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Identifying C-Print as a Support Service for Rural, Mainstreamed Deaf/Hard of Hearing Students

Capstone Research Project

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Abstract

The main focus of this qualitative research was to identify C-Print to participants who work and/or reside in a rural area. The research included 25 total participants. Eleven of the participants were deaf/hard of hearing students in grades 5-11 and attend various mainstreamed school settings. Fourteen adult participants included 7 teachers of the deaf, 2 parents, 1 adult sibling, 1 administrator and 3 educational interpreters. The participants attended a field trip to RIT/NTID to participate in a presentation/demonstration regarding C-Print. The respondents completed a preliminary questionnaire, post questionnaire and the students participants participated in one-on-one interviews about one to two weeks after the C-Print Presentation. The results of the project indicated there was a lack of awareness pertaining to C-Print before the project began. At the conclusion of the research project participants were able to indicate

important aspects related to C-Print. The notes for studying and homework assistance were emphasized as an important aspect related to C-Print. The adult participants indicated the importance of the visual aspect of C-Print within the classroom. The outcome of this research allowed participants the opportunity to experience and learn about C-Print. Now they can assist respective school districts into taking into consideration the option to implement C-Print as an additional support service for deaf/hard of hearing students in the mainstreamed educational setting. Every student should have the opportunity to have the support services that are available and essential to help them as individual students to be successful in their educational experience. Assistive Technology as support services need to be addressed more assertively in the rural mainstreamed educational settings for deaf/hard of hearing students.

Introduction

The qualitative research I conducted related to the introduction and demonstration of C-Print for deaf/hard of hearing secondary mainstreamed students (7-12th grade), their teachers' of the deaf and their parents, the Deaf Education administrator for Oswego County BOCES, in New York and the Committee on Special Education (CSE) Chairpersons of perspective school systems. Adult participants received an invitation to partake in the C-Print presentation/demonstration and student participants received an invitation with a permission form with explanation of the research process which parents and students filled out and signed for approval to participate (Appendix A and B).

This population of students primarily resided in a rural area. No school systems at this time provides a form of real-time speech-to-text, (C-Print) as a support service for secondary deaf/hard of hearing students in the mainstreamed setting in this area. My objective was to identify C-Print as an Assistive Technology device that can be used as a support service for mainstreamed deaf/hard of hearing students at the secondary level of education. IDEA 2004 law explains that IEP teams are responsible for considering and making decisions about implementing Assistive Technology devices and services in order for a student to make educational progress (Castellani, et al., 2005; WATI Assessment Package, 2004). In order for an IEP team to have sufficient information and knowledge to make appropriate decisions for C-Print

to be considered as a support service at least one member of that team must have an understanding of how C-Print is used as Assistive Technology and how to complete protocols for consideration and implementation into a child's IEP.

This research focused on C-Print which is a real-time speech-to-text transcription system used as a support service with deaf/hard of hearing students in mainstreamed classes (Elliot et al., 2001). C-Print was developed by researchers at the National Technical Institute for the Deaf (NTID) to improve the classroom experience for students at both the secondary and postsecondary educational settings (Giles, 1998). References correspond to research that has been conducted using secondary and postsecondary deaf/hard of hearing students. In general, the research that has been conducted related to C-Print involved students and teachers who are currently using the support service of C-Print in a variety of ways and focuses on their perceptions of the support service.

This research paper is organized as follows; an introduction explaining C-Print and other support services, review of literature pertaining to C-Print, the purpose of the research, how the research was conducted, results and a discussion section including some highlights found regarding the research and some limitations and strengths that emerged during the research method.

C-Print is a relatively new support service that has been established for use by deaf/hard of hearing students in the mainstreamed educational setting. C-Print has become more widely implemented and used in the postsecondary

educational setting than in secondary educational setting. The secondary educational setting has been slower to integrate C-Print into their continuum of support services as an additional tool available for deaf/hard of hearing students in the mainstreamed setting.

C-Print is being used nationally as a support service option for mainstreamed deaf/hard of hearing students, but it appears there is a lack of information being issued in rural areas where educational personnel may lack familiarity with and knowledge regarding C-Print as a support service. Some barriers that can cause this shortfall in the rural areas of education are geographic barriers, lack of professional development activities, and lack of available technology and the training and assistance with such technology (Henderson, Kyger, Guarino-Murphey, 1998; Williams, Martin, Hess, 2002). It is necessary for educators, supervisors, Committee on Special Education (CSE) chairpersons, students, and parents to become familiar with all of the support services that are available for deaf/hard of hearing students in order to put these students on the same playing field as their hearing peers. Once knowledgeable about C-Print personnel in mainstreamed educational settings can begin to have an interest in C-Print, do more research analysis to obtain additional information to determine if C-Print is a viable option, and implement this option for some or all of their students who are deaf/hard of hearing.

Considerable changes have been made regarding how and where deaf/hard of hearing students are being educated. Before 1975, most

deaf/hard of hearing students attended a residential or a day school program. Since then, a shift has occurred toward more deaf/hard of hearing students attending mainstreamed programs where students and school districts need to rely on support services to enhance communication and access in the classroom setting (Elliot, Foster, and Stinson, 2003; Marschark, Leigh, Sapere, Burnham, Convertino, Stinson, Knoors, Vervloed, & Noble, 2006). Three types of support services that will be identified, discussed, and evaluated in this paper are C-Print, interpreter, and note taker.

