2008

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A Needs Assessment & Exploration for Incorporating Tablet PC Technology to Improve Deaf and Hard of Hearing Students Cooperative Learning Experiences in the Mainstream Classroom

MSSE Master’s Project Proposal

Submitted to the Faculty
Of the Master of Science Program in Secondary Education
Of Students who are Deaf or Hard-of-Hearing

National Technical Institute for the Deaf
ROCHESTER INSTITUTE OF TECHNOLOGY

By:

Sarah B. Remelt

In Partial Fulfillment of the Requirements
For the Degree of Master of Science
Rochester, New York

Approved: ________________________________

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Capstone Research Project Proposal

A Needs Assessment & Exploration for Incorporating Tablet PC Technology to Improve
Deaf and Hard of Hearing Students Cooperative Learning Experiences in the
Mainstream Classroom

I. ABSTRACT

This project focuses on qualitative exploratory research that analyzes the possible inclusion of
Tablet PC technology and teaching strategies to enhance cooperative learning in the mainstream
classroom environment. After 3 observations, suggestions for use of Tablet PC technology and
teaching strategies were shared and modeled for the classroom Teachers of the Deaf (TODs).
Feedback via interview and survey were solicited from the TODs involved in the study and a
final report written. The report showed the findings that the Tablet PC is perceived to have the
ability to enhance deaf and hard of hearing student experiences, participation and communication
during cooperative learning within mainstream environments.

II. IMPORTANCE

Mainstream Struggles for Deaf Well Documented

The difficulties and challenges deaf and hard of hearing (henceforth referred to as “deaf” of
“deaf/hh”) students face in communicating within the mainstream classroom environment have
been well documented. (Garrison, Long, Stinson, 1994; Johnson, D.W. & Johnson R.T. 2002;
Kluwin, T., Stinson, M. & Colarossi, G., 2002) Deaf mainstreamed student’s communications
can prove to be problematic because deaf students are a linguistic minority in that their language
is visual, and the hearing majority language is auditory. (Reagan, T., 1994; Birkett, D., 2003)

Even with an educational interpreter, a deaf child may experience difficulty in
participation of group work due to lag time of information exchange. Deaf students do not
convey information to the group themselves, but rather rely on a third party to facilitate
communication exchange for them. The use of an interpreter may hinder direct exchange of
information between deaf and hearing members and in some cases can lead to an unhealthy
reliance on interpreters. (Antia, S. & Kreimeyer, K, 2001)
In addition, the quality of interpreting services varies greatly within US education. (Winston, E. 1994; Garrison, W., Long, G. & Stinson, M. 1994; Stinson, M., Lang H. 2002) The opportunity for a deaf student to have direct conversations with their hearing peers is limited due to the third party interpreter or captionist. The ability to effectively communicate with the class, and with their teacher, greatly affects the academic outcome of learning for a deaf student. (Antia, S., Sabers, D., & Stinson, M., 2006)

**Collaborative Learning as a Benefit**

Research has shown that students who are engaged and involved in the classroom have better academic success. (Johnson, D., & Johnson, R., 1986; Sherman, L., 2000) Participation with meaningful exchanges with peers and teachers enhances learning. (Johnson, D. & Johnson R. 1986; Jacobs, G. & Ward, C., 2000; Fish, W. 2006) This is also true for deaf and hard-of-hearing students; those who communicate and participate in class, and feel positive about these interactions, will likely have better academic achievement. (Antia, S., Sabers, D., & Stinson, M., 2006). Also those students who actively participate in classroom group discussions of a deep and meaningful nature with their peers have better retention of learned material. (Iran-Nejad, A, McClatchy, W. & Berliner, D., 1990; Pintrich, P. Marx R. & Boyle R., 1993; Stinson, M. & Lang, H. 2002)

Self efficacy beliefs of students also play a major part in student academic achievement; if they believe they can achieve academically, they do. If they do not believe in their capabilities they become a self fulfilling prophecy of under achievement. (Pajares, F. 2000) If a deaf student feels isolated and cut off from the rest of the class, they may be less likely to feel that they can be academically successful.
Deaf – The Majority are Mainstreamed

The majority of deaf students being educated in the United States are now done so in the mainstream environment. With the passage of US PL 94-142 in 1975, came the provision in the law that education in the least restrictive environment (LRE) is desired. The law encouraged student placement in the mainstream classroom environment as opposed to specialized classes or schools specifically for deaf children. With these mainstream placements are challenges such as student feelings of isolation, communication differences and cultural differences between deaf and hearing students. Simply placing deaf students into a mainstream environment does not ensure smooth classroom discourse, interactions with hearing peers, or that the deaf student will not feel isolated from the rest of the class through having to communicate through a third party. (Mertens, D. & Kluwin, T., 1986; Foster. S., 1988)

