Assistive Technology Options for Students with Cerebral Palsy

What is cerebral palsy?

Cerebral Palsy is a long term impairment that is caused by a brain injury usually very early on in the child's developmental stages. While each case of cerebral palsy is unique, the disability affects a person physically and oftentimes will impair the person's movement in some way. The physical aspect of this impairment limits the person's mobility and sometimes "they experience difficulty with muscle coordination, muscle control, muscle tone, reflexes, balance or posture. They may have difficulty with fine or gross motor skills. Their facial muscles may be affected" (Stern 2016). This range of physical factors greatly affects the persons' with disabilities everyday life and because of the limits this impairment creates it can also be considered a disability (Stern 2016).

The signs and symptoms of cerebral palsy are challenging to identify because cerebral palsy happens in the brain and it isn't something that can be readily seen at birth and in most cases will take several years before they become apparent. With this being said, there are some early indicators of cerebral palsy and the biggest indicator is developmental delay. Developmental delays are "delays in reaching key growth milestones, such as rolling over, sitting, crawling and walking are cause for concern. Practitioners will also look for signs such as abnormal muscle tone, unusual posture, persistent infant reflexes, and early development of hand preference" (Stern 2016).

Due to cerebral palsy being an impairment of the brain, it disables people to the point that it is complicates their freedoms to live their lives independently. Tasks that the average person may find simple are now complex or impossible to carry out for those with cerebral palsy unless they have certain technologies to aide them in these tasks. These aides can be referred to as assistive technology or a technology that is given to persons with disabilities to make their lives easier. What is unique about cerebral palsy is the varying degrees of severity of this disability. Therefore, the assistive technologies in which one student with cerebral palsy need may differ

greatly from another student's assistive technologies. These technologies give people the freedom they need to live their lives independently and efficiently. There are many different degrees of assistive technology. There are high and low tech devices as well as hardware and software solutions to help aide people with disabilities.

High-tech assistive devices:

The implementation of high tech assistive devices/solutions used to educate students diagnosed with cerebral palsy. In order to accurately address this issue, I am examining cerebral palsy from a multiple disability aspect, which is defined under the Encyclopedia of Education. These personnel are identified as those with severe disabilities which are defined in the aforementioned text as, "individuals of all ages who require extensive ongoing support in more than one major life activity in order to participate in integrated community settings and to enjoy a quality of life that is available to citizens with fewer or no disabilities" (TASH,P.19). Often students with cerebral palsy have difficulty communicating and this difficulty often coincides with one's cognitive and sensory abilities. The Encyclopedia of Education further indicates that having multiple disabilities may have a significant impact on learning. The learning is then impacted from an additional environment (telling/instruction) to an environment which is best suited by using interactional methodologies to facilitate learning.

Educational methodologies for students with severe disabilities are controversial, but the methods supported by this author are inclusion classrooms, application of technology therapy for speech and language application, the use of fellow students as community/classroom members, and applying instruction which applies cognitive interaction through the use of technology with typical students in a normal classroom setting.

1. Since the best type of education environment is an inclusion classroom in a normal social setting, the student with cerebral palsy must be capable of movement in a social environment. Therefore the introduction and application of ***Brain Computer Interfaces*** to facilitate muscular movement to overcome paralyzed muscles, which can then allow the brain to

communicate and control movement regardless of physical limitations. Some examples of this technology and its application may be a wheelchair control through augmented communication application and control technology. A signal is obtained through the brain by electrodes, translated into a control signal which is applied to an external device (wheelchairs, exoskeletons, or a neuroprosthesis). This is accomplished by the technology being able to read and apply the control signals into a series of steps. It is also important to consider the application of a ***Hybrid Brain Computer Interfaces (BCI)***. Hybrid BCI's utilize various types of BCI technologies and other non-evasive, evasive and different electrophysiological signals/methods to enhance student movement and cognitive application to improve learning and their overall quality of life (Wolpaw, Neils, McFarland, Pfurtscheller and Vaughan, 113: 767-791, 2002). An example may be the utilizing a gyroscope attached to the head to facilitate movement of a wheel chair.