Support Services

C-Print

As previously mentioned, C-Print is a real-time speech-to-text transcription system used as a support service for mainstreamed deaf/hard of hearing students. C-print uses standard laptop computers. The software includes a phonetics-based abbreviation system that is produced through a standard keyboard or through technology that identifies ones speech and provides text from voice recognition (Stinson et al., In Press; Marschark et al., 2006; C-Print Pamphlet RIT/NTID, 2004). A captionist is trained (about 6 weeks) to use the phonetics-based abbreviation software. The captionist types or voices the information into his/her laptop. The information is then displayed on the student's laptop or a TV monitor approximately 3 seconds after the words are spoken, and is displayed on the students' screen for about 1 minute (Elliot, Stinson, McKee, Everhart, & Francis, 2001; Elliot, Foster, & Stinson, 2003; Marschark

et al., 2006; Stinson, Elliot, Kelly, & Liu, In Press). C-Print provides students and teachers with the “meaning” of the lecture or discussion, not a verbatim transcription. At the end of a lecture or class discussion the transcription is edited and given to the students as a hard copy (print) or an electronic copy for notes and study guides to be used after class.

Educational Interpreting

Sign language interpreting is a support service that is essential for many deaf/hard of hearing students (Marshark et al., 2006). A sign language interpreter is used to provide communication access for the student in a form that he/she can understand (Stinson et al., In press). The communication modes that are most frequently used range along a continuum from ASL to a form of Signed English. The interpreter conveys the message through manual signs, fingerspelling, facial expression, gestures, etc. (Stinson et al., In press).

Note Taker

Hearing students are capable of listening to the teacher and taking notes simultaneously. It is nearly impossible for deaf/hard of hearing students within the mainstreamed setting to concentrate on the teacher and/or interpreter and try to write their own notes. Note takers are usually volunteers within the class (peers) or are paid by the school (professional). The notes are handwritten during the class and given to the students at the end of class.

Research Review

This literature review focuses on identifying, describing and evaluating three types of support services, (C-Print, interpreter, and notetaker) available for mainstreamed deaf/hard of hearing students. C-Print has not been researched in depth; however the research that has been completed encompasses student's perceptions of C-Print, teachers' acceptance of C-Print, and student study habits and retention related to support services. The benefits of the three main support services (speech-to-text, interpreting, and note taking) have been compared. Student preferences for all three systems have also been explored. The main focus here will be to complete a brief research review and show results of this research.

Teacher Acceptance

Elliot, Foster, and Stinson (2003), completed a qualitative study to determine teachers' acceptance of a speech-to-text transcription system to be utilized in their high school and college classroom for mainstreamed deaf/hard of hearing students. The researchers interviewed 14 regular education teachers (various curriculum areas), 10 teachers of the deaf, and 12 college professors from Irvine, CA, San Diego, CA and Rochester, NY. Interviews with the teachers were analyzed using the criteria from Rogers (1995) model of diffusion of innovations (Elliot et al., 2003). The study determined that the technology was

beneficial because it showed an advantage over other note taking services relative to how notes were set up as well as the content within the notes. However, acceptance among teachers was not always positive. Poor acceptance was seen to be related to how the service was presented to the teachers and how well the teachers perceived the system to be suited to the students' learning process in the classroom (Elliot et al., 2003). One professor explained his dissatisfaction with the service indicating he considered it distracting because the students never looked at him but rather were always looking at the computer screen. Other findings indicated that when C-Print enhanced learning, students became more confident through increased participation in class C-Print notes reinforced what was taught in class and served as a good way to review. Notes helped the students become more organized and to determine what was important information (Elliot et al., 2003).

Perceptions of C-Print, Sign Language Interpreter, and NoteTakers

Elliot, Stinson, McKee, Everhart, and Francis (2001), conducted a study regarding support services related to deaf and hard of hearing college students. In this study the researchers had students complete a questionnaire and then interviewed them. Data was collected regarding student use and understanding of C-Print, notes provided by the system (elaborate later), and appropriateness of C-Print as a support service without using other support services (interpreter and note taker). Responses made by the students included: they felt that C-Print real-time transcription during class was a helpful support

system, C-Print use made it easier to understand the teacher and the lecture, and C-Print provided more detailed information with more vocabulary than was provided by an interpreter. One limitation that seemed to stand out with the students was that C-Print doesn't capture visual information like graphs, pictures, formulas, etc. The students also noted that C-Print provided better notes than a note taker. It was felt that note takers may exclude important information, or their handwriting may be messy and disorganized (Marschark et al., 2006; Elliot, Foster and Stinson, 2002). Another limitation that was identified by the students related to C-Print compared to using an interpreter. Students felt that C-Print couldn't communicate expressions like an interpreter. An interpreter allows students the opportunity to capture classroom activity (laughing, coughing, and movement within the room). Taking this concern into consideration, the researchers asked the students for their opinions regarding the use of C-Print without other support services (Elliot et al., 2001). A majority of the students felt they would be comfortable using C-Print without an interpreter and approximately half the students felt comfortable without the support of a note taker and/or interpreter.

Marschark et al (2006), concentrated on four experiments comparing sign language interpreting and real-time speech-to-text for access to information within the classroom setting for deaf students. The first experiment was the only one that indicated a reliable advantage for C-Print. No other experiments demonstrated an advantage of one system over another as a support service

for deaf students in secondary or post secondary settings. Using both services together provided no benefit to the students. It becomes apparent that there is a need for further information regarding support services for deaf and hard of hearing students in the mainstreamed setting in order to provide them the access to supports they need to be successful in the classroom and beyond.

Notes related to Study Habits

In 2002, Elliot, Foster, and Stinson completed a study regarding C-Print notes and how deaf and hard of hearing students in the secondary and postsecondary educational setting utilized these notes as study guides. This research discovered that secondary students primarily used the C-Print notes in a passive manner. Re-reading notes enabled high school students to fill in gaps from class lectures. This practice parallels how notes from a note taker are used. Postsecondary students took a more active approach by highlighting, reorganizing, identifying key points and writing their own thoughts in the margins to enhance learning of the material covered in class (Elliot et al., 2002; Marschark et al., 2006). An important aspect related to the usage of the notes in this research was how the students were taught to use the notes as strategies to enhance their education. It was alarming to me that the majority of students were not taught how to use the notes as an effective tool for studying or how to incorporate them within the classroom setting to reinforce the classroom lecture. The educational system regards secondary and postsecondary students as independent learners (Elliot et al., 2002) responsible for their own learning.