Technology Advances Mean More Options For Communication

With advances in technology, more opportunities for communication are available than ever before for deaf individuals. (Hasselbring, T., Williams Glaser, C. 2000; Pearson, S. 2001; Long, G., Vignare, K., Rappold, R & Mallory, J., 2007) Technology can help deaf students become active learners in the classroom alongside hearing peers by reducing, and sometimes eliminating, communication barriers and equalizing opportunities for communication among hearing and deaf students. (Hasselbring, T., Williams-Glaser, C. 2000; Beaton, C., 2006; Long, G., Vignare, K., Rappold, R & Mallory, J., 2007)

In addition, Deaf Diaspora has resulted in the Deaf population becoming more reliant on technology advances in order to preserve Deaf culture. Technology has made the English language more visible through electronic displays. (Ayers, R., 2005, pg. 27) Deaf Diaspora has also resulted in language variances between deaf populations which can also hinder
communication exchanges between the deaf populations and in turn between the deaf and the hearing populations.

**Preliminary research shows technology such as the Tablet PC can help level playing field**

Preliminary research has shown that technology can be used to facilitate group collaboration in the classroom and help level the playing field between deaf and hearing students. (Long, G., Vignare, K., Rappold, R & Mallory, J. 2007; Beaton, C. 2006)

Strategies that include technology options, such as those offered through the Tablet PC in the mainstream classroom, that can help deaf students have real time communications in the classroom, join in cooperative learning groups, participate in groups independently and help them feel more part of the class, merit further investigation.

**III. INTRODUCTION**

**History of Mainstreaming in the United States**

Mainstreaming of deaf children into a hearing educational environment started long before the All Handicapped Children’s Act of 1975. One of the first mainstreaming programs for deaf children was founded by Yale alumni David Bartlett who was dissatisfied with educational opportunities for deaf children before the age of seven. He opened one of the first mainstream programs for deaf students in 1852. This program integrated hearing and deaf students and used both sign language, spoken language and lip reading to provide all means possible for learning. (Marschark, M., Lang, H., Albertini, J., 2002)

**US PL 94-142**

After World War II, the eugenics movement began to diminish in society and members of society began to advocate for the integration of people with disabilities into mainstream environments. This prompted the 1975 Education for All Handicapped Children Act, also known
as US PL94-142. (Foster, S., 1989) With the passage of US Public Law 94-142, came the stipulation that all children with disabilities be educated in what the Act states is the least restrictive environment (LRE). The law promotes education of disabled children with their non-disabled peers. (Foster, S. & Emerton G., 1991) The law did state that the decision for placement of any disabled student should be on an individual basis. However, for the deaf population, this stipulation was seen by many school districts throughout the United States to mean the placement of deaf and hard-of-hearing students with hearing peers in the classroom. In other words the mainstreaming of deaf and hard-of-hearing children. (Foster, S., 1989)

According to the 2006-2007 Regional and National Summary, completed by the Gallaudet Research Institute in Washington DC, the national percentage of deaf or hard of hearing students attending “Special or Center Schools” was only 26%, where those attending either “Regular School Setting with Hearing Students”, “Self-Contained Classroom in Regular Education Setting and “Resource Rooms in Regular Educational Settings totaled 74.9%. These research numbers do not reflect all deaf students nationally, only those who voluntarily submitted to the annual survey by Gallaudet Research Institute.

Currently in 2008, Harry Lang, Professor at the National Technical Institute of Technology estimated in a class lecture for History of American Education, that 85% to 90% of deaf students in the United States are mainstreamed. (Lang, H, 2008) No matter how one looks at the numbers, the percentage of deaf students attending mainstream educational settings is well over 50%. Strategies are needed to meet the needs of this linguistic minority placed within the hearing majority environment.
Cooperative Learning – Cognitive & Social Constructivism

Cooperative learning was been extensively researched over the past 30 years with hundreds of studies demonstrating its positive effects on student achievement. (McMaster, K. & Fuchs D., 2002) Based in the cognitive constructivism theories from Jean Piaget and social constructivism theories from Lev Vygotsky which reveal learning and knowledge are social by nature, cooperative learning is an instructional method that engages diverse groups of students on a common learning goal (Vygotsky, L., 1978) Each group member is responsible for ensuring that all group members learn the assigned material. In addition each member is responsible for their own learning. (McMaster, K., Fuchs, D., 2002)

Varying backgrounds of Deaf in their communication preferences

Deaf students have many various communications methods and options from which to choose. Due to the variety of these options, and the rate of adoption by the deaf for any single option, there is a wide variety of different communication methods and preferences in practice today. (Long, G. & Beil, D. 2005) Communicating in groups in the classroom can prove to be difficult when the hearing student’s or teacher’s experience of communicating with deaf students is different from one deaf student to the next. In addition, no one option will work each and every time.