2. The next type of assistive technology (AT) I would like to discuss is information and communication technologies (ICT). The specific ICT I am discussing is a ***User Centered Design (UCD)***, which is used in conjunction with identified and designed learning objectives created by educators associated with a student with cerebral palsy. It is important that the student is observed and their learning objectives are understood by the personnel implementing the UCD. The tasks required for the student to follow are measured, codified, and implemented into UCD keyboard which facilitates learning. During the implementation process software which coincides with the UCD is adjusted to maximize student learning potential. The software developed is comprised of Microsoft powerpoint, photoshop, Microsoft word and Corel Draw. The software applications are combined and tailored to the individual student to coincide with the students learning objectives. These software applications are applied to design illustrations, and literacy language writings (Preece, 2005). The structure of the written language is broken down into various stages consisting of letters, sounds and the application of phonemes which share relationships relative to learning objectives presented (Teberosky, 2003).

3. The final high tech method of technology is called an IPAD-based alternative communication device, through the application of alternative and augmentative communication

(ACC). This device promotes language through the use of an Apple IPAD using the software called "Go Talk Now." It is important that the teacher, student, parents, and educational assistant familiarize themselves with this technology to facilitate maximum use. This is a high tech communication device and application for students suffering from severe language disabilities. A child can send and receive message, examine and interpret pictures, and utilize individual sounds to gain access to hundreds of different messages used for communication (American Speech Language Hearing Association, 2004). (American Speech-Language Hearing Association, 2004, Roles and responsibilities of speech-language pathologists with respect to augmentative and alternative communicative technical report (ASHA Leader, 24(9)(2004),p.8).

Low-tech assistive devices:

Low tech assistive technology is said to be a simpler and less expensive solution to aiding those with disabilities. These technologies could include simple devices or equipment that is made up of simple features that don't require training to operate (Stern, 2016). Some examples of low tech assistive devices that have been found most useful for those with cerebral palsy are reachers/grabbers, specialized pen or grips, and multi-level bathroom hand grips all of which are low in price and don't require special training to use. The importance of these technologies is that they all have a common goal in mind, which is to help ensure the independence and freedoms of the persons with disabilities. Researching for deals on these low tech devices is the most efficient way to find high quality products at low costs. One great site that offers low tech devices is http://www.maddak.com/advanced_search_result.php?keywords=Cerebral Palsy. This particular site offers varying devices all at low prices and all devices come with at least a one year warranty. There are three specific low tech devices researched from this site and each are explained in greater detail below:

1. Multi-level hand grip

This low tech equipment can be installed in bathrooms to provide support for individuals who need support getting on and off the toilet. These plastic grips ensure the maximum safety and

independence with their grooved inner surface which provides a non-slip grip and can be installed at different levels to support three different height ranges. This product comes in three sizes and is a total value of $23.30 with a 12 year warranty. This is a small price to pay to give someone the opportunity to go to the bathroom on their own and establish a sense of self-sufficiency (Maddak 2016).

2. Raptor Reacher

This low tech equipment comes with a one year warranty at a low price of $12.15. It has multiple uses from picking up items as small as coins to as large as paper, clothing, and cans. The reachers can be used as a grabber to pick items up or it can also be used as an aide in dressing and undressing. This multi-use tool is well worth the price and can give someone the independence to reach their own papers, or drinks, or even helping them with getting dressed or undressed (Maddak 2016).

3. Steady Write writing instrument

This low tech writing instrument has a unique triangular shape which improves handwriting by providing a wide triangular base that functions as a tool in which steadies the hand and allows one to write smoothly. This tool is $8.80 and requires refills that are $4.60 but this is such a small price to pay to give someone who has trouble with writing the freedom to write on their own. This tool will establish confidence and ensure independence in one's self and one's abilities as a person and as a writer (Maddak 2016).

