose of AAA's Audiology Awareness month is to increase public awareness of audiology and the importance of hearing conservation. The WHO's International Ear Care Day occurs every year on March 3. Furthermore, the purpose of this event is to raise awareness and promote ear and hearing care across the world. In terms of creating awareness for the profession of audiology, measures such as, creating informational posters, health fairs, making office visits to other health care professionals, and even campaigning in high traffic areas in the community have all been used. Although all of the efforts are helpful, the effectiveness is unknown.

Furthermore, gaming is a popular pastime and entertainment source for people with smartphones. In the past, gaming was primarily utilized to entertain; however, today gaming is utilized for many things; one of those being education.

Gaming has the potential to be a readily available tool to create audiology awareness among a key population group. The consumer costs associated with using gaming in this manner are little to none. Therefore, the use of gaming will be implemented to evaluate the effectiveness of gamification among young adults in creating audiology awareness as a potential profession, create awareness about hearing loss by encouraging regular audiological evaluations and the practice of hearing conservation.

CHAPTER II

REVIEW OF LITERATURE

Hearing Loss among Young Adults

Hearing loss is widely prevalent in the United States, and more specifically, noise induced hearing loss (NIHL) among young adults. NIHL is caused by hazardous noise exposure, which could be defined as a temporary or permanent hearing loss due to extensive noise exposure at high levels. A potential cause of NIHL among young adults is personal listening devices (PLDs) (WHO, 2015). PLDs that produce high volume levels pose a risk of hearing loss if they are used at high volumes for extended durations (Levey, 2012). PLD users must become aware of their listening levels and of the maximum amount of time they can listen at their chosen volume without risking hearing loss. Levey stated that hearing loss occurs gradually, and that many individuals may not notice a hearing loss or the symptoms of one right away; therefore early prevention is pertinent to prevent communication and academic difficulties. A few strategies listed to prevent NIHL are educating the public about hearing loss and the sources of toxic noise, avoiding or limiting exposure and protecting ears when exposed to the sources of toxic sounds, using hearing protection when unable to avoid noise exposure, turning down the volume on PLDs, television, and car radios; and wearing ear protection when exposed to loud noise at clubs, sporting events, and workplaces. When reviewing the prevalence of

noise induced hearing loss among college students, Michael Kotowski (2011) used brochures containing messages to study the effectiveness of the message model. This model was entitled the "Extended Parallel Process Model" (EPPM), which was used to inform college students about the risks of NIHL associated with personal listening device (PLD) usage, and how the use of headphones instead of ear-bud transducers can lower the risk. Kotowski's study consisted of 179 subjects being assigned randomly to a control condition or treatment condition. In the control condition, subjects responded to a questionnaire designed to measure the EPPM variables of severity, susceptibility, response efficacy, self-efficacy, and behavioral intentions, as well as several demographic variables. Upon the completion of the questionnaire, the subjects in the control condition were given the brochure. The opposite procedures took place for the subjects in the treatment condition, in which they were first given the brochure and then administered the questionnaire afterwards. The subjects in the treatment group perceived a greater threat to hearing loss among college students than those in the control group. Also, the subjects in the treatment group perceived greater efficacy for the use of earplugs for hearing conservation than the control group. Lastly, the results showed that although students were provided information about NIHL and the use of earplugs, many of them had no intention of using hearing protection. It could be inferred that many young adults avoid taking the necessary precautions to protect their hearing because they may believe that they will have normal hearing forever. This study complements the proposed hypothesis by suggesting that written materials, such as brochures are not effective advocacy tools. Additionally, a study conducted by Le Prell (2011) screened 57

students from a university in Florida, where each participant self-identified as having normal hearing. Upon completion of the study almost 10% of the sample was found to have a hearing loss either in one or both ears.

Additionally, S.E. Widen (2009) examined the possible associations between college students' attitudes, risk-taking behavior related to noisy activities, and hearing problems such as threshold shifts or self-experienced hearing symptoms and discovered that of the 258 respondents, 67 individuals failed the pure-tone audiometry test. Although 11 people reported in the questionnaire that they had a hearing loss, the pure-tone audiometry results indicated, that only three of these individuals reported normal hearing, so 26% actually failed the screening test. The results of Widen's study further support the need of educating young adults about hearing loss and the profession of audiology.

Many young adults do not take the necessary precautions needed to preserve their hearing. Vishakha Rawool (2008) evaluated the auditory lifestyles and beliefs of college students with reference to exposure to loud sounds in regards to the health belief model. Further, the health belief model proposes that the likelihood of taking recommended preventive health action depends on three major elements: (1) Individual perceptions based on perceived susceptibility to disease and perceived seriousness of disease, (2) Modifying factors such as perceived threat of disease and demographic variables such as gender, and (3) Perceived benefits of preventive health action minus perceived barriers to preventive action (Rawool, 2008). The model also postulates that a relevant stimulus or "cue to action" must occur to trigger the appropriate preventive health behavior (Rawool, 2008). According to the model, the likelihood that young adults will take preventive

actions such as minimizing noise exposure or using hearing protection devices (HPDs) will depend on individual perceptions about noise-induced hearing loss (Rawool, 2008). According to Rawool (2008), this includes perceived invulnerability to noise-induced hearing loss, modifying variables such as previous experience with hearing loss or tinnitus and perceived barriers to the use of HPDs such as reduced loudness sensation. Furthermore, a total of 238 (40 men, 198 women) students participated in the study. Rawool developed a 14-item questionnaire organized into nine segments (i.e. occupational noise exposure with and without the use of hearing protection, use of hazardous noise equipment, exposure to loud music, potential internal triggers for preventative actions, experience with tinnitus or hearing loss, perceived invulnerability, perceived availability of treatment, perceived barrier to preventative action, and perceived seriousness). In the use of noisy equipment without ear protection segment of the questionnaire, the results revealed that approximately 44% of the students either moderately (21%) or strongly (22.69%) agreed about not using ear protection in loud environments. Furthermore, in the exposure to loud music and sensation-seeking segment of the questionnaire, the results revealed that approximately 50% of the students either moderately (43.7%) or strongly (7.14%) agreed with the statement that "when they were listening to their headphones, people next to them could hear their music". In addition, 18% of the students either moderately (13.45%) or strongly (3.78%) admitted to sitting near the speakers when attending concerts. The conclusion of this study suggest that many college students are at risk for developing hearing loss due to occupational noise

exposure, exposure to the use of noisy equipment and/or exposure to loud music (Rawool, 2008).

The studies indicate that hearing loss is not only prevalent within the United States, it is significant among young adults and that greater knowledge about the damaging effects of noise and the utilization of hearing protection needs to be offered to young adults. Measures have been implemented to increase awareness and to promote hearing conservation protocols; however, young adults still engage in harmful practices that promote hearing loss. This is most likely due to the findings of each of these studies which further support that young adults are oblivious to hearing loss, and illustrate the need for alternative education tactics to increase awareness about hearing loss and the profession of audiology.