The success of cooperative learning is dependent on the varying abilities of the group members. Heterogeneous groups are designed to give exposure to varying skill levels, communication styles, different races and cultural backgrounds; each of which is supposed to bring something new to the educational experience. (Sherman, 2000; McMasters, K., & Fuchs, D. 2005). McMasters and Fuchs (2005) caution that cooperative learning techniques used in "regular" classrooms with heterogeneous groups have better learning success outcomes than
cooperative learning techniques within special education classrooms. Some critics argue that students within special education classrooms are placed within that environment because of more severe disabilities and therefore wouldn't be expected to have as much success as "regular" classrooms with cooperative learning techniques. The authors further point out that the heterogeneous nature of the groups within "regular" classrooms can provide academic support to those students with disabilities.

Communication is the key to successful interactions and subsequent learning in cooperative learning environments. The varying communication styles can prove to be problematic in cooperative learning environments for deaf students; particularly when communications through interpreters can sometimes introduce lag time and possible third party misconceptions to communications. (Antia, S., & Kreimeyer, K., 2001; Johnson, D. & Johnson, R., 1986) Options that allow the deaf to “communicate for themselves”, not through third parties, allow them greater independence. This independence can lead to greater access to collaborative discussions, independent participation, real time communications, questions for the instructor, incidental learning opportunities and the ability to feel more part of the class in general. Technology can offer the bridge between the deaf and the hearing in a way that allows the deaf student to “speak for themselves.”

In terms of technology options, the Tablet PC has a variety of potential benefits for the deaf in a mainstream classroom. The programs that can be utilized to facilitate classroom discourse and student participation are chat programs, instant messaging, collaboration through visual means – writing on top of given assignments, and representing ideas or thoughts through drawings or graphic representations. These technology tools have the potential to eliminate some
of the communication and social barriers that exist in cooperative learning environments for deaf students in the mainstream.

In addition, the Tablet PC is portable and has the ability to save information once written, drawn or typed. While both the laptop and the Tablet PC are portable, the Tablet PC is different because it gives the extra benefit of spontaneous communication forms in that it uses a pen or stylus which allows students to quickly sketch, draw or write what they want to communicate. These spontaneous communications are often on paper, or through an interpreter, and would need the student to divide their attention from the paper or third party to the work at hand. Also, the spontaneous communications are rarely saved for future reference. With the Tablet PC all communications can be saved and referred to at a later date for better understanding and retention of material.

The addition of the Tablet PC, or other technology, into the classroom gives the added benefit of having the student sit face to face with their peers for communications where body language cues and facial expressions can play an important part in the conveyance of messages. Previous studies have reviewed online collaborations for learning success and found them to be beneficial, however lacking the interpersonal face to face communication cues that can be important for deaf students understanding of social context of the information that is being communicated. (Marschark, M., Lang, H. & Albertini, J., 2002; Roberts, T., 2004; Long, G., Vignare, K., Rappold, R & Mallory, J., 2007)

The intent of this study is to identify ways in which the Tablet PC and inclusion teaching strategies can eliminate the communication barriers and enhance cooperative learning for the deaf student in a mainstream environment.
IV. LITERATURE REVIEW

COOPERATIVE LEARNING

Benefits of Cooperative Learning

The academic benefits of cooperative learning have been documented by researchers throughout the years. (Johnson, D. & Johnson, R. 1986; Jacobs, G. & Ward, C. 2000, Topping, K. & Trickey, S. 2007) Students who are engaged in learning through participation and active exchange of ideas will increase their interest level and therefore maintain focus on a topic. In addition cooperative learning promotes critical thinking among the group members. (Johnson, D. & Johnson, R. 1986) Students who actively participate in discussions will also retain information learned for a longer period of time and will also be able to transfer that knowledge to other areas. (Topping, K.J. & Trickey, S., 2007) Collaborative group learning promotes knowledge acquisition, problem solving ability, content recall, individual accountability and critical thinking skills. (Fish, W. 2006; Pell, T., Galton, M., Steward, S., Page, C., Hargreaves, L., 2007) These traits lead to higher academic achievement for students engaged in collaborative learning. (Johnson, D. & Johnson, T., 1986)

Recently collaborative learning has also been shown to have sustained long term beneficial cognitive gains. Authors K. J. Topping and S. Trickey (2007) published a 2 year follow up to their original intervention study of primary students who were engaged in collaborative inquiry for 1 hour per week during a 16 month study. The original study showed cognitive gains utilizing collaborative learning techniques. In the follow-up to the original study, the authors showed through cognitive ability testing that students after entering secondary school maintained their cognitive gains and transferred them across contexts. This follow-up proved that
not only is cooperative learning beneficial, it has long term sustained positive results for students.