<u>Hardware available for cerebral palsy:</u>

Computers are a great way to help those with cerebral palsy communicate. People who have cerebral palsy oftentimes have trouble with fine motor skills and muscle control. It is hard for those with cerebral palsy to write with a pen/pencil to paper without specialized writing utensils, and even then it may be impossible to read this writing. Luckily, computers have made "writing" easier by allowing those with cerebral palsy to communicate their ideas through typing on a keyboard. Typing allows a much more readable version of what is trying to be communicated. The problem with standard keyboards however is that they all come with a standard set up that is very hard for those with cerebral palsy to utilize. Luckily there is hardware options that have been developed that can provide those with cerebral palsy a keyboard that is more tailored to their typing needs. Examples of these hardware solutions are

1. Mouse Keys: This option allows one to use their numeric keys as a mouse, thus eliminating the use of the computer mouse. This is very beneficial to those with cerebral palsy especially because they have difficulties when it comes to writing. By eliminating the mouse, the numeric keyboard mouse option requires less fine motor and muscle control. One must only tap the key to move the mouse instead of holding and dragging the actual mouse which requires a great deal of muscle control and coordination. The Mouse Keys feature will give those with cerebral palsy the freedom to communicate in an efficient way. This hardware feature is completely free and can be done on both MAC and PC computers.

For complete instructions:
http://windows.microsoft.com/en-US/windows7/Use-Mouse-Keys-to-move-the-mouse-pointer

2. Sticky Keys: This particular hardware change is designed for those who have trouble with holding down multiple keys at once. According to Microsoft, "When a shortcut requires a key combination such as CTRL + P, the Stickykeys will enable you to press a modifier key (CTRL, ALT, or SHIFT), or the Windows logo key, and have it remain active until another key is pressed" (Microsoft 2016). This is helpful to those with cerebral palsy because it makes it easier for them to type. This hardware solution cuts out the need to hold down multiple keys simultaneously and requires less muscle and hand coordination. This hardware feature is completely free and can be done on both MAC and PC computers. Again, the Microsoft hardware solutions are completely free and come with complete instructions on how to set up these special keyboard modifications and how they work specifically.

For complete instructions:
https://www.microsoft.com/resources/documentation/windows/xp/all/proddocs/en-us/access_stickykeys_settings.mspx?mfr=true

3. Filter Keys: This hardware solution allows one to change the keyboard so that the keyboard will ignore continuous or repeated keystrokes that may be made by the user. This option can also be set up to control the rate that the key will repeat when it is held down (Microsoft 2016). This is helpful for those with cerebral palsy because it allows for error, especially when it comes to muscular tremors or excessive shaking which can be a limiting factor of cerebral palsy. This hardware solution is completely free and complete instructions on how to modify the keyboard to meet the needs of the user and specific directions on how to use these modifications can be found on the Microsoft website.

For complete instructions:
https://www.microsoft.com/resources/documentation/windows/xp/all/proddocs/en-us/access_filterkeys_turnon.mspx?mfr=true

Eye Movement Detection Devices: These devices are among the high tech hardware that has been developed in the past seven years to detect the movements of children and adults on programs that are included in game hardware and writing devices utilized by people with cerebral palsy that are often in the spastic cerebral palsy category that have limited grasping and fine motor skills due to their affliction. Students in classrooms are able to write essays, poetry, and complete job applications like their peers. Children are especially happy with the eye movement detection devices because they can write their name after they play alphabet recognition games.

This video of the EyePro shows a man name Sean using the assistive technology and hardware to communicate with his audience and to his hard drive to save documents for later if he is writing. Sean has severe cerebral Palsy yet has great determination and drive to continue with his love of computers and education. (https://youtu.be/uQ-sQ6EAeO8)

Software solutions for cerebral palsy:

People around the world use computers everyday, but the computer is designed for people who do not have physical or cognitive impairments (Davies, Mudge, Ameratunga, & Stott, 2010). The computer age is still in it's beginning stages, thus more and more software programs will become available in the future. Just as there are more and more programs for the everyday users, there are programs that are being designed to aid people with various degrees of disability. "A study by the US National Centre for Education Statistics in 2003 showed that children between the ages of 5 and 17 years, who have a disability, are less likely to use computers or the Internet than their counterparts without disabilities," this occurrence is due to not having the software solutions available for them to easily use a computer (Davies, Mudge, Ameratunga, & Stott, 2010). Cerebral palsy refers to an individual who has disorders related to movement or posters, and it is increasing in its prevalence in live births (Davies, Mudge, Ameratunga, & Stott, 2010). For example, when a student has cerebral palsy simple tasks on a computer need to be performed differently to achieve the same outcomes. Software companies have created multiple programs that aid the use of computers for students with cerebral palsy.

Students who have cerebral palsy may need different types of software programs to be successful in their schooling. Since cerebral palsy can range in severity, software programs must be able to accommodate these students in multiple ways to be effective.

