Click.Pic.Communicate.

by

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Submitted to
the Faculty of the School of Information Technology
in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science
in Information Technology

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April 2019

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ABSTRACT

The use of a free, web-based tool for speech pathologists has economic and environmental benefits, yet few currently exist. Speech language pathologists often have limited budgets to buy supplies. Sticker books, flash-cards, and “fill in the blank” booklets are the primary items used by professionals. These tools break down, with some even being one-use. The result is that teachers often spend their own time and money creating their own solutions. Our team decided to create a web-based application that mimics the exercises in already existing paper products. Such applications do exist, but the quality apps cost around $70.00 per year. Our project, Click.Pic.Communicate will be free. It will alleviate economic burdens on teachers and speech pathologists while also reducing the waste of paper product.

INTRODUCTION

Problem

Speech language pathologists (SLPs) help children with speech and language disorders. They often rely on sticker books and physical media to aid in their therapy. The issue with using physical items is two-fold: they are often one-use, and the use of paper has an environmental impact. The cost of constantly replacing supplies adds an unneeded burden on speech language pathologists, that often have a low or non-existent budget.

Solution

Our solution is to create a web-based application that allows speech language pathologists to teach children. The app will have users to log in and track their progress. Also, the user profiles will allow the users to log in from any computer with internet access. There will be different user roles. For instance, the therapists will have an admin role which allows them to see their clients progress, create new users, and update information. This app will reduce waste and lower the financial burden on SLPs, all while creating a more client-specific experience.

Project Goals

The objective of Click.Pic.Communicate. is to create an application that will help alleviate the financial burden on SLPs while reducing the environmental impact of paper-based, educational tools. Our scope is to target children, ages 3-5, who have language disorders. We will not be addressing speech disorders (impediments, lisps, etc.).

There will be multiple exercises for both expressive and receptive language disorders, varying by three levels of difficulty. The goal is to create a working, open-source prototype that can be built upon after graduation.

Overview

The discussion section of this report outlines in detail how the project was completed. It includes the following sections: project concept, design objectives, methodology, user profile, case diagram, Gantt chart, and problems encountered. Following the discussion section is our conclusion. This report details the lessons learned, skills developed, and plans for the Spring semester.

DISCUSSION

Project Concept

Abby Pace's sister is a speech language pathologist named Anne. Anne was discussing with Abby about how frustrating it is that she constantly feels like she is running out of materials when assisting clients. Anne was going out constantly to buy flash cards, markers, and sticker books. This gave Abby the idea that we could look at this problem as something we could solve for our senior project. There was one issue, no one in our group has a background in speech-language disorders. We had to research types of disorders to determine the what was in our capabilities and could be solved by an application.

We learned that speech and language are two different things. On its Web site, the American Speech-Language-Hearing Association defines speech as "how we say sounds and words," and language as "the words we use and how we use them to share ideas and get what we want." From talking with Anne, we knew that fixing speech issues such as lisps, stutters, and other disorders was out of our ability. This led us to focusing on language.

Language disorders can be broken down into two categories, receptive language disorders and expressive language disorders. Receptive disorders are where an individual have difficulty understanding the ideas that others are saying. Expressive disorders involve difficulty expressing one's own ideas. We asked Anne the best solution to addressing language disorders. She told us that it is best to start young, use pictures, communicate often, and practice. She said that she uses pictures and books to instill concepts to children like clothing, body parts, animals, buildings, etc. With that, we had

our scope, and new what types of exercises to create. We would target children, ages 3 through 5, who need to improve their receptive and expressive language skills. Click.Pic.Communicate. was born.

Design Objectives

The primary objective of our project was to create the foundation of an application to help SLPs. We wanted to complete three goals well, in the hopes that others would build upon our design. The first was to incorporate both expressive and receptive language exercises. We knew that we wanted to have varying degrees of difficulty as well. However, one thing we did not have time to complete was giving the user the ability to pick a specific type of expressive or receptive exercise. For instance, a specific receptive exercise could be "Simon says." Click.Pic.Communicate. just allows the user to pick between the two types of language disorders, not specific exercises.

The next goal was to make the user interface (UI) appealing to children. We accomplished this by using animals, bright colors, and big fonts. The animals act as "mascots" in our application. They have speech bubbles that read off the questions and congratulate the user when they get a question right.