COOPERATIVE LEARNING AND DEAFNESS

Cooperative learning can also help to improve personal and academic self concepts in deaf students (Cambra, C., 2002). This can prove to be a benefit for deaf students in the mainstream who: do not often establish close relationships with their peers; are more comfortable interacting with other deaf students rather than hearing students; and often feel isolated in their classroom environment. (Foster, S., Oct 1988; Kluwin, T., Stinson, M. & Colarossi, G, 2002) In addition, deaf and hard of hearing mainstream students often have difficulty communicating easily with their hearing peers in the mainstream classroom, even with an interpreter present. (Stinson, S. & Liu, Y, 1999) This can lead to frustration on the part of both the hearing and deaf participants in the interaction and subsequent avoidance and withdrawal from any further interactions. (Johnson, R. & Johnson D., 1986) Therefore cooperative learning experiences that can bridge the gap, or level the playing field, between hearing and deaf peers can promote equal benefits for all students involved. (Beaton, C. 2006) This is particularly important for deaf students in that it is estimated are 85-90% mainstreamed in local public schools (Lang, H. 2007) many of whom have a different first language (sign language) than their hearing peers.

D. Johnson and R. Johnson (1986) in their landmark study “Mainstreaming Hearing-Impaired Students: The Effect of Effort in Communicating On Cooperation and Interpersonal Attraction” evaluated mainstream hearing impaired students interactions and communications with hearing peers in cooperative learning groups. Johnson and Johnson found that deaf and hearing students in cooperative learning groups promoted greater interpersonal attraction and in these groups the deaf students did not tend to withdraw from, or be frustrated with,
communications. While communication did take effort, this effort was manageable. It is important to note that efforts were taken to initiate, manage and sustain communications within the classroom. Previous studies have shown little interaction between deaf students and their hearing peers without the intervention and initiation. (Foster, S., 1988; Mertens, D. & Kluwin, T. 1986)

**The Communication Challenge - when deaf and hearing worlds collide**

When two languages contact each other in the same environment the results can be confusing. For deaf and hard of hearing students in a mainstream classroom, language is largely visual. For the rest of the mainstreamed class, the hearing students, language is predominantly auditory. Combining the two can be a cumbersome task. For some it means slowing down, for others it could mean having to go through an interpreter to be understood, and still for others it means transliteration.

Typically, deaf students mainstreamed into hearing student environments use interpreters, voice-to-print captioning and FM systems if there is enough residual hearing to make it worth while using. While these systems do help the student communicate with their hearing peers and teacher, they do not provide direct or real time communication opportunities. Many times there is a concern on the part of the deaf student that their message is not completely conveyed, understood or accurate as communicated through a third party. There is a need for technology as a helper in the classroom to assist deaf student’s communication and subsequent interactions with their hearing peers. Real time communications in their own voice can be an asset to the deaf student. (Long, G., Vignare, K., Rappold, R & Mallory, J., 2007)

With the advent of various forms of instant messaging and the associated technology tools, such as blackberries and hand held computers, many students and adults alike find
themselves communicating through wireless technology – through text. In 2004, it was estimated that 53 million adults used instant messages for communication and 24% of those more so than email to communicate. (Shiu, E. & Lenhart, A., 2004) Many people have found themselves using a shortened text format to convey messages to family and friends. The trend is continuing to rise. This shorten text format is shared by both the deaf and the hearing and can possibly be a common ground between the two.

Greg Williams, Barbara White and Jodi Tutty (2006) describe a generation of students that are now entering colleges and universities that were born after the computer became a "desktop tool", were brought up on "TV channel and Internet surfing and rapid fire video clips" who are used to mobile phone technology and a wired and connected world. These students are technologically savvy. The authors refer to them as the Net Generation. They have experience with technology that can be transferred to the classroom for learning.