Some software programs that have designed to be self-directed are one of the most effective forms of software solutions for individuals with cerebral palsy. Technologies related to Internet browsing and word processors are the most helpful for students with cerebral palsy at all ages. These technologies are the most useful because they would not need a form of caretaker to help administer the programs (Davies, Mudge, Ameratunga, & Stott, 2010). Through these self-directed programs, individuals with cerebral palsy will regain a level of control in their lives and be able to use a computer in their daily lives.

1. Pointing Devices

Some software solutions can be easily applied to any computer. Through studies from Durfee and Billingsley, they compared a touch screen with an enlarged arrow on a screen. They found that the onscreen enlarged arrow was better than the use of a touch screen. The enlargement of an arrow on screen is easily done on any computer by changing the mouse settings (Davies, Mudge, Ameratunga, & Stott, 2010). However, individuals with cerebral palsy must have a degree of movement control to be able to use a traditional computer mouse. This software solution may be effective for some individuals but not others with more severe cerebral palsy.

Cost: Free

2. Keyboard modifications

An onscreen keyboard was found to be faster and more accurate for individuals with cerebral palsy. This software solution is "currently available in the accessibility options in the Microsoft Windows operating systems" (Davies, Mudge, Ameratunga, & Stott, 2010). There are also setting options to increase speed and accuracy, such as: sticky keys, key repeat, and post-acceptance delay. These modifications can help individuals with cerebral palsy have better writing skills that would be comparable to their student counterparts. This software solution can be used for any subject or activity that would involve the use of a computer or writing assignment.

Cost: Free

3. Screen interface options

Microsoft Windows has accessibility options that allows for users to scan through the various screen icons, rather than double-clicking a program icon. The options are: automatic (clicking a switch), inverse (holding switch down and releasing), and step scanning (successive clicking). Different accessibility options could be more helpful for one student with cerebral palsy compared to another. The results found that automatic scanning was difficult for individuals with spastic cerebral palsy, while step scanning was difficult for individuals with athetoid cerebral palsy (Davies, Mudge, Ameratunga, & Stott, 2010). This further confirmed that one screen interface option may be better for one individual with cerebral palsy, but not another. This then relates back to the differences between individuals with cerebral palsy, and how solutions need to be assessed on a personal basis.

Cost: Free

Voice-output communication devices can aid individuals who are nonverbal be able to communicate. There are software programs that use visual scanning and switches to select different symbols on a screen interface (Davies, Mudge, Ameratunga, & Stott, 2010). These screen interfaces work through symbol-prediction software which "is a method of access that involves highlighting a specific symbol within an array on the basis of an expected or predicted response" (Davies, Mudge, Ameratunga, & Stott, 2010). This software gives the individual the freedom to communicate with others when they have a nonverbal impairment from cerebral palsy. However, this software is limited in the symbol selection and has been seen to make errors (Davies, Mudge, Ameratunga, & Stott, 2010). Overall, this software solution is helpful to aid communication for individuals with cerebral palsy. An example of this software is Nuvo Symbol Software, which is the premier Augmentative and Alternative Communication solution for individuals who are nonverbal (RM Speech: Nuvo Symbol Software, 2014). The Nuvo Symbol Software allows for individuals with disability to speak through tapping buttons with words or phrases, use grammar correctly, use word prediction, have prerecorded responses, create and edit symbols, change the settings, customize, prevent accidental selections, and expand vocabulary (RM Speech: Nuvo Symbol Software, 2014). This independence will positively affect any

individual who is nonverbal, now these individuals will be able to speak for themselves and be heard for the first time.

Cost: $400, taken from similar hardware with this type of software (CallTalk)

4. Speech recognition software

Some individuals with cerebral palsy can be verbal, however utterances can be incomprehensible to others. Thus, there may be the need for speech-recognition software. The major difficulty with this type of software is the amount of time and dedication for the training to use this type of software (Davies, Mudge, Ameratunga, & Stott, 2010). A mainstream example of speech recognition software is the program Dragon. Dragon software provides the user to navigate through their computer using their voice, which would not require the user to use any movements (Computer/Electronic Accommodations Program: Speech Recognition, 2016). There is currently many different Dragon softwares available, which are available for Mac and Microsoft Windows.