Effectiveness of Gaming on Learning

Matthew Richardson (2009) used an exploratory internet activity and trivia game to teach students about large groups of plants or animals that have similar characteristics due to common climates; also known as biomes. Richardson investigated whether the use of an internet activity and trivia game would increase the overall grades of seventh and eighth-grade science students. The students understanding of biomes were tested with pre and posttest questionnaires, a letter-writing activity, and a competitive trivia game. The study consisted of approximately 200 eighth-grade students and 55 seventh-grade students of varying academic abilities. The results of the study showed that the average grade on the pretest activity was 5.34 out of 9, whereas the average grade for the posttest was 7.32. There was a significant difference between the grades on the pre and posttest,

indicating that the students did better on the quiz following the activity. Closer examination revealed that 86.3% of the students improved their grades, not indicating students who scored a perfect grade on the pretest. Student's feedback indicated that the overwhelming majority also enjoyed the activity; in which 85.7% indicated that they "liked it" or "loved it". This study indicates that students benefit as well as enjoy trivia based gaming for educational purposes.

Bin-Shyan Jong et al. (2013) investigated online game use in an operating systems course using a game-based cooperative learning method to improve learning motivation in college students. This study consisted of 128 students enrolled in the Department of Information and Computer Engineering at a university in Taiwan. A peer interaction game for six players was designed to examine the effectiveness of gaming as an educational tool; in which the players were divided into two competing three-person teams. The results of the study indicated that students' desire to win the game motivates them to learn from online course materials before they play, which in turn was believed to enable them to achieve better learning outcomes. After the experiment concluded, members of the experimental group were given a questionnaire. A total of 46 questionnaire results were collected. Results showed that students had positive interactions with their peers during the game and were satisfied with these interactions. The students also indicated that their interactions using the game helped them to learn more when compared to traditional classroom exercises. Overall, the students were interested in the game and their performance and indicated that they would recommend it to other students in the department as a learning tool. Moreover, students highly agreed

that they found winning to be motivational. This finding indicates that winning the game can give students a sense of confidence and achievement, and it motivates them to learn more about their topic. The results of this experiment indicate that gaming can be used to enhance knowledge in college students, just as was reported in younger students. Furthermore, it indicates that at least in college students, the added variable of competition was viewed as enjoyable and possibly contributed to enhanced learning.

Shortage of Audiologists

There is a projected critical deficit in the number of graduating audiologists needed to address the growing demand for audiological services. Considering that the population of individuals 65 years and beyond is expected to double, and the fact that hearing loss is the third most common health condition within the United States, especially within the geriatric population; a greater demand is placed upon audiologists in order to accommodate the growing hearing loss epidemic. Windmill and Freeman (2013) examined the current number of audiologists and applied the Physician Supply Model (PSM) to determine if the anticipated supply of audiologists would meet the demands necessary to provide audiological services over the next 30 years. The PSM was adopted from the U.S. Department of Health and Human Services, which was developed in 2006 to anticipate the future supply and demand for physicians. Furthermore, this model was utilized to produce two measures of audiologist supply, with (1) being the number of full-time clinical audiologists, and (2) being the total number of licensed audiologists. At the time of this study, the current workforce of audiologists consisted of approximately 16,000 licensed practitioners, while there are a very small number of unlicensed

individuals; they did not affect the current or future supply calculations. The results for this study was determined by subtracting the number of retiring audiologists from the number that is entering, with the consideration of the attrition for graduates. Furthermore, the results revealed that more audiologists are exiting the profession than there are graduates. These findings translate to there being an inadequate supply of audiologists to meet the demand for audiology services. Furthermore, it has been concluded that in order to meet demands, an urgency for entering number of individuals entering the profession must increase by 50%. Additional implications for changes within the audiological workforce capacity consists of increasing the supply of audiologists entering the profession, increasing the capacity of each individual audiologist or practices beyond what is predicted, improving efficiencies of business practices, and increasing class sizes in academic programs. All of which should be considered in order for audiologists to meet the demands that are approaching, or else new models of service delivery would be introduced (i.e. over-the-counter products) (Windmill, Freeman, 2013).

While the population over the age of 65 will increase significantly, the population in all other age ranges will also inflate, further increasing the demand for services such as newborn screenings, pediatric assessments, provision of amplification, and general diagnostic testing (Windmill, Freeman, 2013). Houston, Munoz, & Bradham (2011) evaluated the effectiveness of early hearing detection intervention programs (EHDI) by distributing online surveys to fifty one EHDI coordinators. The survey consisted of professional development questions that required respondents to report at least one strength, weakness, opportunity, and threat (SWOT). Additionally, responses were

reviewed by a panel of experts in the field (i.e. audiologists, speech-language pathologists, early interventionists, pediatricians, and family physicians) and organized into common themes into each of the four strategic planning areas (i.e. SWOT). To generate recommendations from the SWOT analysis, a TOWS (i.e. threats, opportunities, weaknesses, and strengths) matrix was used to match identified strengths with opportunities (S-O strategy), strengths with threats (S-T strategy), weaknesses with opportunities (W-O strategy), and weaknesses with threats (W-T strategy) (Houston et. al., 2011). Of the 50 respondents, 47 (92%) of the coordinators completed the SWOT survey. The top theme for the strength section was professional development (i.e. strong university affiliations). Furthermore, the top theme for the weakness section was the lack of perceived need for training (i.e. low attendance rates to training opportunities). For the opportunities section the primary response was the amount of access to professional development and training (i.e. good opportunities for pediatric audiology training).

Lastly, the most common theme in this section was inadequate funding and resources (i.e. the need for continued funding to keep training opportunities). The use of the TOWS analysis matrix addressed each of the common themes by offering suggestions such as, working with university and online training programs to maximize the opportunities to provide training to existing providers in newborn hearing screenings, evaluations, and areas of follow-up. Another suggestion after the TOWS analysis was to advertise training opportunities to target audiences for greater participation, forming collaborative relationships between professional entities and agencies to reduce the impact on resources, eliminate barriers of travel, and to increase the availability of

training opportunities. Lastly, suggestions to reduce and prevent weaknesses from making programs susceptible to threats consists of developing program policies and procedures and clearly defining expectations in order to eliminate barriers to training. The three strategies that were developed from the suggestions to improve professional development opportunities are, (1) targeting personnel shortages by providing a range of professional development activities for medical, clinical, and educational professionals who deliver direct services to young children with hearing loss and their families; (2) establishing policies and procedures to eliminate barriers to training; and (3) publicizing all training opportunities to foster greater participation. The conclusion of this study revealed that there is growing evidence of a critical shortage of professionals with the qualifications needed to deliver appropriate, evidence-based, medical, clinical, and early intervention services to young children with hearing loss and their families (Houston, Munoz, & Bradham, 2011).

A significant amount of families with infants who have been identified with hearing loss fail to follow-up and seek the proper resources from qualified personnel. Shullman, Besculides, Saltzman, and Ineys (2010) surveyed 55 state and territorial universal newborn hearing screening intervention (UNHSI) programs and conducted site visits within eight state programs to (1) assess the improvement of fulfilling program goals, (2) to identify the barriers for successful follow-up from birth to screening, from screening to audiologic evaluation to early intervention, and (3) assess how the existence of medical home and family support programs can help overcome these barriers within UNHSI systems. Respondents were asked to identify barriers to successfully implement

each component of an effective UNHSI program. The survey used was developed by incorporating an open-ended telephone interview which was constructed on the basis of research and literature and then administered to a diverse set of 7 UNHSI programs. Furthermore, the responses were then used to develop the survey with special options for most survey questions to facilitate cross-program analysis. Surveys were mailed and faxed to UNHSI program coordinators in the U.S., the District of Columbia, and eight territories. To add, emails and phone calls were made to non-respondents. A 100% response rate from the U.S. was achieved for the survey, while completed surveys were also received from the District of Columbia, Guam, the Northern Mariana Islands, Puerto Rico, and the Virgin Islands. The results of the study revealed four barriers that states need to address, (1) sufficient screening equipment, (2) adequate early intervention services for infants with hearing problems, (3) family support programs, and (4) more provider knowledge. In terms of adequate early intervention services for infants with hearing problems, nearly half of the UNHSI programs reported a lack of pediatric audiologists as a major obstacle of diagnostic evaluation. According to Shullman (2010), shortages in available pediatric audiologists stem from a lack of university training programs that emphasize pediatric audiology. Compounding this problem is the difficulty involved in evaluating infants, because it necessitates specialized equipment and often requires extra time for testing (Shullman et. al., 2010).