TABLET PC AS COMPUTER MEDIATED COMMUNICATION AND DEAFNESS

Computer Mediated Communication (CMC) has been used to help deaf students communicate in real time with their hearing peers and instructors without having to go through a third party. In the conclusion to the study “Access to Communication for Deaf, Hard-of-Hearing and ESL Students in Blended Learning Courses” authors Long, Vignare, Rappold and Mallory (2006) state “the addition of discussion board and other online tools to facilitate written communication provide tools for the deaf and hard-of-hearing students to interact directly with hearing instructors and peers.” They also noted that students were able to accomplish peer to peer learning through technology. The authors further noted that online options for communication helped “level the playing field” and offered “greater ease of communication” with their hearing peers. (Beaton, C. 2006; Long, G., Vignare, K., Rappold, R & Mallory, J., 2007)
Assistive technology is not a new concept in terms of adapting environments for students with disabilities so they can participate in their learning environment without barriers. (Bryant, D. & Bryant, B. 1998) Technology designed programs to build productive learning teams and help reduce barriers to communication for those with disabilities can help to enhance participation and learning. Teams that are allotted the proper amount of time to build relationships and form a vested interest in their team’s success are particularly likely to be successful. (Mainzer, L., Castellini, J., Lowry, B., Nunn, J., 2006) The Tablet PC has been successfully used to level the playing field between deaf and hard of hearing students, and deaf students with varying communication styles, by providing a common ground communication tool. (Beaton, C., 2006; Liu, C., Chou, C., Liu, B.J. & Yang, J.W., 2006) The key to successful collaborative learning is communication; the Tablet PC can help to facilitate communication for the deaf with their deaf peers, their teacher and their hearing classmates by providing a variety of communication tools and options.

The Tablet PC

The Tablet PC has a digitizer that can accept physical touch or digital pen for inputting to the screen of the PC. Text and information inputted to the Tablet PC can be entered using handwriting or speech recognition, standard keyboarding (attached through normal wireless or USB connections) or with pen inputs. As with any computer, all input can be stored, manipulated and printed for further analysis or future referral.

The in-classroom use of the Tablet PC has several benefits over online collaborative learning options in that it promotes face to face interactions, real time communications and opportunity for immediate corrections of miscommunications. These features give deaf students the much needed practice skills for working in the hearing world.
From his study of ten one-to-one laptop K-12 schools in California and Maine, Mark Warschauer concluded that in classroom use of one-to-one laptops promote information and literacy skills; however the socioeconomic context, visions, values and beliefs of those using technology within the classroom all play a part in shaping how the technology is used, and of what benefit it will be. (Warschauer, M., 2007) This face to face contact provides the true interactive environment where students are engaged in meaningful discussions that will promote learning. In an online environment information is posted without visual body language cues, which for the deaf, can carry critical information. The ability to correct misconceptions and immediate feedback are other benefits of face to face use of computers in the classroom. Classroom use of Tablet PC technology can promote and enhance communications in real time and therefore give access to the rich dialog needed for enhanced learning.

The features of the Tablet PC that make it such a powerful tool for collaboration are its portability, ability to be networked, versatile communication modes and the ability to save conversations and spontaneous communications for later referral. Not only are students able to type information to each other, they are also able to collaborate through handwriting, pictures and sketches of ideas. This quick pictorial information is critical to deaf students whose main mode of communication is visual. This is particularly true for math and science formulas and applications. Computations and graphical ideas can be quickly sketched and shared using the Tablet PC.

Tablet PCs are already being used in higher education environments by hearing students for collaboration. Students at MIT enrolled in the 2002 International Design Contest for robotic design were given Acer TravelMate 100 Tablet PCs for collaboration. Author Paul McCloskey of “Tablet PCs Stake Out Higher Ed” in Campus Technology noted that the Tablet PC played a
key role in the early design process for the competition. Teams of students were able to take the Tablet PCs to their workstations and different laboratories as needed where they could quickly sketch out and modify ideas and share them with the team. Even complex shapes and mathematic formulas were easily collaborated on and shared. (McCloskey, P., 2002)

Students of the Net Generation that have grown up with Internet surfing, instant messaging and digital social network tools and are familiar with these technology tools. This knowledge can be transferred to the learning environment. Authors Williams, White and Tutty (2006) wrote about Tablet PC workshops that are being held instead of class lectures at Charles Darwin University in Australia in an attempt to engage first year students and enhance their initial college experiences. These workshops are designed to cater to the technology experience students bring to college, and their preference for it, by incorporating online chat rooms, digital social networks, mobile technologies and the Internet into the learning experience. The workshops are hands on practice and collaborative activities designed to engage students in enhanced learning. Initial findings from the workshops are that students engage more readily in their learning, cultural differences blend in this environment and students are using the technology for the intended enhanced collaborative learning. In addition, students are interacting with each other on a more personal and social level bringing enhancement to the social experience at the college. (Williams, C., White, B. & Tutty, J., 2006)