Cost: Mac (Dragon Dictate for Mac) $200.00, Microsoft Windows (Dragon Naturally Speaking Professional) $300.00

Gesture recognition also requires a degree of training, where the individual frequently repeats actions until the software can interpret the action (Davies, Mudge, Ameratunga, & Stott, 2010). However, this type of software is just at its beginning stages of development. There are not many software solutions that are readily available for consumers. Examples of gesture recognition software would be similar to an XBOX Kinect system, which would require no remote to control the systems interface. Gesture recognition software involves a camera to interact with the software. This is an up and coming solution that needs to be further tested, but has possibilities to aid individuals with cerebral palsy.

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Scenario: Leo a Student with Cerebral Palsy in an Inclusion Classroom

Leo Johnson is a student in Great Northern Central School District, which is located in Twin Peaks, Washington. Leo was diagnosed with cerebral palsy at the age of three, due to his slow development and stiff movements. As Leo became older, motor skills and manual ability became more limited. Leo has a form of cerebral palsy called mixed types which includes spastic, ataxic, and dyskinetic cerebral palsy. Before Leo had entered elementary school, a Committee on Special Education (CSE) team was formed to help Leo be in an inclusion classroom throughout his academic career. Leo can be included in an inclusive classroom because he does not show any effects on his cognitive ability and has been tested to show he has an average IQ for his age group. For this inclusion classroom to occur Leo's IEP needs to have numerous assistive technologies listed, so current and future teachers can implement these strategies into their classrooms. This vignette will follow Leo throughout elementary, middle, and high school showing his required accommodations and assistive technologies he will need to be successful in an inclusion classroom.

Leo in Leland Palmer Elementary:

In the Great Northern Central School District, the elementary school goes from kindergarten through fifth grade. Annually, the CSE team meets and discusses Leo's IEP and creates goals and strategies that must be implemented to ensure Leo's success in the classroom.The first CSE meeting was comprised of Audrey, Leo's specialized resource teacher, Laura, his kindergarten teacher, a member from the school board, Leo himself, and his parents. Since Leo is now five years old, there has been some assistive technologies that he uses in his home life. These assistive technologies will need to be discussed at this first CSE meeting. When Leo started elementary he was at a Level 2 classification of his gross motor skills function system (GMFCS).

First off at this CSE meeting Leo is introduced by his parents, Catherine and Pete, to make Leo more comfortable in this room of adults. Leo is as first very shy, so Laura introduces herself and tells him how she will be his kindergarten teacher this coming year. Leo smiled reluctantly, but then went on to introduce himself through prompting of his favorite activities and hobbies.

Leo said, "Hello...my name is Leo Johnson. I need help with things in my life because I am different. I like soccer, playing with my dog, and video games." Everyone in the room smiled back at him, then Leo's mood instantaneously changed.

His parents then prompted him to talk about his assistive devices that they use in their home life. Leo perked up and said "I use Mr. Grippy!" Pete smiled and told the other adults "Mr. Grippy"

was a gripping device they have anchored to the wall that assists Leo when going to the bathroom. It allows him to pull himself up from a seated position to become more independent with his everyday activities. Right now the one they are using is adjusted to be at his height and an arms length away from him. This then sparked the conversation between the CSE team members, to make sure there would be a gripping device located in the classroom bathroom. The cost of this product was supplied by the parents, which was around $20. The school board team member approved the purchase of this assistive device and made arrangements for maintenance to put this device in Laura's classroom bathroom.

Right now Leo's cerebral palsy is in its early stage of development, so he does not need extra assistance with many of his daily tasks. However, the CSE team did make plans to implement emergency plans to accommodate Leo's needs. If the class is walking through the halls, he is to be at the front of the line with an adult in case he loses balance while walking. If he is going to a location outside of the classroom, he is to be with a classroom buddy. On the first day of the school year, Laura will educate her other students about Leo and his disability. This will lead to fewer questions from his peers and foster acceptance.

In the following years, there was a focus on the writing skills of students. Leo began having difficulties holding pencils in the classroom. During his second grade CSE meeting, the additional technology of a writing device was suggested by his teachers to the school board. This writing device costs $8.80, which was budgeted and approved for Leo's use. After Leo began to use this device, he enjoyed writing more and did better on writing focused work. Due to the success of this device, it was written into his IEP for future use by his teachers.