Awareness of the Profession of Audiology

Developing good hearing health practices can be an omitted task if it has never occurred to someone that hearing loss can happen at any age. Jeffrey Danhauer (2009)

developed a survey entitled the "Personal Listening Device and Hearing Questionnaire" (PLDHQ) to examine college students' knowledge about, experiences with, perceptions of, and practices/preferences for hearing health and use of iPods and/or other personal listening devices (PLDs). Danhauer's experiment was designed to determine the need, content, and preferred format for educational outreach campaigns regarding safe iPod use to college students. This study sampled 322 students from 40 universities across the U.S. and included an online version of the survey, while also sampling 278 students where they were distributed the paper-version of the survey. In the Knowledge about, Experiences with, and Attitudes toward Hearing Health and Hearing Health Behaviors section of the PLDHQ, 49% of the students reported being in noisy settings frequently that may have exposed them to loud noise levels for possibly dangerous periods of time. The Personal Listening Device Ownership and Preferences section of the PLDHQ, revealed that 66.2% of the respondents reported having ownership of iPods, while only 6.1% said that they did not own any device. It should be noted that in the Habits and Preferences of iPod Users section of the PLDHQ, the results revealed that 76% of the respondents listened to their iPods using ear buds. Finally, in the Attitudes toward iPods and Their Use section of the PLDHQ, the results revealed that 54% of the respondents believed that iPods should contain warning labels similar to cigarettes to caution users about the potential hazard of noise induced hearing loss. The responses to each portion of the survey suggest that participants are aware of the potential risk of hearing loss due to personal listening devices and that the majority are willing to embrace better hearing health practices; however, a large percentage of the participants were either oblivious or

unaware of the effects of hazardous noise levels. Furthermore, the conclusions of the study suggests that public service announcements made by physicians and other experts via TV or internet directed towards raising awareness among young adults of possible dangers from iPod use should be employed, and that young adults need information about the role of the audiologist in hearing health care (Danhauer, 2009).

Modalities such as brochures, health fairs, and informational posters have all been attempted in terms of educating individuals about audiology and hearing loss. Robert Randolph (2003) examined two training techniques for educating young children about noise and hearing loss to determine whether a brief lecture and demonstration along with a simple informational handout would provide an increase in hearing loss prevention knowledge versus no-intervention. Third grade students from seven Pennsylvania elementary schools received either no intervention between the pre and posttest questionnaire tests, a lecture about hearing loss, or an informational bookmark along with the same lecture. A 10 item quiz was administered as a pre and post-test questionnaire to measure changes in acquired knowledge. The results showed that scores on the quiz improved the most for the lecture intervention groups regardless of whether they received the bookmark (15.1%), whereas the group that received the lecture and the bookmark showed significantly higher scores (13.6% greater) than the group with no intervention (4.99%) (Randolph, 2003). The authors conclude that there was a clear improvement in knowledge resulting from the informational intervention activities (Randolph, 2003). Based on the results from this study, any tool that can add to the effective prevention of hearing loss and promote audiology awareness should be considered.

Diana Emanuel, Jeremy Donai, and Chris Araj (2012) developed a pilot survey for entering college students' awareness of the profession of audiology in order to report the preliminary findings. Additionally, the students' knowledge about the requirements to become an audiologist were also surveyed. Two surveys were developed, one in 2003 and the second in 2009, in which both were administered to entering college students at a university located in Pennsylvania after being reviewed and published in 2012. The primary goal of the 2003 survey was to determine respondents' overall awareness of audiology as a profession; while the secondary goal was to collect demographic data to determine if specific groups of students should be targeted for future marketing efforts. Furthermore, the pilot survey was distributed to 35 students in a non-CSD course who were asked to complete the survey and comment on questions that were not clear. Furthermore, the answers were then used to create the final 2003 survey, which consisted of 13 closed-ended and three open-ended questions. The 2009 survey development was similar to the 2003 survey, however, it contained modifications to improve the response rate, clarity, and response quality. The completed survey response rate was at 84% (1,090 respondents) in 2009, which is more than double of the 58% response rate (582 surveys) that were completed during the 2003 survey. The results of the study suggest that the field of audiology is not widely known by entering college students. Furthermore, the results revealed that seventeen percent of the students self-reported that they knew what an audiologist did and were able to accurately describe the profession. To add, approximately 30% of the students learned about audiology from family and or friends. Students reported selecting their major based on interest in a specific field and not on

market-driven forces such as job opportunities and salary. This study concluded that future surveys should be conducted to confirm the extent on the lack of visibility of audiology as a profession and to serve as a metric for the efficacy of future marketing efforts in the profession.

Statement of the Problem

With the advanced aging of the current population, the increased incidence of hearing loss among younger people, and the projected need for more audiologists, it is essential to find an effective means of generating greater awareness of audiology among college age adults (i.e. proposing a potential career and encouraging the use of audiological services). Furthermore, the use of a gamification application designed for either the smartphone or tablet will be developed and used for the purposes of (1) creating audiology awareness as a profession, (2) creating awareness about hearing loss by encouraging regular audiological evaluations, and (3) encourage the practice of hearing conservation. The primary aim of this study will be to evaluate the effectiveness of gamification among college aged adults for these three areas.

CHAPTER III

METHODS & PROCEDURES

Participants

Fifty volunteer participants were included in this study. The participants were young adults between the ages of 18 and 25, both male and female. Subjects were recruited from Louisiana Tech University via email or flyers distributed on campus (see Appendix B for participant recruitment form). Upon arrival, each participant was given a verbal description of the study and was required to read and sign an informed consent form as required by the Institutional Review Board at Louisiana Tech University (see Appendix A). The inclusion criteria was as follows: (a) registered student of Louisiana Tech University; (b) have no known cognitive deficits; (c) a non-speech pathology or pre-audiology major; and (d) anyone who is an English speaker. If all inclusion criteria were not met, the participant's data was excluded from the study.

Materials and Procedures

All testing was conducted in a quiet room at the direction of the principal examiner. During the experimental testing, a smartphone or tablet was used for the digital application/game. The experimental instrumentation included a pre and posttest questionnaire (Appendices C and E) to determine the effectiveness of the primary experimental variable, which was a digital application that can be used on a smartphone or tablet. The game was completed in one experimental session, and the participants

agreed not to use any outside resources (i.e. internet or sharing information) for the completion of the pre and posttest questionnaire, or the game. The approximate time to complete the experiment was 15 minutes. All experimental data was saved from the digital device, downloaded, and converted into a Microsoft Excel spreadsheet for subsequent data analysis.