However, it would seem that if a service were being provided to students it would benefit them to be taught strategies enabling them to use that service to its fullest capacity.

Retention

The most recent research that has been conducted by Stinson, Elliot, Kelly and Liu (In Press) regarding deaf and hard of hearing students relates to how secondary and post secondary students retain information from support services (speech-to-text and interpreting). This study involved students who participated in two separate lectures. One lecture was supported with an interpreter and the second lecture was supported with C-Print. After the two lectures researchers divided the students into three random groups. The first group was not allotted any review time prior to completing two tests (sentence-completion and multiple-choice) after the lecture. The second group was given 20 minutes to review with either hand written notes (interpreter) or a hard copy (C-Print) of the lecture they participated in and then completed the two tests following the review. The third group was given the same review time after the lecture and also the hand written notes or a hard copy of the lecture. Additionally, they also reviewed the material one week later for 20 minutes and then completed the two tests. The results determined that deaf/hard of hearing students at the high school level retained more information from the speech to text support service. Also, the students who received the second review sessions showed more significant retention of the information from the lecture than the other two

groups. The college students didn't demonstrate the same results as the high school students. Their results didn't show a significant difference in support service or review group. The researchers perceive this difference between high school and college students to be due to maturity and experience in using different formats to receive information (Stinson et al, In Press).

Literature Review Discussion

This literature review concentrated on identifying, describing and evaluating three types of support services that are currently available for mainstreamed deaf/hard of hearing students. It has been established that each support service has its pros and cons related to how it is used and what the specific needs of the students are.

Outcomes related to all of the research conducted regarding support services do not imply that one service is better than the other. The research comparatively demonstrates that each service can benefit the students as much as another and each service should be researched, studied and implemented based on the need and preference of the student, whichever support service is provided to a student will be successful for that student as long as teachers and the student are trained properly with regard to what the service is and how the service can be effectively used within a classroom. Giving teachers this opportunity to become familiar with the support service may increase acceptance and encourage a positive impact within the classroom.

The students need to be educated as to how to utilize the support service to the best of their abilities. Each service provides qualities that students may need to use separately or in combination in some cases services utilized will depend on the type of class in which the student is currently enrolled (lecture, lab, debate, etc).

C-Print allows students to view a lecture in a written form during class and provides each student with a hard copy of notes at the end of a class. These notes can be beneficial to the student for use when studying. An interpreter is a support service that is essential for many deaf/hard of hearing students to utilize and provides the student with communication access within the classroom setting. A note taker provides students with hand written notes at the end of class.

Each of these support services has benefits and limitations. C-Print provided students with enhanced learning. Students participated more in class, and notes reinforced class lecture and were used outside of class to review, organize, and fill in gaps missed during class. These outcomes indicate that C-Print exhibits more benefits for deaf/hard of hearing students in the mainstreamed setting who are skilled in reading and writing English and in receiving spoken English (Elliot et al, 2001). The first limitation that was highlighted by students relating to C-Print was that it couldn't provide visual information. The second limitation addressed C-Print inability to communicate expressions as an interpreter can. A final limitation was that a majority of the

students haven't been taught how to use the notes effectively for studying purposes.

An interpreter provides the student with a language or communication access that is necessary and beneficial for him/her in a mainstreamed setting. An interpreter can capture classroom activity and conversations that occur throughout the classroom. The first limitation regarding interpreters is they may miss important information and may not provide the student with all vocabulary. The second limitation is students were identified as retaining less information when provided an interpreter as compared to using C-Print.

A note taker provides students with handwritten notes, but throughout all the reading this service seems to have more limitations than benefits. First of all the notes are handwritten and can be disorganized and written sloppily. Note takers may miss important information because they cannot possibly write fast enough to keep up with the teacher. A note taker is usually a volunteer from within the classroom and may not regard certain information as important.

The findings from this review revealed several avenues for future research. Elliot et al. (2003) explained that future research related to teacher acceptance could be conducted with the same research format using programs that already have speech-to-text systems established and are used on a regular basis; the results may be different as to how the teachers accept the service. Future research could also include providing an in-service for half of the prospective teachers with no introduction for the other half to determine

differences in acceptance of the service. It seems that the ways in which teachers are approached and instructed in system use impacts their degree of acceptance and their perceptions related to extent of benefit for students.

Stinson, Elliot, Kelly, and Liu (in press), explained future research could be conducted related to the three support services and the relative benefit toward providing notes or text without the support of interpreting. This type of future research could assist in determining if a student benefits more from receiving one service or being provided two services concurrently to one another.

Purpose of This Study

The primary objective of this research project was to identify, introduce and have participants discover C-Print as a support service for deaf/hard of hearing students who reside in a rural area and attend a mainstreamed school setting. This project gave the participants the opportunity to learn about; the campus at RIT/NTID, all the activities students on campus can be involved with, life on campus and about a fairly new support service (C-Print) that is available to deaf/hard of hearing students in the mainstreamed setting.

By having the participants complete this research project it allowed me to collect data and evaluate that data in regards to the respondent's experience, their opinions and the their interest related to C-Print. The experience of learning about C-Print may assist in school districts taking into consideration the option to implement C-Print as another additional support service for deaf/hard of

hearing students in the mainstreamed setting. All school districts should be aware of all assistive technology that is available to students. Every student should have the opportunity to have the support services that are available and essential to help them as individual students be successful in their educational experience. The participant's opinions are valuable to determine if C-Print is a helpful device to assist deaf/hard of hearing students and in what areas of their educational setting would it possibly assist them the most.