Leo commented on this addition to his IEP, "I like the writing device, because I feel like I have a pencil from the future! A space pencil! It helps me write and write better."

When Leo went to the fourth grade, he was re-classified by the GMFCS to be at Level 3. This led to him needing to be in a manual wheelchair full time. At the CSE meeting for his fourth grade IEP plan, this was a main focus during the discussion.

With Leo's manual wheelchair, a resource teacher needed to accompany him since he is unable to push himself independently. A resource teacher was hired and introduced to Leo in a casual setting. Shelly, the resource aid, and Leo instantly became friends. Shelly worked closely with Leo's family before it was time for Shelly to be in the classroom with Leo.

Shelly said, "Leo should get a raptor reacher to accommodate his limited mobility. This product would allow Leo to reach for items that above his height or out of reach from a sitting position.

This product allows for him to still have a level of independence both in and out of the classroom. Recently, I looked at this product on Amazon.com where it cost $12.15."

Everyone on the CSE team positively reacted to Shelly's suggestion for Leo. The school board approved of the raptor reacher, and Leo began using it in his everyday life. Leo was transitioned into a new bus route that had a wheelchair lift. This allowed him to still be picked up by a bus and brought to school everyday. This type of bus will be used throughout the rest of Leo's schooling. Leo will be taught how to get on and off the bus safely using this wheel chair lift. Leo will not need to learn where the elevators are because his elementary school is only a one story building.

Throughout fourth and fifth grade, Leo's cerebral palsy did not worsen so no new assistive technologies were required. Catherine and Pete were thankful for Shelly's help throughout his final years in the elementary school. They requested the school board to continue her contract to assist Leo in the Middle School after he completed fifth grade.

Leo was asked how he felt about transitioning to the middle school, when the end of his fifth grade year approached. He responded, "I'm nervous because the school is much bigger, there is a lot of more kids, and I'm worried about changing classrooms throughout the day."

Shelly listened to these concerns and told him, "I will be with you every step of the way, my little buddy! We will work it out with your new teachers before you start to make sure you have an easy transition to your new school. We will have another CSE team meeting in August to do just this!"

Leo in Benjamin Horne Middle School

Leo is very nervous about his transition to the middle school in September. He knows that the school work will become more challenging and he does not want to fall behind his other classmates. At the summer CSE team meeting, Shelly's new roles to assist Leo in the school are explained. Shelly will push Leo's wheelchair around and he will have permission to leave his classes five minutes early. By leaving early, he will be able to avoid the congested hallways in between periods of the day. This first CSE team meeting will also show Leo around the school so he can become familiar with the layout of the school. Leo will learn where all the elevators are, his classrooms, and important places in the school. He will also learn any new safety procedures that differ from his elementary school classrooms.

At this first CSE team meeting, all of his new teachers came to the meeting. They prepared Leo with the type of assignments he would have to complete throughout the school year. Leo became

worried, you could see his eyebrows furrow and his head sulked into his chest, when they said the word “computer.” Leo had been able to avoid most computer work when he was in elementary school, he usually completed and alternative assignment or got help from a resource teacher. He knew that moving up to the middle school, he would have to do it himself. The group of teachers, Shelly, and his parents knew that they would need to research assistive technologies that would help him with these new school demands.

To get a better idea of what issues Leo has while using the computer they had asked him, “What problems do you have when you have an assignment that requires the computer?”

Leo angrily responded, “Well...the mouse is hard to see...the words are too small...it doesn’t type right…I just hate it!”

The school board member, Bobby, suggested that he may be able to change the settings in the computer to fix some of these problems. He said “You can change the size of the mouse so that it is much larger, that may help you see what you’re doing. We can also make sure we change the automatic font size so that you can always read what you’re writing. Now, about the keyboard there’s a few things we can try...we can start you out with a traditional keyboard. With this traditional keyboard we can change the settings so it doesn’t register the errors like sticky keys and use filter keys. If this isn’t working well for you Leo, we can have an onscreen keyboard that would require a mouse to click each letter you want.”

Leo reluctantly said, “I guess I’ll try that then…” Leo has had such negative experiences with computers he has a hard time getting over the initial hurdle of logging onto the system. He is still worried that even with these new suggestions, computer use will still be hard for him.