The third goal was to create a system that allows SLPs to create user profiles for their clients. These profiles track progress and see where they left off. A goal for those that want to build on our application would be to incorporate an achievement system. For instance, there could be a reward for completing several tasks where the user unlocks a new mascot.

We wanted to incorporate more audio into our application, but there are two problems with that. The first is quality of audio. When dealing with children that have

speech-language disorders, you must ensure that you pronounce everything clearly and accurately. We did not have the funds to secure a microphone good enough to accomplish this. The second issue is copyright. Our group was able to find free audio files for objects such as plane, dog, house, etc. If we had more time and money, we would have the questions be read out to the user.

Methodology

Syed Ovais Amin is the only member of the group with extensive development skills. He was in charge of the programming the foundation of Click.Pic.Communicate. It was not until the Spring 2019 semester that Abby and Kevin helped with the coding. In the Fall 2018 semester, Abby oversaw research, while Kevin focused on the project management elements. Everyone participated in designing decisions. The cycle of development was as follows:

Planning

Every member of the group came together to discuss potential ideas for a project. Abby told the group about the issues her sister had with paper-based teaching tools. The group decided that a Web-based application could alleviate Anne's problems.

Research

Ovais and Kevin researched speech and language disorders, while Abby researched into the personal needs of speech-language pathologists and their clients. From the research, it was determined that an application that targeted children with language disorders, aged 3-5 would be the best fit.

Design, Build, Convene, Repeat

Storyboards were used to express ideas among the group. Abby and Kevin would determine the needs of the user and design a storyboard to show how the application should flow. Ovais would then build the section of the Click.Pic.Communicate. that was discussed. The group would convene the next week to review the progress of the software. Ideas would be discussed, leading to revisions or the group continuing the design of another section of the application. By the end of the Fall 2018 semester, the group had a usable base for the software that included a working menu UI, one example of each type of exercise, and user login functionality. Figures 1-4 are examples of what Click.Pic.Communicate. looked like after this design phase.

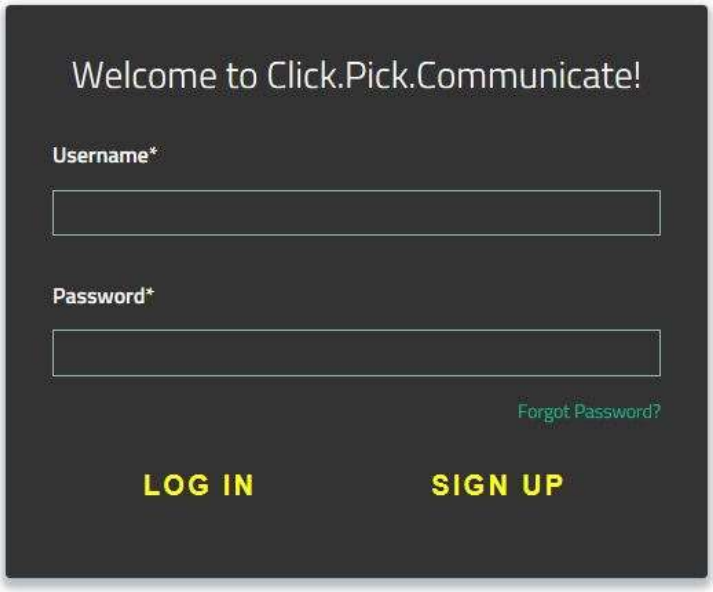

Figure 1: Login Screen

Figure 2: Select Difficulty Screen

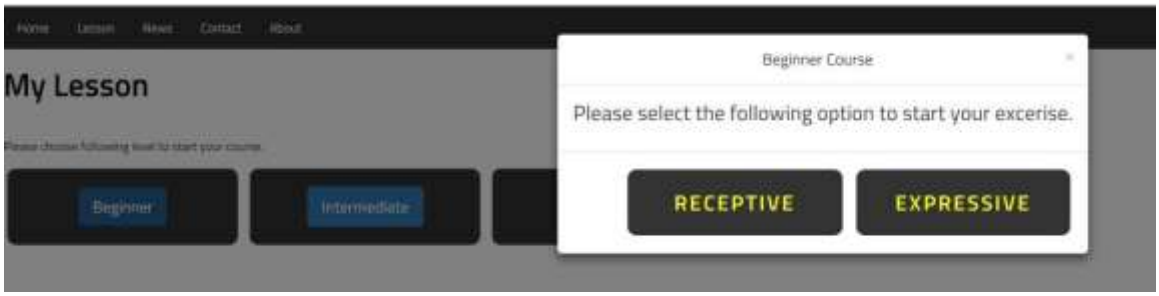

Figure 3: Select Exercise Type Screen

Figure 4: Exercise Example

Testing

With the prototype complete, Abby took Click.Pic.Communicate to her sister. Her sister went through the application, as well as showed it to some of her kids. While Anne was using the app, Kevin and Abby tried to break it by entering unexpected inputs and

testing with different browsers. The group compiled the suggestions from Anne and the results of break testing and moved onto redesign.