**Tablet PCs – Leveling the playing field between deaf and hearing.**

Tablet PCs have also been used for collaborative learning with the deaf. (Beaton, C. 2006; Liu, C.C., Chou, C.C, Liu, B.J. & Yang, J.W., 2006). In the article “Tablet PCs as a Leveling Device” Catherine Beaton from Golisano College at Rochester Institute of Technology details her study for bridging the communication gap between deaf and hearing students using Tablet
PC technology. In the study Tablet PCs were distributed to groups of both hearing and deaf students for team discussions in a mainstream college level environment with the stipulation that the chat program be used for all group discussions. This was so the deaf people in the class could participate in real time in the discussions, without the use of an interpreter. The Tablet PCs were also used to facilitate communication between the instructor and the groups as well. Beaton states that, "The use of the Tablets allowed the Deaf students to participate at a pace that was more acceptable." By acceptable the author means that there was no interpreter to introduce lag time into conversations. In classrooms where there are both hearing and deaf individuals, the lag time from the speaking teacher being communicated through an interpreter can cause some information to be lost, as well as, missed opportunities for questions by the deaf students. Rather than interrupt the hearing students and the class pace, deaf students will hold their questions and many times never ask them. (Beaton, 2006). In addition, all side comments and discussions between students are mostly missed. Beaton notes that a benefit of using the Tablet PC is that a deaf student can communicate and act independently. Collaborative learning is enhanced through the independent nature of these types of communications.

Another such study of CMC focused upon a group of deaf students with varying communication preferences and methods. This study produced similar findings in that deaf students felt they could share equal responsibility for collaborative work and that the CMC provided equal access to participation for the deaf students in the group regardless of how they normally communicated. (Pandian, M. 2006) The study also proved that students using CMC were able to include more pertinent information and summaries with regard to the assignment than groups without CMC. While not examining communication between hearing and deaf students, this study does illustrate that computer mediated communication can level the playing
field in the classroom with students from many varying communication styles to that of one style—communicating through the computer. The study findings can also be applied to both hearing and deaf communications. A reduction of the varying communication modes to the single common mode of communication produced positive learning results and increased participation by students in the group using CMC. (Pandian, M., 2006)

In addition to cooperative learning in a group setting the Tablet PC offers the deaf student the ability to annotate through typed words, handwriting or drawing the materials being covered in class. This provision of ability to spontaneous annotate class materials for further reference and future exploration can help the student take charge of, and enhance, their own learning. With the Tablet PC all annotated notes can be saved for future reference.

**Tablet PCs Support Collaboration**

Authors Alvarado et al. from the Microsoft Research University Relations Program note that the main strength of the Tablet PC is its ability to support collaboration. The pen stylus makes communication more natural. (Alvarado, C., et al, 2004). This is particularly important for students in a deaf classroom where communication is in the visual mode. Having to watch the teacher, an interpreter and what’s on a screen can be a tiresome task. By collaborating on materials on a Tablet PC everyone is watching the same thing and expanding on it. Real time chats can be initiated spontaneously for further understanding all on the Tablet PC so the students’ attention is focused on one common tool. Again, the importance of classroom discussion for deeper more meaningful understanding of materials can not be understated.

**Technology Innovations for the Tablet PC**

There are more innovations being created to help facilitate the use of the Tablet PC in real time communication and for use in the classroom. One such example is a new collaboration tool that
has started to be used to facilitate communication among deaf or hard of hearing people. This technology tool is called Facetop. (Stotts, et. al., 2005) Facetop allows students to collaborate via video streams from two different computers. This would be particularly helpful for two deaf students who wanted to collaborate long distance on a project using sign language and the Tablet PC collaboration tools. See the picture below for an example of Facetop being used.

Tablet PCs for the Deaf in Math Class

In their study of the use of Tablet PCs with deaf and hard of hearing in math classes authors Liu, Chou, Liu and Yang (2006) found that Tablet PCs significantly enhanced student achievement in the course. The student-teacher interaction helped to enhance understanding of the lecture content and decrease distraction for the deaf students. Their study also showed that the implementation of Tablet PCs in the classroom actually increased student’s participation in class by reducing communication difficulties. The dynamic exchange of submitting course work for feedback by the students also helped them learn faster. (Liu, C.C., Chou, C.C, Liu, B.J. & Yang, J.W., 2006)
Preparation and practice make implementation smoother