A few months into the school year, Leo admitted that he did think that the bigger font and mouse size had helped him with his computer use. However, he still had trouble with a traditional keyboard and the onscreen keyboard. When he had long essays to complete, he felt that it took too long to use these keyboards. Shelly listened to Leo’s concerns and met with his parents about solutions that might help.

When Pete and Charlotte arrived for the meeting with Shelly at the school, they first went to sign in at the main office. It was there that there was a TV on in the background on the news channel. As they were talking to the secretary a commercial came over the station about a program called Dragon Speech Recognition Software. They had never heard of something like this, but immediately thought it might help Leo with his schoolwork. They ran up to meet Shelly, where together they looked up this software online. All the adults talked to Leo, who became very

excited about this program he could use. Shelly, Charlotte, and Pete contacted the school board who approved the funding for this program.

Leo quickly learned how to use the Dragon Speech Recognition software. He soon was able to write his essays quickly and with fewer mistakes. This software was permanently added to Leo's IEP, so he would have access to it for assignments and tests in the future.

Throughout middle school he used all of his assistive technologies that the CSE team had come up with. This led to Leo enjoying school and became excited about transitioning to the high school after eighth grade. He no longer had the fears he had when was transitioning to the middle school, he was confident in his ability to do his school work. However, he did know that moving up to the high school he would need to become even more independent and would have many more responsibilities.

Dale Cooper Regional High School

To foster Leo's need for greater independence was set back by his new classification of his GMFCS to Level 4 before he entered the high school in the Fall. This new classification meant that he would have even more limited mobility than he already had. Leo still wanted to have independence to do things by himself. It was at this time that his parents decided that he should be fitted for a custom robotic wheelchair. This wheelchair would have a custom cushion, for his back to keep his spine in a healthy position, and a joystick that allowed for him to steer his wheelchair himself. Over the summer before his Freshman year, he learned how to drive and maneuver his new robotic wheelchair. He even got it in his favorite color--blue! This new device allowed him to have a new level of mobility and independence. That's what really made Leo excited to go back to school.

Shelly was contracted again to help Leo in all of his classes as an aid. Shelly and Leo now had a close bond from spending many years together. Shelly knew how to help Leo in any situation--in and out of the classroom. She knew how to use all of his assistive devices and how to best effectively used them for his classwork.

In high school, Leo joined clubs and extracurriculars. He joined community service organizations, culinary club, and gaming club. As Leo progressed through high school, he had more and more leadership roles in his school and community. Everyone loved Leo's uplifting spirit. In high school his favorite subjects were English and Social Studies.

Leo even said, “I never would have thought that I would love English and Social Studies. I used to have such a hard time on the computer, I would never turn in my assignments on time. Now with Dragon, I love writing stories!”

Leo was on track to receive an advanced diploma in the state of Washington. He was extremely proud of this accomplishment. However, Leo knew that soon he would have to do something after high school.

Leo said as a sophomore, “I have a few more years to decide on that, but right now I just want to be a teenager.”

When Leo was entering his senior year, his CSE team needed to have a serious discussion with Leo about what he wanted to do after high school. Leo expressed some interest in attending a college, he just didn’t know what options he would have. The CSE team found resources for Leo, which led Leo to decide he wanted to go to college. He found a college that was handicap accessible and where he could live independently and study at the same time. He applied to college and got accepted! He plans on studying to become a writer of science fiction or historical fiction novels.

Leo After High School

At the college that Leo attended, he was able to take courses alongside his peers. His college was very progressive in their resources for individuals with disabilities. He continued to do community service activities at the college. While in school, he learned how to drive himself in a specialized van. Since his college was close to Seattle, Washington, there was a program that taught individuals with disabilities how to drive these types of modified vehicles. At the end of Leo’s senior year of college, he received his driver's license. This gave Lero the ultimate independence for himself. Leo completed his college career with a bachelor's degree in Writing and Communication.

As a speaker at a convention for individuals with cerebral palsy, Leo said, “I could have never excelled in life today, if it wasn’t for my CSE team and their assistive technologies they provided me throughout my schooling. It gave me opportunities to do many things I had never dreamed that I could do. Assistive technologies provided these opportunities in my life, and I want to thank every individual that helped me to be the man I am today.”