Research Method

Sample Selection

A letter explaining the nature of the research project was emailed to seven teachers of the deaf, in the Central New York area. The email contained a short explanation of the research project, participants the researcher was gearing the project towards and a permission form for parents and students to sign for approval to participate (Appendix A). The teachers of the deaf explained the project to their students and had them take home the permission form to allow the parents to read it over and discuss the project with their child to decide if they wanted to participate in the research.

An invitation regarding the research project was emailed to an Oswego County BOCES administrator explaining the project and that administrator sent the invitation to all the respecting district CSE Chairpersons in the area.

Participants

A total of 14 deaf/hard of hearing students handed in a permission form to attend and participate in the enrichment day. A total of 11 deaf/hard of hearing students completed all aspects of the research project. The three students that did not attend or complete the research were either absent on that day or had transportation issues. All the students that attended were in 5th-11th grade (Table 1 on the following page) and are enrolled in seven different school districts in a variety of mainstreamed settings.

The deaf/hard of hearing students that participated in the research project varied in range/type of hearing loss from a mild to profound loss, two of the students have a unilateral sensorineural hearing loss and six of the students have a bilateral sensorineural hearing loss. Two of the students have a bilateral conductive hearing loss and there was no audiological information regarding one of the participants. One of the participants has a cochlear implant and all the student participants use an FM system within the classroom setting. Only one of the students uses another form of Assistive Technology (Computer-word processor/spell check). Three of the eleven student participants have an educational interpreter. One student receives notes for some of their classes. All of the students receive teacher of the deaf and audiology services at varying times per week/month (1x, 2x, 5x, etc.) and types of service (push-in, pull-out, direct, consult, etc.)

A total of 14 adults attended the C-Print presentation/demonstration and participated in the research project. The 14 adults consisted of seven teachers of the deaf, one administrator, two parents, one adult sibling, and three educational interpreters. None of the CSE Chairperson's who were invited attended the trip to RIT/NTID. Several of the CSE Chairperson's did bring up the event to their perspective teacher's of the deaf and asked for them to report what they learned from the day.

Table 1

Grade level and
Gender of Student
Participants

Grade Level	Male	Female
5 th -6 th	3	4
7 th -8 th	0	2
9 th -11 th	2	0

Enrichment Day

The participants were given an opportunity to experience a field trip to RIT/NTID, from Oswego County, NY. The enrichment day included several activities regarding campus life and to learn about C-Print, ask questions and explore it through hands on activities. All of the participants traveled to RIT/NTID by bus and car. The participants experienced a full day of enrichment which started by receiving a tour of NTID and the main campus of RIT. The tour was given by a deaf/hard of hearing student attending RIT/NTID. The tour was followed by a video presentation about life on campus. The video was followed

by a discussion about admissions to RIT/NTID and allowed time for questions and answers. The participants experienced and enjoyed a lunch at The Commons.

Procedure

The participants concluded the day with the C-Print presentation/demonstration. The C-Print presentation/demonstration was presented by Dr. Michael Stinson and Pamela Francis while Anne Alapudukis assisted in setting up the equipment and helping the students utilize C-Print during the hands on demonstration. The C-Print presentation/demonstration gave a brief overview of the program and how it worked and then the presenter introduced all the options one has while using C-Print (reading the lecture, highlighting important information, notes, how the system works and how the captionist relays the information, abbreviations used for typing, typing in your own message to remember important information or to ask a question, drawing, etc.).

The C-Print presentation/demonstration was evaluated by collecting data from all the participants. The objective to collect data was accomplished by all the participants completing two questionnaires. All the participants completed an identical preliminary questionnaire (Appendix C) which included background information and the participant's awareness of C-Print and other assistive technology services that are available to deaf/hard of hearing students. The participants responded to several questions on a 5 point scale (5

being Very Knowledgeable to 1 being Very Unknowledgeable). At the conclusion of the presentation/demonstration all the participants completed a final questionnaire (Appendix D & E). The students and adults completed separate questionnaires. The questions and the participants responses related to the information they discovered, learned and understood about C-print. Their opinions were given of C-print as a support service for deaf/hard of hearing students in the mainstreamed setting and which parts of C-Print they felt would be most beneficial from what they learned. The participants had to respond to several questions on a 5 point scale (5 being Strongly Agree to 1 being Strongly Disagree) and answer a few open ended questions and rate the importance of the notes given after class.

The student participants completed a one-on-one interview (Appendix F) at a later date pertaining to what they learned about C-Print and their experience of the day. The interviews were completed five to ten days following the C-Print presentation/demonstration at each of the student's perspective schools. The interviews were completed in reserved rooms that had been established so the student's would have privacy, comfort and to promote sincere thought through answers. The interviews were videotaped and notes were taken throughout the interview to remember important information the student's presented during the interview.

The researcher's intention was to identify C-Print to these participants with the hope that there would be an interest and they would consider researching C-Print in more depth. Then begin the implementation process to include C-Print as a support service that would benefit one or more deaf/hard of hearing students within this rural educational setting.

Results

Table 2 below indicates the results related to the participants awareness of Assistive Technology before the C-Print presentation/demonstration. Followed by an open ended response regarding what Assistive Technology the participants are currently using or have used in the past, as well as, knows someone who uses or has used the technology.