Gaming

Using a game-based classroom response system called *Kahoot!* Self-developed questions were used and uploaded (Appendix D) using a "drag & drop" creator tool. To launch the game, an initiation screen was used to direct the material to each participant's smart device. Each participant was provided an individualized game pin which allowed them to join the game using any personal device (i.e. tablet, cellular device, laptop, or desktop). Access to Wi-Fi or internet was mandatory for participation, as the game is strictly web-based. Once each participant joined the game using their individualized game pin, they were instructed to enter their designated number (i.e., player 1), which then would appear on the screen in front of the testing site to confirm participation. To play, each participant used their personal smart device to answer each question using an easy-to-use interface that correlated a color scheme and shape with the answers on the screen. The game has the option of being played individually or as a group; however, it is recommended that the game be played with multiple participants. Research has shown that cooperative game modes enhance game play and motivation (Peng, 2012). Each participant also had the option to leave feedback and to rate their experience after playing the game. Additionally, upon completion of each game, a snapshot of the results was available and captured. Each individual's results screen was used to create a spreadsheet

that indicated their answers, as well as the time it took them to complete each question. It should be noted that the correct answers were highlighted in green, incorrect in red, so that the participants could see the accuracy of their selections (see Appendix F for detailed procedures).

CHAPTER IV

RESULTS

Demographics

Fifty undergraduate students participated in the study by completing a pre and posttest questionnaire, as well as taking part in a 15 minute trivia based game. Questions 1-4 on the pretest questionnaire inquired about specific demographic information. Of that, one hundred percent (n=50) of the participants were between the ages of 18-22 years. Seventy six percent (n=38) of the participants were female and twenty four percent (n=12) were male. Furthermore, the ethnic composition for this study consisted of 88% Caucasian, 8% Hispanic, and 2% African American (see Figure 1). In terms of academic classification, 16% of the respondents were identified as freshmen, 22% were sophomores, 32% were juniors, and 20% were seniors (see Figure 2).

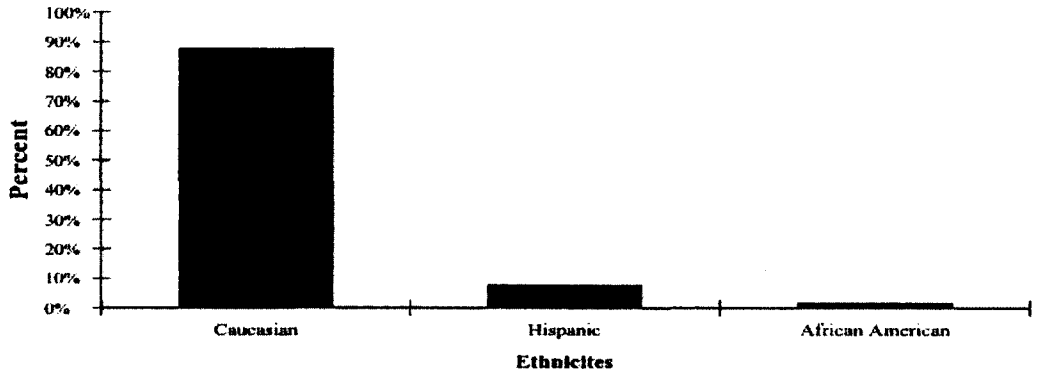


Figure 1. Percentage of participant ethnicities.

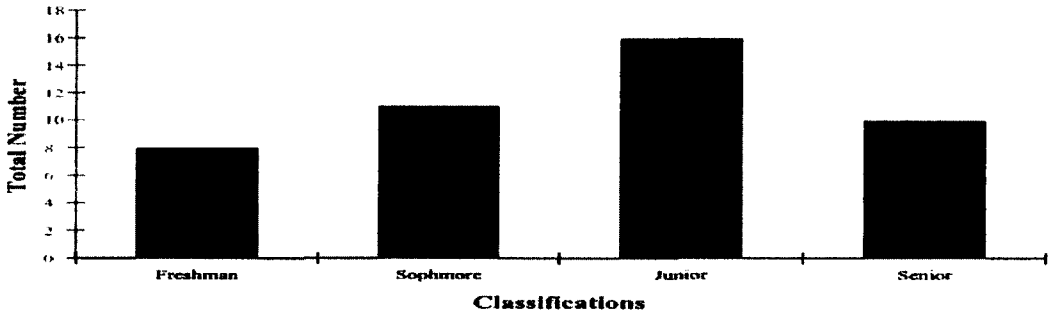


Figure 2. Total number of participants that are Freshman, Sophomore, Junior, and Senior.

Academic Program Selection, Audiology Awareness, & Intent to Pursue a Post-Baccalaureate Degree

Question number 5 on the pretest asked participants if they have declared a major, in which all (n=50) of the participants reported that they have selected a program of study. Louisiana Tech University offers a large variety of undergraduate academic programs. The academic programs are grouped into five colleges: Applied and Natural Sciences, Business, Education, Engineering & Science, and Liberal Arts (see Table 1). For question number 6 respondents were asked to report their majors, 32% of the respondents were associated with the College of Applied and Natural Science, 26% associated with the College of Education, 22% were associated with the College of Engineering, 10% were associated with the College of Business, and 10% were associated with the College of Liberal Arts (see Figure 3).

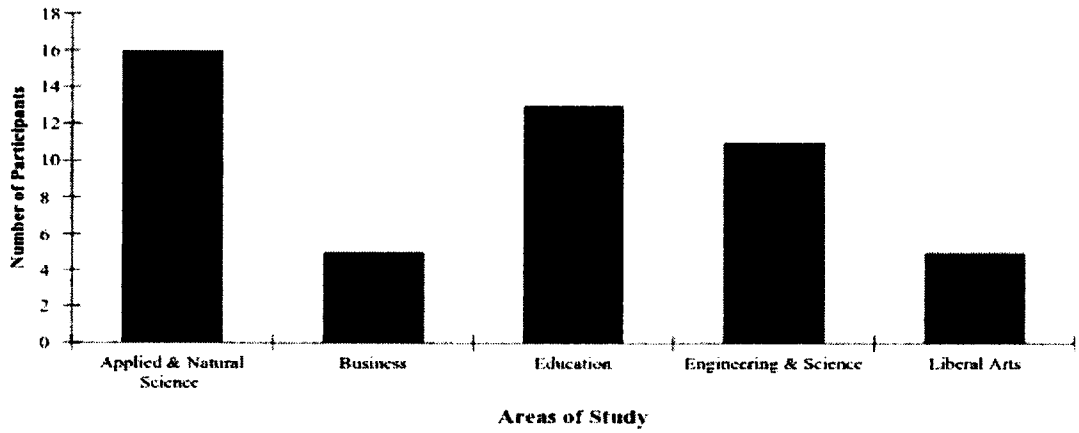


Figure 3. Total number of participants within the specified areas of study.