Redesign

At the start of the Spring 2019 semester, Ovais fixed the bugs found by Abby and Kevin. The group discussed the suggestions that Anne made. They drew up storyboards for what the completed design would look like. Ovais implemented the new design and Click.Pic.Communicate. had a fleshed-out UI, but it still only had one example of each exercise.

Cut and Paste Coding

Almost all of the work on Click.Pic.Communicate. had been completed. The final step was to take the code of existing exercises, cut out the images and phrases, and insert new ones. This creates multiple exercises of the same type, with different answers.

Technical Information

Click.Pic.Communicate was programmed in JavaScript and VisualBasic. The database used to store user information is run on SQL Server Management Studio (SSMS). The application was tested in Google Chrome, Mozilla Firefox, and Microsoft Internet Explorer.

User Profile

Figure 5: User Profile, illustrates the user profile of Click.Pic.Communicate. This profile shows the attributes of our targeted user, allowing our group to design our application to meet their specific needs.

USER PROFILE

Application:

Click.Pic.Communicate.

Potential Users:

- Kids ages 3 to 5 with receptive and expressive language disorders.
- Speech-language pathologist working with their kids to improve their language skills.
- Parents working with their children to help improve their receptive and expressive language skills.

Software, Interface, and Related experience:

- Users should have basic experience with desktop and mobile devices, as well as Web browsers.
- Children will be assisted by their speech-language pathologist.

Experience with Similar applications:

- Articulation Station
- ArtikPix
- Articulation Games
- Speech with Milo: Prepositions
- Describe It
- Word Vault
- Speech Tutor

Task Experience:

- For first time users, there will be an initial account set up by the speech-language pathologist, so they are able to easily track their kids progress over time. After initial set up the SLP will be able to select which type of exercise they will be working with at that time. This will then give them an option to select a level of difficulty. Each activity will provide direction as to what the task is, with the guidance of a SLP or a parent the child will be able to complete the activities.

Frequency of Use:

- This application is intended to be used every day by the speech-language pathologist in their sessions with their patients.
- The application can also be used at home with the assistance and guidance of a parent.

Key Project Design Requirements that the profile suggests:

- Simple, kid friendly interactive interface
- Visually appealing to children ages 3-5
- Self-explanatory learning activities
- Engaging activities

Figure 5: User Profile

Case Diagram

Figure 6: Case diagram, shows the basic flow of interaction that a user will have with Click.Pic.Communicate.