As with any technology implemented in the classroom, careful consideration, preparation and resources must be allotted in order for that technology to be successful. As for the implementation of Tablet PCs in the classroom, students and teachers who will use the technology should be provided practice and instruction in using the technology before the technology is brought into the classroom. The key is preparation. In the article, *Experiences From a Wireless-Enabled Tablet Classroom* authors Tutty, White and Pascoe (2005) shared their learnings from experiences where there was little preparation work done before the Tablet PC technology was brought into the classroom and tried. The lack of prep work created difficulties because when there were problems with the technology, no one on-site knew how to fix them. This created frustrations among the students. Those students who were more technically savvy, or using the Tablet PCs for a technology related class, reported fewer instances of problems. However if appropriate instruction and practice had been done before using the Tablet PCs in the classroom, the process of implementation of the Tablet PCs would have been smoother. The authors also noted that despite the fact that students had complained about many technology difficulties and frustrations with the initial use of the Tablet PCs, the majority of the students in the study were agreeable to using the Tablet PCs again. They stated that the Tablet PC held their interest longer and made the learning experience more collaborative, thus more information was retained. This study illustrates the need for proper training and preparation before technology can be utilized in the classroom. Proper preparation and practice is needed for any technology implemented in the classroom, not just the Tablet PC.
TABLET PC POTENTIAL DRAWBACKS

Cost
The use of Tablet PCs in the mainstream classroom is not without some difficulties. According to EducationWorld.com, the Tablet PC typically costs approximately $200 more than a laptop and certainly more than a desktop computer in the classroom. (Jackson, L., 2004).

In a study by Luckner, Goodwin, Muir and Johnson Howell (2005) the authors stated that even if teachers are aware of the different needs to be accommodated for a deaf or hard of hearing student, they have a hard time convincing administrators of the school that the services, technology or interventions are needed. This is also true of any school with a tight budget, however the benefits provided should be weighed against the cost and time needed for implementation for any service or technology.

Potential User Error
Technology is only as good as the individual using it. More schools are adopting the use of Tablet PCs however this technology is not in wide use today. Because of the sporadic use of this technology, technical support for the equipment and software may also be sporadic. In order for any technology to be fully utilized to its potential, practice must be made available with the equipment and software before any true benefit can be measured.

Another factor that will affect the efficacy of the Tablet PC in group collaborations is the various computer abilities of those in the group. Those with better computer skills such as typing, more experience with technology and in general those more computer savvy should be strategically placed within cooperative learning groups in order to facilitate the use of the technology. The deaf student, if not already technically savvy, will also need to be brought up to speed. These varying skills may cause communication to slow down at first; however practice at
using the technology can help. Students are becoming more and more comfortable with technology as it is introduced younger and younger in schools and at a rapid pace. More and more schools are moving towards classroom activities and interactive, collaborative projects utilizing the Internet giving students critical computer experiences. (Marschark, M., Lang. H. & Albertini, J., 2002)

**Divided Attention**

Students will need to divide their attention between each other and the Tablet PC screen in order to communicate. Body language, gestures and facial expressions are important components of communications for deaf individuals and can not be discounted when utilizing the technology in the classroom. (Marschark, M., Lang. H. & Albertini, J., 2002) While the student would need to divide their attention between the Tablet PC and their partner during group work; this is one less thing to attend to than using an interpreter and paper for group work. With the Tablet PC, the deaf/hh student would communicate directly in real time through a chat program (writing or typing) with the hearing student. The student’s attention would be all on one, or two if using two, Tablet PCs and their partner or group members. Again, the students would all be looking at the same information and dialogue; this means that they are attending to each other or the Tablet PC or two different things. With an interpreter, the students would need to attend to each other; the interpreter and the paper in front of them this means the student would be dividing their attention between three things.

The use of Tablet PCs in the classroom, rather than computers in an online environment, has the benefit of being face to face with group members. Miscommunications can be instantly clarified and if need be conveyed pictorially. It should also be noted that attention would also need to be
divided between assigned tasks and an interpreter or captionist if these were being used for communication in a cooperative learning setting instead of the Tablet PC.

SOCIAL ASPECTS OF TABLET PC TECHNOLOGY INCLUSION

Mainstreaming – Social Effects

With the mainstream placement of deaf students came challenges with regard to social isolation, communication differences and cultural clashes between deaf and hearing peers in the classroom. Deaf students often experience isolation in the mainstream academic environment due to the fact that they are a linguistic minority placed within a hearing majority. (Stinson, M., Chase, K. & Kluwin, T., 1990; Foster, S. & Emerton, G. 1991; Stinson, M. & Lang, H., 1994)