Table 1. Louisiana Tech University Undergraduate Academic Programs

Applied and Natural Sciences	Business
Plant Science	Accounting
Equine Science	Business Administration
Livestock Production	Business Economics
Pre-Veterinary Medicine	Computer Information Systems
Biological Science	Information Assurance
Applied Biology	Management
Biological Sciences	Marketing
Medical Technology (BS)	Finance
Environmental Science	Sustainable Supply Chain
Forestry (BSF)	Management
Forest Management	
Wildlife Habitat Management	Education
Geographic Information Science*	Early Childhood Education
Health Informatics and Information	Elementary Education
Family and Child Studies (BS)	General Special Education
Family Science	Secondary Education
Fashion Merchandising and Retail	Kinesiology and Health Promotion,
Nutrition and Dietetics (BS)	Health & Fitness/Clinical Practice
Dietetic Internship (non-degree)	Health and Physical Education
Nursing RN (AS)	Psychology
*Interdisciplinary Programs	

Engineering	Liberal Arts
Engineering	History and Social Sciences
Mathematics and Statistics	Pre-Professional Speech-Language Pathology/Audiology
Computer Science	Professional Aviation
Physics	Art history
Chemistry	Architecture
	Graphic Design
	Interior Design
	Studio Art
	Literature & Language
	Music
	Theatre
	General Studies

Source: https://secure.latech.edu/academics/degrees.php

Kahoot! And Posttest

A 15-minute session of *Kahoot!* was conducted where participants were instructed to use either their cell phone or tablet to play the game. After the entire game was completed, participants were then given a posttest to answer similar questions. The first question on *Kahoot!* asked participants to indicate what the study of audiology consisted of, 94% answered this appropriately on the game, and 100% answered this appropriately on the posttest questionnaire. Question number 2 on *Kahoot!* asked participants to indicate what an audiologist does; 84 percent selected the appropriate answer, while 88 percent answered this appropriately on the post questionnaire. Question number 3 on *Kahoot!* asked the participants what type of degree is required in order to become an audiologist, only 40 percent selected the appropriate answer, while 100% answered this appropriately on the post questionnaire. Question number 4 on *Kahoot!* asked respondents to indicate the primary anatomical part that audiologists primarily evaluate; 80% selected the appropriate answer, while 100% answered this appropriately on the post questionnaire. Question number 5 on *Kahoot!* asked respondents to indicate the amount that students and staff would have to pay in order to receive audiological services at the Louisiana Tech Speech and Hearing Center, 78 percent selected the appropriate answer, while 98 percent answered this appropriately on the post questionnaire. Question number 6 on *Kahoot!* asked the participants to indicate if only older people were at risk of having hearing loss in today's society, 98% selected the appropriate answer on both the game and posttest. Question number 7 on *Kahoot!* asked participants how often they should have their hearing evaluated, only 38 percent selected

the appropriate answer, while 92 percent answered this appropriately on the post questionnaire. Question number 8 on *Kahoot!* asked the participants to identify the potential causes of hearing loss in the population of young adults, 98 percent selected the appropriate answer, however when asked to recall this information only 88 percent answered this appropriately on the post questionnaire. Question number 9 on *Kahoot!* asked the participants to identify the listening transducer that would least likely cause hearing loss, only 44 percent selected the appropriate answer, while 94 percent answered this appropriately on the post questionnaire. Question number 10 on *Kahoot!* asked the respondents to indicate the undergraduate major that should be selected prior to applying to graduate school for audiology; only 8% selected the appropriate answer on the pretest, while 86% answered this appropriately on the post questionnaire. Question number 11 on *Kahoot!* asked the respondents to indicate another aspect about the study of audiology besides hearing; only 24 percent selected the appropriate answer, while 88 percent answered this appropriately on the post questionnaire. A graphic depiction of the responses to questions 1-11 for *Kahoot!* and the post test is shown in Figure 4.

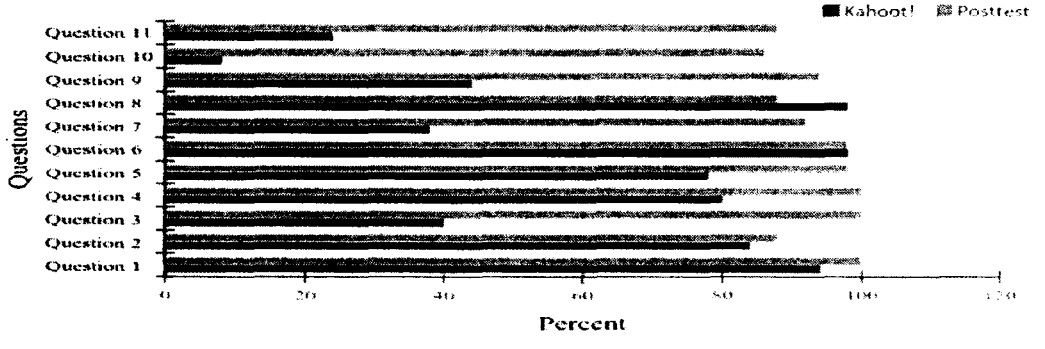


Figure 4. Comparison of Kahoot! and posttest questions.

The primary purpose of this study was to evaluate the effectiveness of gamification among young adults by establishing visibility of the profession of audiology and preventing hearing loss. Fifty students participated in the study, consisting of a pretest questionnaire, game, and posttest. A one sample t-Test was conducted to determine the effect of the interactive-module (*Kahoot!)* regarding audiology awareness and hearing loss prevention. After the study was completed, respondents were asked if they were potentially interested in pursuing audiology, which served as the test variable. The results indicated that the use of *Kahoot!* significantly affected the students' knowledge and interest in the profession of audiology [$t=10.98$, $p<0.05$]. Additionally, another purpose of this study was to encourage students to receive regular audiological services as a means to practice hearing conservation. Furthermore, another one sample t-Test was conducted to determine the effect of the interactive-module on hearing loss prevention and better hearing conservation practices. Respondents were asked if they would comply with the annual hearing evaluations recommendation, which served as the test variable. The results indicated that *Kahoot!* significantly affected students intent to receive a hearing evaluation [$t=2.47$, $p<0.05$].

CHAPTER V

DISCUSSION

According to Windmill & Freeman (2013), there is and will continue to be a demand for audiologists due to more audiologists retiring than they are currently graduating (approximately 400 annually). In fact, it has been noted that approximately 15 years ago, there were 1,000 new audiology graduates per year (1995-1997), up until 2011 when there were approximately only 600 as the Au. D. became the entry level qualification to practice (Windmill & Freeman, 2013). According to the Higher Education Data System (2011), the 2010-2011 Academic Year Communication Sciences and Disorders Aggregate revealed that a total of 3,755 applications were submitted for graduate school admissions in Audiology, from which 1,633 were approved for admissions, indicating that less than 50% (37% total) of applicants are admitted to pursue an Au.D. degree and approximately only 37% (based on the reported 600 Au.D. graduates in 2011) are graduating.

Research has indicated that the profession of audiology is not as widely known as similar professions, such as optometry and podiatry. Furthermore, Donai et al. (2013) sought to determine if measures should be implemented in terms of increasing the awareness of the field of audiology within the population of entering college students'. A modified survey was developed in 2012, which included additional questions regarding the professions of podiatry and optometry. A total of 849 students received the surveys at

a university in Pennsylvania during the new-student orientation sessions in June and July of 2012. It should be mentioned that students who know about the profession of audiology were permitted to complete the survey, unlike Donai's pilot study completed in 2012. The response rate was above 50% (i.e. 71%, n=603). Results of this study indicated that college students were more accurate in describing the profession of optometry and

July of 2012. It should be mentioned that students who know about the profession of audiology were permitted to complete the survey, unlike Donai's pilot study completed in 2012. The response rate was above 50% (i.e. 71%, n=603). Results of this study indicated that college students were more accurate in describing the profession of optometry compared to audiology, but no difference existed between their awareness of podiatry and audiology. However, students with self-reported awareness of the three professions were more accurate in describing the professions of podiatry and optometry as compared to audiology (Donai et al., 2013). To add, it was reported that over the span of 2009 to 2012, college student's knowledge about the profession has increased over time, however, it remained lower than the areas of indicated knowledge compared to the fields of podiatry and optometry (Donai, 2013). Based on these findings, it was concluded that the awareness of audiology as a potential career path is low relative to that of the professions of optometry and podiatry for those with self-reported knowledge (Donai et al., 2013).