Table 2

Awareness of Assistive Technology

These are averages of each group with the *standard deviation below in italics.*

Assistive Technology	11 Students	14 Adults
TTY relay system	2.27 <i>1.60</i>	3.29 <i>1.20</i>
Closed Captioning on TV	3.55 <i>1.08</i>	4 <i>0.80</i>
Real-Time Captioning in your classroom or another place	2.09 <i>1.50</i>	1.86 <i>0.91</i>

Signaling device (e.g. Flashing light or vibrating pager)	3.27 <i>1.71</i>	3.21 <i>1.13</i>
Personal amplification system/hearing aid/Cochlear Implant	4.45 <i>0.99</i>	4.14 <i>0.91</i>
FM System	4.90 <i>0.29</i>	4.43 <i>0.76</i>

Chart indicates participant's levels of awareness for several of the statements regarding a 5 point scale (5 being Very Knowledgeable to 1 being Very Unknowledgeable).

The results above show that both groups of participants lacked in the knowledge/awareness of real-time captioning (C-Print) compared to other types of assistive technology. The participant's awareness of a few other devices was low, which could be addressed at a later time in future research. The results conclude that C-Print and other forms of Assistive Technology need to be addressed more aggressively in rural area educational settings.

The open ended question results indicated that hearing aids and FM systems are or have been used the most among all the Assistive Technology that was mentioned by respondents. Signaling and/or vibrating devices were also widely used among the participants (vibrating clock, watch, pager, bed vibrator, phone and doorbell light, flashing fire alarms, etc.). Four of the participants indicated they have used closed captioning. Five of the adult participants indicated they have used a TTY a telephone relay system but none of the students listed using a TTY. None of the participants indicated using and/or knowing someone who uses C-Print.

The student and adult responses towards their basic understanding of C-Print at the end of the presentation/demonstration were (students) 3.72 with a *standard deviation of 1.54* (adults) 4.50 with a *standard deviation of 0.60*. Now that identification has been indicated it was intriguing to discover the adult's responses to the benefit of C-Print as a support service for mainstreamed deaf/hard of hearing students. Table 3 shows these results below.

Table 3
Benefits Regarding C-Print

These are averages of each group with the *standard deviation below in italics*.

C-Print	Adult responses
Beneficial to use in a mainstreamed classroom setting	4.57 <i>0.51</i>
Should be examined in more depth as a Support Service	4.79 <i>0.34</i>
Beneficial to complete a trial run with an interested student	*4.64 <i>*0.62</i>
Information useful to make future decision	*4.29 <i>*0.86</i>

*These results were only from 13 adult participants rather than all 14. Two of the participants did not complete one of the two areas
Participants responded to questions on a 5 point scale (5 being Strongly Agree to 1 being Strongly Disagree)

The most intriguing information that was gathered from the final questionnaire data related to the notes provided to the students from C-Print.

The students indicated strongly (8 out of the 11) that the notes would be more helpful to them for later use than the actual captioning that occurred during class. The students were then given a list of different ways the notes could be used and they were to rank them from 1 being most important to 6 being least important. The results below were devised by averaging all the responses of the students from each category and they are in the order of how the students ranked the importance of the notes.

1. To complete homework assignments
2. To study for quizzes and tests
3. To write a report or term paper
4. To highlight important information
5. To use in class during discussion or small group projects
6. To work with a teacher or a teacher of the deaf

The adult participants indicated that the notes would benefit the students (4.93, $sd=0.12$). All the adults indicated that the notes would be helpful to the students regarding homework, to study for a quiz or test, and to work with a teacher or teacher of the deaf.

The students completed the interviews within five to ten school days of the C-Print presentation/demonstration. When the students completed the interviews two of the questions were related to the notes. At the end of the C-print presentation/demonstration the student respondents indicated the notes would be very useful by ranking them one and two (ranked above) for use regarding C-Print. During the interview the students also indicated the notes

would be useful for studying for quizzes and tests, to complete homework and answer questions. This information corresponds to the previous information the student participants provided. Some of the student's responses were as follows;

"Studying I would use them...mostly for studying...for certain tests"

"They may help you get ready for a test or a quiz"

"I would basically mostly for the homework because homework I have a hard time doing my homework."

"I would use it for homework and quizzes um....to help me remember"

It was interesting to discover what classes the students considered C-Print to be most beneficial if they were able to utilize it and why they chose that subject. A few of the student respondents expressed that C-Print would be most helpful in English Language Arts (ELA), Math, Social Studies and some students indicated all their core subjects. It is worthy to note that three student respondents' explanations for use pertained to the previous topic of note use for studying and homework help.

"ELA...Why?...Well because there a lot of things you have to study...are a lot notes that You have to take and that is why I like C-Print it would help me with notes"

"Hmmm....I would have to say all of them...Why?...sometimes I don't know what the homework is..."

It is also worthy to note that several of the student respondents indicated that the subject they chose to be most beneficial was due to the fact that they had difficulty hearing in the classroom due to noise, teachers location in the classroom and class size.

“Social Studies...more students...teacher walks away and can’t really hear him”

“Maybe all of them because sometimes I can’t hear with the hearing aid and it gets distracted and you have to ask after they get done talking and all that”

“I’m going to say math....Why?...I can’t really understand the teacher....people shout....a lot of people shout”

One aspect of the research that was discovered due to the participant’s responses regarding the advantages of C-Print related to C-Print being beneficial as a visual tool in regards to reading and not missing important information. Another advantage that seemed to be significant to the respondents related to the notes that are provided in order to help them review, highlight, and obtain accurate information. Below are some responses pertaining to both adult and student respondents;

Adult Responses: (Visual Tool)

“Visual support”

“A visual language, time saver with notes and highlighting, printing a hard-copy to review”

“Follow the teachers lecture....”

“Real time notes, English model of the spoken word...”

Student Responses: (Visual Tool)

“They would be able to read the words and understand it more clearly if they miss anything and not only that but they can save them and use them for later....”