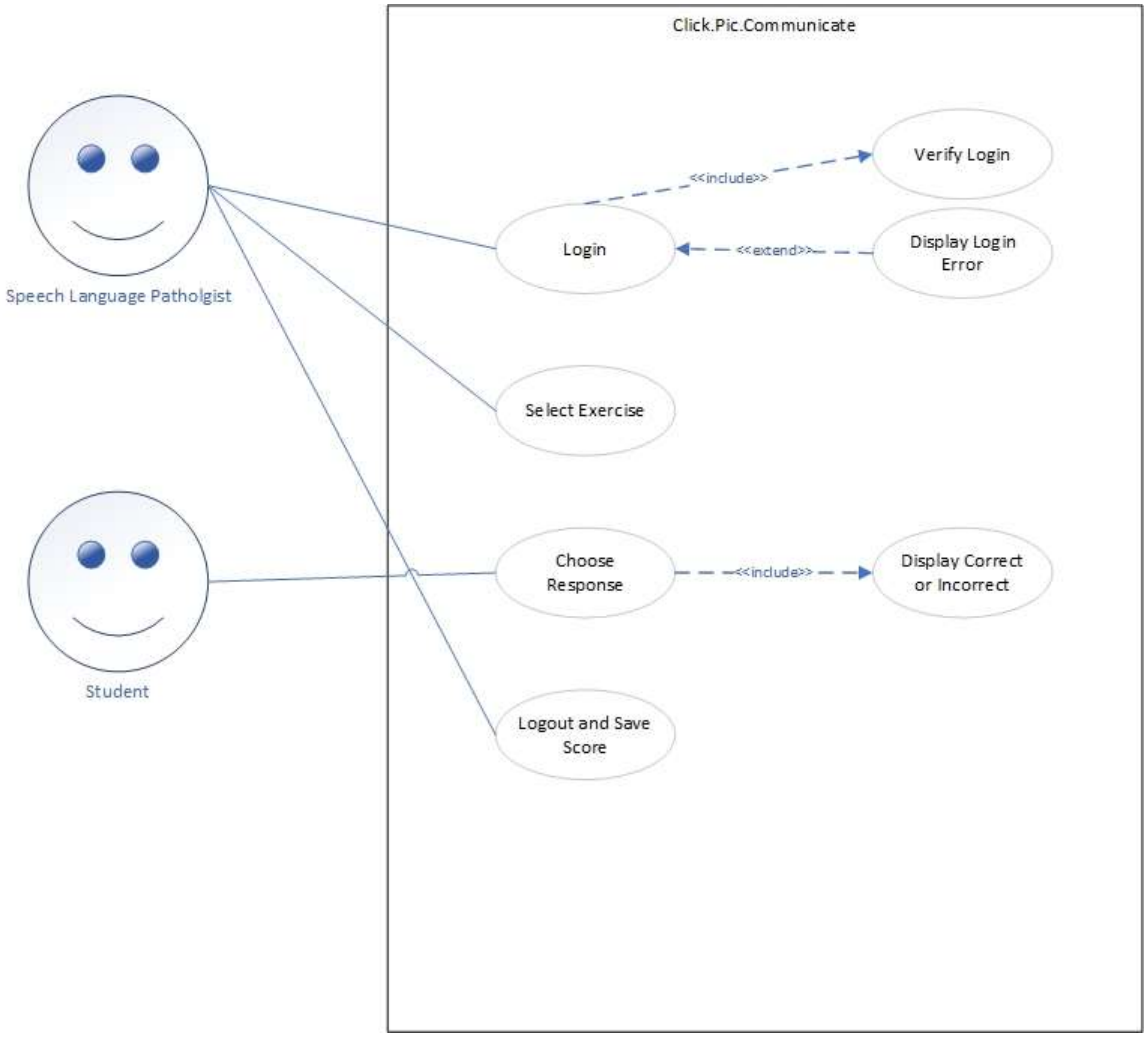

Figure 6: Case Diagram

Technical Architecture

Figure 7 illustrates the technologies used to create our web application.

Figure 7: Technical Architecture

Technical Discussion

From a technical standpoint our application is simple. There is no network technology, as the webpage and databases are hosted on the terminal. A future recommendation for a real-world implementation, would be to host the website and database online.

Front End

The website was designed using HTML 5 and CSS3. The coding for an interactive website was done using JavaScript. To help with the design elements, Bootstrap was used.

Back End

Visual Basic was used to interface with a Microsoft SQL Server database.

Testing

The following three sections are our testing phase broken down into the methodology and approach, the testing plan, and the testing results.

Methodology and Approach

The objective of testing was to determine the usability of Click.Pic.Communicate. by our target audience (kids aged 3-5) with the assistance of a speech language pathologist. We also were looking for any flaws or bugs in the program. The application was tested by Anne and her students. Abby observed the use of the application and recorded the results of each testing criteria (pass/fall).

Entry Criteria:

- Test build completed
- Test criteria completed
- Speech Language Pathologist (Anne) has been briefed on functionality

Exit Criteria:

- All test criteria completed
- All bugs/errors fixed and retested

Test Plan

The following areas of the application were tested:

- Profile – The creation of a user profile, accurate test scores recored, and authentication of user passwords

- Activities – Accurate information displayed when clicking the correct or incorrect response, sound working, and score tracking
- UI – Navigation throughout the site with no assistance and adaptive website sizing
- General Satisfaction – Activities were age appropriate, look and feel of site, and accurate activities for each section (expressive vs receptive).