There have been reported attempts to recruit more students for audiology. The American Academy of Audiology (AAA) Public Relations Recruitment Subcommittee has identified that participation in state and regional science and career fairs as a key

platform to engage students at a young age and promote awareness of the profession ("Recruiting for the Future of Audiology | Audiology," 2016). To add, the American Speech Hearing Association (ASHA) established a program to expose high school students to both the professions of audiology and speech-language pathology, more specifically to draw more minority interest to the field (ASHA, 2001). Other efforts have also been implemented, such as the use of brochures, informational bookmarks, flyers, and lectures, however none have been proven to be successful. Therefore, due to the increased demand for audiological services for all ages and the increase of hearing loss in young adults, the purpose of this study was to evaluate the effectiveness of gamification among young adults in creating audiology awareness as a potential profession, create awareness about hearing loss by encouraging regular audiological evaluations and the practice of hearing conservation.

Demographics, Classification, and Academic Major

Each of the participants for this study were between the ages of 18-22, where 32% of the respondents identified as a junior, 22% were sophomores, 20% were seniors, and 16% were freshmen. In terms of the overall ethnic makeup of the university, the participants of this study are non-reflective. Specifically, the Caucasian population as a whole at Louisiana Tech University is about 71% compared to the 88% that participated in this study. About thirteen percent of the total population African American compared to the 2% of respondents, and about two percent of the whole student body Hispanic compared to the 8% involved in the study. Since the profession of audiology could be pursued regardless of academic major, the demographics, classification, and academic major were not of importance.

According to institutional research from Louisiana Tech University in 2012, 19% (n=332) degrees were conferred in the area of Applied and Natural Sciences, in comparison to the 32% percent of the participants that have declared majors (*Louisiana Tech University: Some Basic Facts 2008-2012*, n.d.). On the other hand, 10% of the participants selected majors within the College of Liberal Arts, in comparison to the 21% (n=371) graduates in this area at Louisiana Tech. Twenty-two percent of the respondents were within the College of Engineering, in comparison to the 22% (n=393) of graduates in this area at Louisiana Tech. Sixteen percent of the respondents were within the College of Business, in comparison to the 15% (n=266) of graduates in this area at Louisiana Tech. Lastly, 10% of the participants declared majors within the College of Education, compared to the 24% (n=423) of graduates in this area at Louisiana Tech ("Majors & Fields of Study at Louisiana Tech University," 2013). Based on these numbers, it is suggested that the responses from this study partially reflect the general population at Louisiana Tech University. The importance of this data depicts that the majority of the sample for this study was not heavily saturated with participants from one particular major or area of study.

Respondents were asked why they selected their chosen field of study, the majority (62%) indicated their selected field of study because it fits their "interests", 26% indicated that they "love helping people/kids", 8% of the respondents selected their major based off of a "disinterest for working a desk job", "the job market", "indecisive", and "financial gain", while 4% of the respondents did not answer this question. According to Forbes magazine (Morrison, 2015), a study was conducted in the U.K. to identify why students choose their majors. In conjunction with the application process, students are

required to submit a personal statement in 4,000 words about why they are interested in a particular study (Morrison, 2015). In brevity, it has been concluded that the majority of the students selected their field of study due to having "passion" (Morrison, 2015). The relevance of this data reflects that the majority of the participants selected their programs of study due to attraction, passion, or interest; whereas financial gain or the potential job market had little to no influence of their overall choices.

Awareness of the Profession of Audiology in General, and from a University Standpoint

When participants were asked if they have ever heard of the profession of audiology and if they have ever been seen by an audiologist, 68% of the participants indicated that they have, while 32% of the respondents indicated that they have not, these results mimic the responses to the question "Have you ever been seen by an audiologist?", where 68% of the participants indicated that they have, while 32% of the respondents indicated that they have not.

Furthermore, the city of Ruston, Louisiana has about four establishments in which audiological services could be obtained. Of those four, Louisiana Tech University offers a variety of services at no cost to students and staff. Participants were asked if they knew where the closest place was to see an audiologist. Furthermore, 84% percent of the respondents indicated that they did not know where the closest place was to see an audiologist, while only 16% did. The results of this question accurately reflect the small percentage of students and staff who receive audiological services at the Louisiana Tech Speech and Hearing Center (LTSHC) annually, and further strengthens the notion in

regard to the profession of audiology being unknown or acknowledged among young adults.

Louisiana Tech University received approval from the Louisiana Board of Regents to offer the Doctor of Audiology (Au.D.) program and began admitting students in 2004 ("Liberal Arts Department: Doctor of Audiology Program," n.d.). Respondents were asked if they were aware if Louisiana Tech University offered a degree in audiology. The majority (66%) of the respondents were aware, 30% were unaware, and 4% were unsure. In the year of 2016, approximately 20 applicants applied to the Au.D. program at Louisiana Tech; none of which were applicants from Louisiana Tech. Considering that only 20 applications were submitted and that 66% of the participants were aware of the doctor of audiology program at Louisiana Tech University, and none of the applications submitted were from students of Louisiana Tech, suggests that greater efforts must be exercised in order to attract the interests of students to consider the profession at Louisiana Tech University.

Intent to Obtain a Post-baccalaureate Degree

According to the National Center for Education Statistics (2015), 2.9 million students were enrolled in post-baccalaureate programs in 2013. Furthermore, there is a projected increase of 20%, where approximately 3.5 million students will obtain a post-baccalaureate degree between 2013 and 2024 ("Condition of Education - Participation in Education - Postsecondary Enrollment - Post baccalaureate Enrollment - Indicator May (2015)," 2014). Furthermore, respondents were asked if they planned on pursuing a post-baccalaureate degree on the posttest. Sixty-four percent of the respondents reported that they planned to pursue a post-baccalaureate degree, while 36% of the respondents

reported that they did not plan to. Considering that 64% of the participants are considering high level education, it suggests that students are not deterred from the profession due to it requiring more time in school.

Gaming and Information Retention

A study conducted by Silmara Rondon, Fernanda Chiarion Sassi, and Claudia Regina Furquim de Andrade (2013), revealed that game-based learning methods are comparable to traditional learning methods in general and short-term gains; while traditional lectures were more effective in terms of improving students' short-term and long-term knowledge retention. Furthermore, with approximately 90% accuracy rate on the posttest from the present study, it is agreed with this research that game-based learning methods are effective in general and short-term gains.

CHAPTER VI

CONCLUSION AND FUTURE RESEARCH

Conclusion

In summary, the results from this study indicated that the game-based learning model is an effective means to educate students about the profession of audiology and hearing conservation strategies. Collectively, students may be informed about the profession in various modalities (i.e. lecture, posters, games, etc.); however, an entertaining component should be exercised to grasp the attention of participants; as well as the incorporation of a retention measurement (i.e. quiz or posttest).