“The screen so you can see what they said if you didn’t hear a word or something.”

Adult Responses: (Notes)

“The benefit of carrying over the information...outside of class”

“The students getting accurate information in their notes. The student can also go back to ask questions from the teacher of information they didn’t understand.”

“Real time notes, English model of the spoken word...ability to highlight important information...”

Student Responses: (Notes)

“The notes...And why do you think that?...So you know what the teacher is talking about for homework”

“Well basically I think that C-Print would be second hand in giving info...What do you mean?...From teacher onto paper so you won’t miss any information”

The adult and student participants both gave interesting information regarding the disadvantages of C-Print, but none of the responses pertained to the C-Print program itself. The adult responses focused mostly on what disadvantages the students would endure if C-Print would be implemented or how the districts would handle the implementation of C-Print. Several of the adult participants were concerned with the districts dropping services, finding and keeping a captionist and money issues.

Adult Responses:

“Possibility of districts dropping services to add this one”

“The captionist—finding and keeping an appropriate person—subbing”

“Downsizing of interpreters transitioning over to technology”

“With districts concerned about money the C-Print is impressive enough that they feel they would not need both services and eliminate the interpreting services. Finding a qualified captionist”

The student participants that implied there was a disadvantage focused on the C-Print presentation/demonstration and how it was difficult to follow at times because the information that was being addressed related to the adult participants. The manner of which the presentation was conducted confused some of the student participants. As mentioned earlier only three out of the eleven students have an interpreter and it was difficult for several of the students to follow the presentation since spoken English and sign language were being used together. However, one of the student respondents mentioned since it was difficult for them to follow the people giving the presentation they used the C-Print to read the information that was given.

Student Responses:

“More talking to the teachers, a little boring”

“The woman was harder to understand the Dr. was easier to understand”

“Signing and speaking at the same time was confusing...when I read the C-Print understood information more”

The student responses made regarding advantages and disadvantages of C-Print compared to the adult responses were very interesting. The advantages that both groups were somewhat similar just in a different level of language, but the disadvantages were altogether different. It was interesting to mention because several of the students had the same response when asked about disadvantages of C-Print. Several of the students mentioned how the

presentation changed from being informational to all the participants to the information going directly to the adults.

Below are a few general comments made by student and adult participants, regarding what they learned about C-Print. It seems necessary to mention these comments because it clarifies how the respondents viewed C-Print as a support service once they became aware of C-Print and understood its capabilities to be used within the mainstreamed educational setting.

Students:

“I think it would be helpful to add into a classroom, but I think it would take time to get used to and it would probably be more helpful if they started off in the early grades”

“Not much...C-Print is basically a useful tool for anyone who needs help getting information or...gathering information”

“I think it’s helpful and it will help a lot of kids with notetaking and stuff like that”

Adults:

“I think that it is a useful tool for the classroom and for outside the classroom for students who are deaf or have some sort of receptive language difficulties.”

“Gave a much clear picture of usage and where it would benefit the students who don’t have interpreter and don’t get all the information auditorily.”

I feel it would be a great tool for anyone because it is so versatile.”

“Very impressive, technology has come so far!”

Discussion

The results indicated that the participants discovered C-Print and were able to express their thoughts and opinions regarding what they learned by

giving detailed information regarding their perspective of C-Print. The investigation into C-Print allowed the participants to express advantages and disadvantages that they perceived in relation to C-Print.

A large number of the participants indicated the notes from C-Print would benefit the students inside and outside the classroom. Elliot, Foster, and Stinson (2002) explained that in a mainstreamed educational setting it is assumed that notes will be taken by the individual student during a lecture. Deaf/hard of hearing students rely on lipreading and interpreters to relay the spoken word during a lecture making it almost impossible for the student to write their own notes (Elliot, et al, 2002). This particular information is important to know regarding the implementation process pertaining to support services for deaf/hard of hearing students. C-Print is an additional support service that should be taken into consideration when deciding implementation options for deaf/hard of hearing students in the mainstreamed setting.

There are many barriers to implementing appropriate Assistive Technology for deaf/hard of hearing students in the mainstreamed setting even though there are legal responsibilities of the school district (Elliot, Foster, and Stinson, 2003). Several different aspects are related to this issue like cost, lack of knowledge pertaining to Assistive Technology and allotting time for training (Elliot, et al, 2003). Another barrier that could be included is location of the

school district. Rural school districts seem to lag behind when it comes to Assistive Technology awareness compared to larger urban school districts.

The student participants indicated they would use the notes to study and complete homework. The participants indicated that the notes provided from C-Print would be helpful because they would attain accurate information in order to help them study and complete homework. In order for the students to be successful with the notes provided from C-Print it would be important to provide the students with strategies on how to use the notes effectively.

One other interesting matter when student and adults were asked what they felt the biggest advantage C-Print would give a student in the classroom only a few responded by explaining that you would be able to “*see what was said*” during the lecture. I find that fascinating because most participants indicated information regarding advantages to the benefits C-Print provides in other ways like notes, highlighting, homework, etc. rather than the actual information they gain by reading the written real-time text during class. It would be interesting to complete future research into what benefits the students would receive during class while being able to read the lecture. Would the students participate more in class? Which classes might the students participate more in? Would the students ask and answer more questions in class while viewing and reading the real-time text during class?

Strengths and Limitations

One limitation that seemed to occur during the C-Print presentation/demonstration related to the grouping of participants. It seemed to be a difficult task to keep the student participants attention and interest when the discussion turned directly to the adults or when the terminology was directed at the adult participant's level. If this research was completed again it would be more beneficial to provide separate locations for adult and student participants during the presentation/demonstration. This would allow each group to achieve higher gains of important information because the information would be presented at their capacity for understanding.