Test Results

	Task Category	Task	Expected Outcome	Actual Outcome	Pass/Fail
2	Profile	Create user profile via the sign up button.	A profile is created in the database.	Profile was created.	Pass
3	Profile	Login with created profile.	User is able to login.	User was able to log in.	Pass
4	Profile	Type the wrong password for a created profile.	User will not be able to login.	User was unable to login.	Pass
5	UI	Navigate to the activities section of the site.	User will click activities and be taken to that section.	User was taken to the appropriate section.	Pass
6	UI	Select an activity difficulty.	User will click on the difficulty and be asked to chose the activity type.	User was taken to the select activity type section.	Pass
7	UI	Change the screen size of the browser.	The site will adaptively change size of objects depending on screen size.	Some object were weirdly placed during size change.	Fail
8	Activity	Click generate word.	A word will be generated.	A word was generated.	Pass
9	Activity	Select the picture of generated word.	A "correct, good job" message will appear and score will increase.	Message appeared and scored increased.	Pass
10	Activity	Generate another word and select the wrong picture.	A "incorrect" message will appear and incorrect score incremented.	Message appeared and incorrect response was incremented.	Pass
11	Profile	Check to see if scores are accurate in profile section.	Scores are correct.	Scores were correct.	Pass
12	UI	Navigate to the activities section and select a new activity.	User is able to select a new activity.	User was able to select a new activity.	Pass
13	Activity	Rearrange the words of the activity to match what is happening in the picture.	User correctly rearranges the words and score is increased.	User correctly completed the activity and score was increased.	Pass
14	Activity	Rearrange the words incorrectly.	User incorrectly rearranges the words and incorrect score is incremented.	User incorrectly rearranged the words and incorrect score was incremented.	Pass
15	General Satisfaction	Is the user interface easy and intuitive to navigate?	User should reply "yes."	User replied "yes."	Pass
16	General Satisfaction	Were the activities age appropriate?	User should reply "yes."	User replied "yes."	Pass
17	General Satisfaction	Are the activities accurately labeled as "receptive" or "expressive"?	User should reply "yes."	User replied "yes."	Pass

Figure 8: Testing Results

Figure 8 shows the testing results. The only failed test was the adaptability of the web application when the browser size was adjusted. This was fixed to an extent, but we determined that it would take a lot of recoding of objects to get the application to work on smaller screens.

Budget

Figure 9 represents the budget that this project would cost if developed in the real world. We assumed a pay of $30 an hour.

1	Item	Cost Per Unit	Units	Item Total
2	Labor (In Hours)	$30.00	$128.00	$3,840.00
3	Web Hosting (Per Month)	$10.00	$12.00	$120.00
4	Total			$3,960.00

Figure 9: Budget

Gantt Chart and Activity Breakdown

Figure 7: Fall 2018 Gantt Chart and Figure 8: Spring 2019 Gantt Chart display the schedule for this project. Figure 9: Activity Breakdown shows the division of necessary activities, organized by their location in the design process.