Future Research

This study was conducted at Louisiana Tech University. Although the results may reflect data obtained from other universities with similar populations or within the same geographic locations, similar surveys should be administered to high school students seeking career paths in schools that vary in ethnicity, size, and geographic locations. Additionally, research examining the knowledge of the profession of audiology among high school and college guidance counselors should be examined. Furthermore, the mode of presentation, amount, and accuracy of the information provided by career or academic advising should be examined, as well as the resources that are used to enlighten students. Future research should also be conducted to examine the effectiveness of current audiology awareness as a profession and hearing conservation activities. Recruiting or

advocacy strategies such as, requiring all entering college students to receive a hearing evaluation prior to beginning school should also be implemented.

APPENDIX A

CONSENT FORM

APPENDIX A

CONSENT FORM

HUMAN SUBJECTS CONSENT FORM

The following is a brief summary of the project in which you are asked to participate. Please read this information before signing the statement below.

TITLE OF PROJECT: The Effect of Gamification on Hearing Loss Prevention and Audiology Awareness among Young Adults

PURPOSE OF STUDY/PROJECT: The purpose of this study is to examine your knowledge of hearing loss prevention and conservation, as well as the profession of Audiology using a digital game-based classroom response system called Kahoot! on your smartphone or tablet.

PROCEDURE: If you agree to participate, you will complete a brief questionnaire concerning your age, gender, academic classification, etc. You are not to provide any identifying information of the questionnaire. During the experiment you will use your smartphone or tablet to complete a sixteen (16) item pretest questionnaire, an eleven (11) item quiz, and finally an eleven (11) item posttest questionnaire. If you are subject for any rate or data charges incurred by your phone service carrier as a result of your participation; Louisiana Tech University is not responsible for any charges.

INSTRUMENTS: You will need a smartphone or tablet to complete the experiment. I will provide all of the necessary instructions to complete the experiment.

RISKS/ALTERNATIVE TREATMENTS: The participant understands that Louisiana Tech is not able to offer financial compensation nor to absorb the costs of medical treatment should you be injured as a result of participating in this research. The following disclosure applies to all participants using online survey tools: This server may collect information and your IP address indirectly and automatically via "cookies".

EXTRA CREDIT: If extra credit is offered to students participating in research, an alternative extra credit that requires a similar investment of time and energy will also be offered to those students who do not choose to volunteer as research subjects.

BENEFITS/COMPENSATION: None.

I, _____, attest with my signature that I have read and understood the following description of the study, *"The Effect of Gamification on Hearing Loss Prevention and Audiology Awareness among Young Adults"*, and its purposes and methods. I understand that my participation in this research is strictly voluntary and my participation or refusal to participate in this study will not affect my relationship with Louisiana Tech University or my grades in any way. Further, I understand that I may withdraw at any time or refuse to answer any questions without penalty. Upon completion of the study, I understand that the results will be freely available to me upon request. I understand that the results of my survey will be confidential, accessible only to the principal investigators, myself, or a legally appointed representative. I have not been requested to waive nor do I waive any of my rights related to participating in this study.

_____ _____

Signature of Participant or Guardian Date

APPENDIX B

RECRUITING FLYER

APPENDIX B

RECRUITING FLYER

RESEARCH SUBJECTS NEEDED!

Subjects: Undergraduate students at LaTech off ALL majors except M.A. in Speech-Language Pathology and Au.D. In Audiology

Requirements: Participants will engage in a 15 minute trivia based game and complete a questionnaire before/after.

Gaming Experience is NOT necessary

Contact:
Shenque I. Lester at (318) 257-4677
Or shenquelester@gmail.com
For Additional

APPENDIX C

PRETEST

APPENDIX C

PRETEST

Player #: _____

Directions:

1. Insert your assigned "Player #" above.
2. Please wait quietly for further instructions.

Age? _____
Gender? Male or Female
Ethnicity? _____
What is your classification? _____
Have you declared a major yet? Yes or No
What is your major? Skip if undeclared. _____
What made you select this major? _____.
Have you ever heard of the profession of audiology? Yes or No
Have/were you ever seen by an audiologist? Yes or No
Do you know where the closest place you could go to see an audiologist? Yes or No
Does LaTech offer a degree in audiology? Yes or No
Do you plan on pursuing a graduate degree after your undergraduate education? Yes or No
If your answer was "No" to number 12, why not?

_____
.

What do you anticipate your starting salary to be upon graduation?

_____.

How many years total are you willing to spend in college?

_____

On a scale of 1-10 how stressful do you think your future profession will be compared to others?

2 3 4 5 6 7 8 9 10

Please wait quietly for additional instructions upon the completion of the pre-questionnaire.
[See examiner for questions]

APPENDIX D

GAME QUESTIONS

APPENDIX D

GAME QUESTIONS

1. Audiology is the study of what?
   a. Music
   b. Plants
   c. Hearing
   d. Audio/Stereo
2. What is an audiologist?
   a. A person who works on the radio
   b. A person who assesses ears
   c. An engineer
   d. A person who designs headphones
3. What type of degree is required to be an audiologist?
   a. High school diploma
   b. Bachelors
   c. Masters
   d. Doctorate
4. Audiologists primarily evaluate or assess which anatomical part?
   a. Eyes
   b. Tongue
   c. Brain
   d. None of these
5. How much do students and staff have to pay to receive audiological services at the Louisiana Tech Speech and Hearing Center?
   a. Small 5 dollar co-pay
   b. 15 dollar co-pay

c. Depends on the insurance

d. Nothing

6. Only old people are at risk of having hearing loss in today's society?
   a. Yes
   b. No
   c. Not sure
7. How often should you have your hearing evaluated?
   a. Every 1 year
   b. Every other year
   c. Every 3 years
   d. Not sure
8. What could cause hearing loss in the population of young adults?
   a. Concerts
   b. Shooting guns
   c. Personal Listening Devices (Phones, IPods, etc.)
9. Which type of listening device is better in terms of hearing conservation?
   a. Basic Headphones
   b. Basic Ear buds
   c. Does not matter
10. Which major is required prior to going to graduate school for audiology?
    a. Music
    b. Speech/Communication
    c. Biology
    d. Does not matter
11. Audiologists study hearing and what?
    a. Temporal Cues
    b. Frequency
    c. Balance
    d. None of these

APPENDIX E

POSTTEST

APPENDIX E

POSTTEST

Directions:

1. Insert your assigned "Player # above
2. Please wait quietly for further instructions

An audiologist studies: _____
Where on campus can you have your hearing evaluated?
_____
Do you feel like there is more risk for hearing loss in today's society?[Yes] [No] [Unsure]
Should your hearing should be tested every 1-2 years. [Yes] [No] [Unsure]
I will have or try to have my hearing evaluated every 1-2 years or whenever I notice a difference. [Yes] [No] [Unsure]
Audiologists primarily does this: _____
An Audiology doctorate requires ____ years of graduate school.
As a student, a hearing evaluation would cost you $ _____.
To protect my hearing, it is important to follow the manufacturer's instruction when using personal hearing devices. [Yes] [No] [Unsure]
I am interested in audiology. [Yes] [No] [Unsure]
I know that the one dollar ear plugs/ protectors could go a long way in terms of protecting my hearing at football games, basketball games, concerts, hunting, etc. [Yes] [No] [Unsure]
What undergraduate major/ degree must you obtain to be considered for the Au.D. program? _____