Once the presentation focused on the adults the terminology changed and that may have varied some of the data I collected from the student participants. Several of the student participants indicated this change of focus towards the adults as a disadvantage in regards to C-Print, but it really only pertained to the actual C-Print presentation not the C-Print itself. The way the question was comprehended by the students may have played a factor in their responses.

A strength that I discovered was that the student participants were able to retain the information they learned during the C-Print presentation/demonstration and express that through the one-on-one interviews. A few of the questions that were addressed in the post questionnaire

were also referred to in the interviews and the students gave the same types of responses. This information is good to know because it does indicate that the student participants were able to comprehend the information and explain it in their own words.

Conclusion

It is necessary and important that all service providers on an IEP team are aware of all the options for supporting students' success in and out of the classroom. Future research could be completed by determining how to develop ideas on ways to educate and implement support services like C-Print and other Assistive Technology into the school systems.

One student participant from the research project was fascinated with C-Print and wanted to learn more about it. This particular student's teacher of the deaf, interpreter and parent were participants in the research as well. The teacher of the deaf and the student researched the topic of C-Print in more detail after the presentation/demonstration. Once they had gathered sufficient information regarding C-Print they developed a PowerPoint presentation. The student presented this presentation to two local organizations in the community the student resides in and both organizations granted her money to assist her in purchasing the necessary C-Print equipment and to train her interpreter to become a captionist. The student will start utilizing C-print in the upcoming school year this fall. This student will have the essential services to help continue

a successful educational career by having an interpreter and the Assistive Technology of C-Print to be facilitated in all classes depending on the type of class; lecture, lab and discussion or debate.

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Dear _____;

February 13, 2008

My name is Andrea Hollier and I work for Oswego County BOCES as a Teacher Assistant/Interpreter. I am also a graduate student at Rochester Institute of Technology/National Technical Institute for the Deaf (RIT/NTID) in the Masters of Science in Secondary Education program (MSSE program). As part of this program, I am conducting a research project on the use of "C-Print" as a tool for students with hearing loss. "C-Print" is a real time speech-to-text program with benefits for students who are Deaf/HH within the mainstreamed environment at both the secondary and post-secondary educational levels. With that being said, I am inviting mainstreamed Deaf/HH students, who are at the secondary educational level (5th-12th grades) within the Oswego County BOCES Deaf/HH educational program, to participate in this research project. Parents are also encouraged to participate. This project will consist of a fieldtrip to NTID in Rochester to see the "C Print" in action along with completing relevant before and after questionnaires and a follow-up interview. All participants who take part in my research will remain anonymous. No names or personal information will be provided within my research project.

The field trip date to RIT/NTID is scheduled for **Friday, March 14, 2008** (snow date of Wednesday, March 19, 2008). Your child's Teacher of the Deaf and/or Interpreter will also be attending this field trip. An Itinerary of the day will be handed out later along with bussing schedules. This will be an extended day for the students participating.

On the following page is a permission form. Please fill it out and have your child return it back to their Teach of the Deaf, by **February 29, 2008**. Thank you in advance for taking the time to read this letter and fill out the permission form.

If you have any questions regarding the project you may contact me through email: ahollier@oswegoboces.org or my cell number after 3:00 pm 315-224-5000. I am looking forward to having you all help me in my endeavor to complete this project.

Sincerely,

Andrea L. Hollier

Permission Form

Appendix B

Please check appropriate statement, both child and parent sign your name and date at the bottom of the form.

____My child and I will attend the field trip and participate in the research project and complete all aspects of the research. Child (two questionnaires and one-on-one interview) Parent (two questionnaires only).

____My child has my permission to attend the field trip and participate in the research project and complete all aspects of the research (two questionnaires and one-on-one interview).

____My child has my permission to attend the field trip and participate in the research project, but can only complete the two questionnaires and not the one-on-one interview.

____My child does not have my permission to attend the field trip or participate in the research project.

Print Parents Name

Print Students Name

Parents Signature

Date

Childs Signature

Date

Preliminary Questionnaire

Appendix C

Please read and complete all that apply.

Gender: Male_____ Female_____

Please check appropriate line:

Student: _____ Grade: _____

Parent: _____

Teacher of the Deaf: _____

Interpreter: _____

Administrator: _____

CSE Chairperson: _____

Other: _____

Read each statement below related to Assistive Technology and indicate your level of awareness for each of the following statements by circling a number from 5 for Very Knowledgeable (VK) to 1 for Very Unknowledgeable (VU).

1. Word processing program (E.g. Microsoft word, works, etc.)

VK 5 4 3 2 1 VU

2. Computers

VK 5 4 3 2 1 VU

3. TTY relay system

VK 5 4 3 2 1 VU

4. Closed Captioning on television

VK 5 4 3 2 1 VU

5. Real Time Captioning in your classroom or another place

VK 5 4 3 2 1 VU

6. Signaling device (e.g. flashing light or vibrating pager)

VK 5 4 3 2 1 VU

7. Personal amplification system/hearing aid/Cochlear Implant

VK 5 4 3 2 1 VU

8. FM System

VK 5 4 3 2 1 VU

9. Personal Data Assistant (E.g. Palm pilot)

VK 5 4 3 2 1 VU

10. Electronic dictionary/thesaurus/spell checker

VK 5 4 3 2 1 VU

Students please indicate below which Assistive Technology devices you presently use or have used in the past. You can include the devices listed above and any others you can think of that you have used that are not listed above.

Adults please indicate below any Assistive Technology devices related to deafness that you either use yourself or anyone you know that is presently using or has used in the past related to deafness.

Post Questionnaire (Adults)

Appendix D

Please read and complete all that apply.