Figure 10: Fall 2018 Gantt Chart

Figure 11: Spring 2019 Gantt Chart

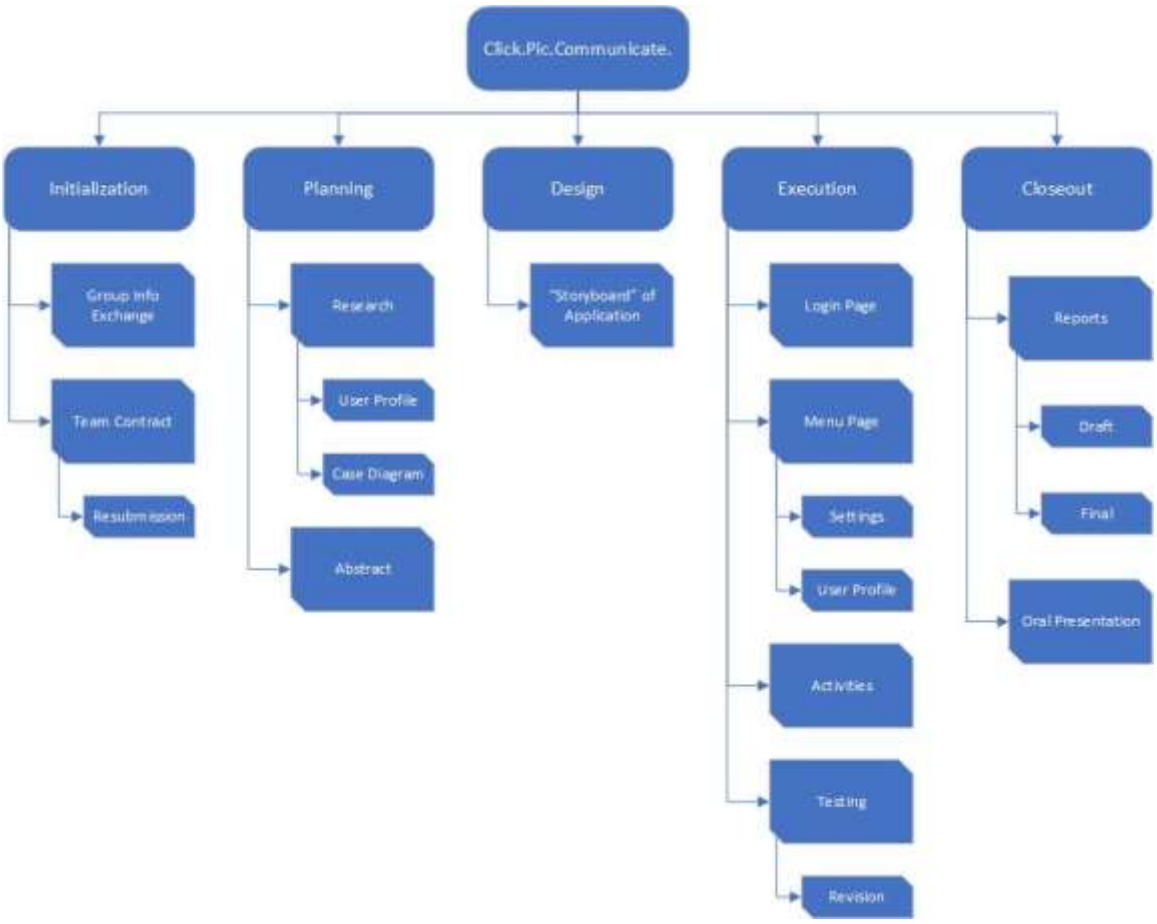

Figure 12: Activity Breakdown

Problems Encountered

There were two issues that occurred during the development of Click.Pic.Communicate.

Problem 1

Ovais was the only developer during the beginning of this project. Initially Click.Pic.Communicate was going to allow a user's profile to be stored in a cloud service, so that their data could be synced across multiple devices. This proved to be too much of a workload, so the group narrowed their scope and determined that the profile would just be saved locally.

Problem 2

In the Spring Semester our team encountered a problem with setting up testing. Anne was very busy (though excited to try out the application), and we had to wait for a good time for all the schedules to sync up.

Future Recommendations for Improvement

Click.Pic.Communicate. is a great stand-alone web application, however we were unable to get the web-hosting to work on time. If this were to be developed further that would be the first thing we would work on. Another item would be the adaptability of the website. Currently if the screen gets to small, the application does not look correct. This would take a complete code overhaul to fix.

CONCLUSION

Fall Semester 2018

Creating an application with a team of developers has its own challenges but trying to create one with only one developer and two cyber-security students took an immense amount of communication, time, and discipline. The team learned that meeting regularly was paramount to the success of Click.Pic.Communicate. Even though the scope narrowed throughout the semester, the team learned that they could still create something that could one day help a lot of people.

Many skills were picked up during the completion of this project. Ovais learned more about databases for user information, Kevin learned how to effectively manage a project and get more organized, and Abby now knows how to translate design ideas into coding elements.

For the Spring semester the team will focus on polishing Click.Pic.Communicate. Testing will be interesting, because they will finally get to see how kids react to their product. They hope to end the Spring semester strong and be able to stand confidently at IT expo with an exceptional application.

Spring Semester 2019

Spring Semester was a busy time for the group. We all were getting ready to graduate, preparing for the IT Expo, and trying to finish strong in our other classes. This lead everyone in the group to further develop their time management skills, as well as stress management. We communicated with Professor Scott when we felt like we were getting in the weeds, and he talked us down and gave some great advice.

Tech Expo was a great experience. Abby can be soft spoken, but having to speak repeatedly about the work we did all semester gave her a lot of practice. By the time the judges got to the table, we all were confident in our abilities to discuss our project.

REFERENCES

American Speech-Language-Hearing Association. “What Is Speech? What Is Language?” Accessed September 3, 2018. https://www.asha.org/public/speech/development/language_speech.htm.

APPENDIX

Acronyms and Abbreviations

App	Application
SLP(s)	Speech Language Pathologist(s)
SSMS	SQL Server Management Studio
UI	User Interface

Tech Expo Poster