APPENDIX F

PROCEDURES

APPENDIX F

PROCEDURES

Procedures

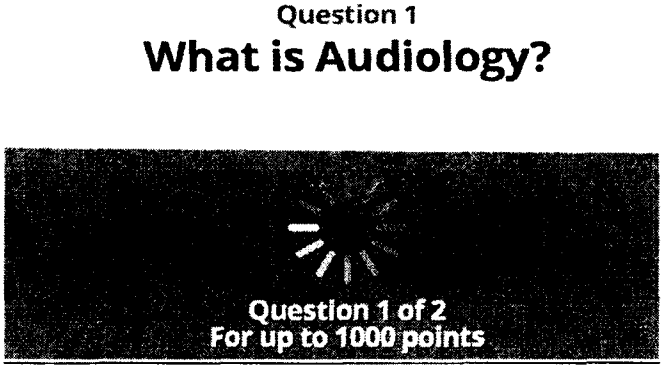
1. Each subject would be asked to complete the pretest questionnaire (see appendix C) before they are permitted to go on to the next step in the study.
2. Now, subjects will be instructed to follow the link found at the bottom of their pretest questionnaire as "Step #2" https://kahoot.it/#/.
3. Upon completion of the entire pretest questionnaire, subjects will be provided an access code/game pin which consists of six digits (which would also be found at the bottom of the pretest questionnaire). The game pin is me accurate in order to participate.
4. Subjects are then instructed to enter the six digit game pin in the provided area that says "Game pin" and then press enter.

5. After the game pin has been entered the following screen would appear and the subject will be provided with an area to enter their name or nickname. For this study, subjects will be instructed to enter their initials and the session number (which will be provided). Once the subject has entered their initials and session number, they will be permitted to join the game.

6. After steps 4 and 5 have been completed, the subject would see a screen indicating that they have entered the correct game pin. From there, the subject should see their name (initials and session number) appear on the screen at the front of the room.

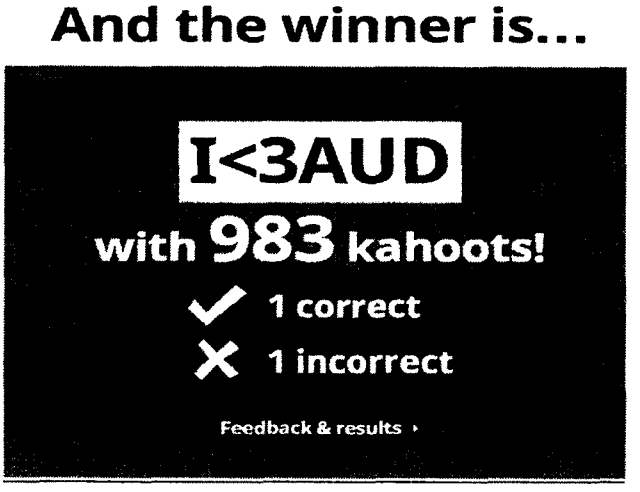
7. Once every subject has identified their name on the screen at the front of the room, the examiner may select "start now".

8. Once the examiner has selected the "start now" button, the first question to the game should appear on the screen.

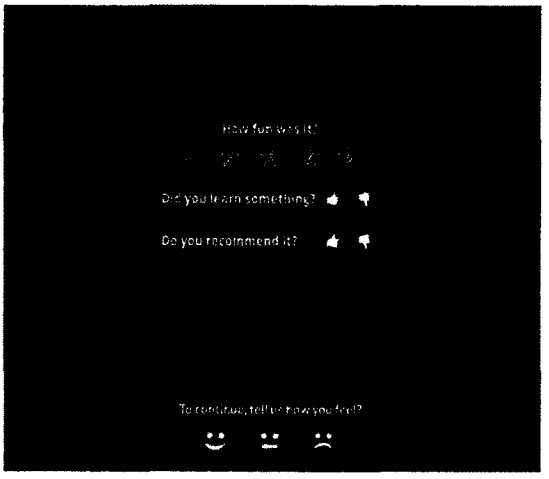


9. Once the subject selects their answer a scoreboard should appear on the screen at the front. All subjects identifying info (initials and session number) should appear on the screen. From there, the examiner may select "next" to proceed to the next question.

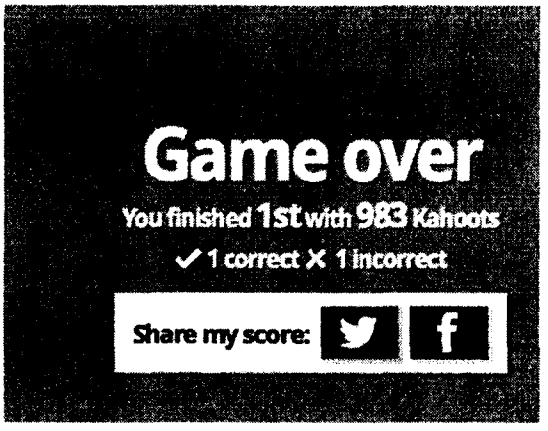
10. Upon completion of the game the winner will be displayed depicting the amount of questions correct and incorrect.



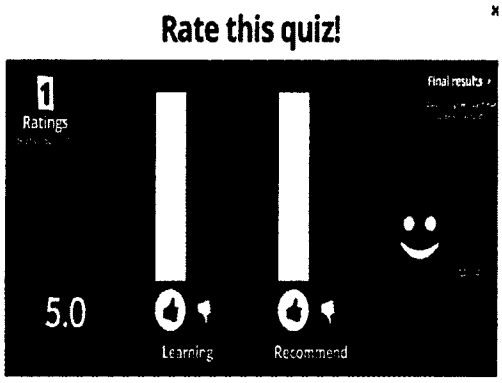
11. Subjects would be able to rate the quiz and how they felt about their overall experience.



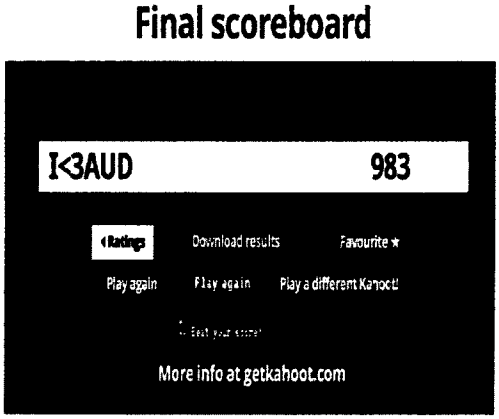
12. The "Game over" screen below would appear on the subject's device, the ordering of placing will apply accordingly for each subject. As you can see, each subject also has the option to share their score on either Facebook or Twitter.



13. The screen below depicts the results in which the subjects rated their overall game experience.



14. In the screen below depicts the way the final scoreboard will appear. In this screen the examiner may download the results as an Excel or Google drive document for further analyzing.



15. After the game has been completed and every subject answered all questions, the examiner will then proceed to the final step, which is the completion of the posttest.

16. The post questionnaire should be completed entirely. The use of cellphones or talking/consulting others will be prohibited, as this step is the key determinant in whether the game-based learning objective was successful.

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