Gender: Male_____ Female_____

Please check appropriate line:

Parent: _____

Teacher of the Deaf: _____

Interpreter: _____

Administrator: _____

CSE Chairperson: _____

Other: _____

Please read each question carefully and answer as honestly as possible from what you learned from today's presentation/demonstration. Circle your response from 5 being Strongly Agree (SA) to 1 Strongly Disagree (SD).

1. Today's presentation/demonstration gave me a basic understanding of C-Print.

SA 5 4 3 2 1 SD

2. Do you think C-Print would be beneficial to use in a mainstreamed classroom setting?

SA 5 4 3 2 1 SD

3. Do you think C-Print should be examined in more depth as a Support Service for mainstreamed Deaf/Hard of Hearing students?

SA 5 4 3 2 1 SD

4. Do you think it would be beneficial to complete a trial run using C-Print with an interested student before implementing it as a support service?

SA 5 4 3 2 1 SD

5. What were some of the advantages you noticed regarding C-Print?

6. What were some of the disadvantages you observed or thought about regarding C-Print?

7. Do you think the notes produced with C-Print would be beneficial to the students?

SA 5 4 3 2 1 SD

8. How would the notes most benefit the students? (Check all that apply)

___To complete homework assignments

___To use for a report or paper they have to write

___Use notes with teacher or Teacher of the Deaf

___To study for quiz or test

___Other:_____

9. Was the information you learned today regarding C-Print useful to make future decisions regarding C-Print as a potential support service for mainstreamed Deaf/Hard of Hearing students?

SA 5 4 3 2 1 SD

10. What is your overall evaluation regarding C-Print from what you learned today?

Post Questionnaire (Students)

Appendix E

Please read and complete all that apply.

Gender: Male_____ Female_____ Grade: _____

Please read each question carefully and answer as honestly as possible from what you learned from today's presentation/demonstration. Circle your response from 5 being Strongly Agree (SA) to 1 Strongly Disagree (SD).

1. Today's presentation/demonstration gave me a basic understanding of C-Print.

SA 5 4 3 2 1 SD

2. Do you think C-Print would be helpful as a support service?

SA 5 4 3 2 1 SD

3. Do you think C-Print would be beneficial for you in the classroom setting?

SA 5 4 3 2 1 SD

4. Which part of C-Print would be most helpful? (Check only one)

____The captioning of what the teacher is saying during class

____The notes for later use

5. Do you think it is important to have good reading skills in order to use C-Print?

SA 5 4 3 2 1 SD

6. From the list below put in numerical order of how you would rate the importance of the notes and how you would use them (**number one being most important to 6 being least important**).

____To complete homework assignments

____To study for quizzes and tests

____To write a report or term paper assignment

____To work with a teacher or Teacher of the Deaf

____To highlight information

____To use in class during discussion or small group projects

Interview Questions (Students)

Appendix F

1. Did you enjoy the field trip to RIT/NTID?
2. What was your highlight of the day?
3. What did you learn most during the C-Print presentation/demonstration?
4. What do you think is the biggest advantage C-Print would give a student in the classroom? Why?
5. How good of a reader do you think a student should be to use C-Print? Why?
6. Do you think you would be able to read fast enough to follow the class lecture and answer questions? Why or why not?
7. Did you notice any disadvantages of C-Print? If so or if not explain?
8. How often do you participate in class (asking questions, answering questions, class discussions, etc.) Do you think you would participate more in class if you were using C-Print? Why or why not?
9. How much would the C-Print notes that are provided after class help you? Please explain.
10. How do you think you would use the notes?
11. In which class do you think C-Print would be most beneficial to you? Why?
12. Do you think the C-Print program on the computer would be easy or difficult for you to use?
13. What did you like about C-Print program? Why?
14. What did you not like about C-Print program? Why?
15. Do you have any other comments you would like to add regarding what you learned about C-Print?

Child Assent Form

Appendix G

Child's Name: _____

Teacher: _____

Investigator: _____

I am completing a research study about your point of view and interest in C-Print as a support service for Deaf/HH mainstreamed students. A research study is a way to learn and find out more about people.

If you decide that you want to be part of this study, you will be asked to complete two questionnaires and a one-on-one interview. The two questionnaires will be completed today and the interview will be completed within the next two weeks. The interview should take about ½ hour and will be videotaped. My mentor Dr. Michael Stinson and I will be the only people who will read your answers and/or view the videotape.

There are some things about this study you should know. Sometimes when people answer questions they may become nervous and/or confused. If you feel nervous and/or confused during or after answering these questions you should talk to me or your teacher.

The information I learn could help teachers and benefit you and/or other students. A benefit means that something good happens to you or someone else.

When I am finished with this study I will be writing a report about what was learned. The information in the report will not include your name or that you were in the study.

If you would like to help me and answer the two questionnaires and interview questions, please sign your name below. Remember, this is your choice, nobody will be mad if you decide you don't want to participate in this study. If you say "yes" now, you can change your mind at a later time.

(Sign your name here)

(Date)

Adult Consent Form

Appendix H

Name: _____

Investigator: _____

I am completing a research study about your point of view and interest in C-Print as a support service for Deaf/HH mainstreamed students. If you decide that you want to be part of this study, you will be asked to complete two questionnaires. The two questionnaires will be completed today. This study should take about 2 hours of your time. My mentor Dr. Michael Stinson and I will be the only people who will read your answers.

The information I learn from this research could facilitate parents and teachers understanding of C-Print and benefit students.

When I am finished with this study I will be writing a report about what was learned. The information in the report will not include your name or that you were in the study.

If you would like to assist me by participating and answering the two questionnaires please sign your name below.

(Sign your name here)

(Date)

Acknowledgements

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A special thank you to my husband Keith, my family and friends for being supportive and patient with me and for giving me the strength and encouragement to accomplish my dream. I love you all!