Students often feel isolated in the mainstream and miss out on important informal and incidental learning in the classroom such as peer to peer interactions, whispering of information and information conveyed through social interaction. (Foster, S., 1988) Mainstream adolescent hearing impaired students have reported feeling a better sense of self emotional security when interacting with other deaf and hard of hearing students. In addition they reported no more comfort or emotional security with an increase in the number of mainstreamed courses they took with hearing peers. (Stinson, M., Chase, K. & Kluwin, T., 1990) Authors D. Mertens and T. Kluwin (1986) found that simple exposure of deaf students to their hearing peers in the classroom does not imply, or stimulate, interaction between deaf and hard of hearing students in a mainstream setting. Teachers must facilitate and set up learning environments in which deaf and hearing students have meaningful interactions such as in cooperative learning environments. In order to do this, technology such as the Tablet PC may serve as the bridge between the hearing and the deaf.
Deafness in America is typically seen through the medical model, it is seen as a loss of ability or a handicap, although this is not how most Deaf individuals view themselves. The medical model perpetuates the ideal of the deaf person as someone to be fixed, pitied and with something wrong with them. (Foster, S., 2001). This can taint the view hearing peers in the classroom have of a deaf peer. Hearing students that have a positive attitude towards interactions with deaf students in the classroom can contribute to a meaningful and engaging experience for deaf students; however deaf students also must take appropriate actions in order to fully participate in classroom activities. (Stinson, M. & Liu, Y., 1999) Students that fully participate in learning environments learn better. However, authors of this study also caution that participation in class through meaningful interactions with peers does not imply social acceptance. Social acceptance barriers may inhibit the participation of a deaf student in the mainstream classroom even when deaf students are able to communicate. (Stinson, M., Liu, Y., 1999)

Encouraging comfortable participation in which deaf and hard-of-hearing students interact and learn with their hearing peers through direct communications can help both deaf and hearing students have a positive view of deafness and reduce the stereotype of deafness as loss of ability or handicap.

TECHNOLOGY IS OF HELP BUT IT IS NOT ENOUGH

Inclusion Strategies
There are many different ways to include the deaf and hard of hearing student in the classroom and enhance learning experiences for them. Some of the ways in which this can be accomplished are through teaching strategies for working together. Other ways include the
addition of technology to the classroom to facilitate communication, increase participation and enhance learning. The point is that accommodations, changes and attention to inclusion must be made in order for deaf students to be successful in a mainstream environment. (Luckner, J. et al, 2005).

Learning in group activities requires effective exchange of information. (Stinson, M., Lang, H., 1994; Ballentine, J. 1997) Even informal informational exchanges can provide learning for students; such things as attitudes, whispers of information exchanges and stories from other students can provide additional learning. With the majority of the deaf population’s children being educated in mainstream settings, it is important to recognize the need for a leveling of the playing field for educational experiences, both formal and informal, so deaf students are able to effectively take part in these informational exchanges.

Researchers D. Mertens and T. Kluwin (1986) already found that simply having deaf students in the same classes with their hearing peers does not instigate interaction between the two. There must be a concerted effort by the teacher to engage students, make the content more visual and to encourage classroom discourse.

This effort may include teaching deaf students the different roles students can play within the classroom. These roles may be inherent to hearing children, which take for granted the incidental learning opportunities afforded through classroom interactions with their peers. However, for deaf students in the mainstream these roles may not come naturally and therefore they must be taught them. (NTID Class Act Website, 2008)

**Student Roles**

One way to enhance deaf student participation is to enhance their sociability and peer relationships within the mainstream classroom. Studies show that rich communications with
meaningful interactions between diverse students can promote learning (Natal, D., 1997; Kluwin, T., Stinson M., Colarossi, G., 2002). Teachers can promote interactions within the classroom through cooperative learning strategies; however simply placing a deaf/hh student in a group with their hearing peers with specific instructions to perform tasks may not be enough to promote interaction. Deaf students may need to be taught the different roles that their hearing peers automatically assume in a group situation. (Miller, K., 1995; Natal, D., 1997; Kluwin, T., Stinson M., Colarossi, G., 2002)

Social skills are necessary when promoting interactions between students. Typically deaf students are less socially mature than their hearing peers; those in separated classes even more so than those who are mainstreamed. Those in “mainstreamed” environments are typically placed within this environment because they are more socially mature than separate class deaf students. (Kluwin, T., Stinson, M., 1993)

This disparity in maturity between deaf and hearing students can lead to lack of conversation initiation, sustained communication and participation between deaf and hearing students. (Kluwin, T., Stinson, M., Colorassi, G., 2002). Teaching the necessary social roles within the classroom and giving opportunity for practice through cooperative learning techniques can help enhance student participation and subsequent learning through peer to peer learning. (Natal, D., 1997) True learning requires sustained meaningful interaction so skills in initiating, maintaining and leading discourse are necessary for positive learning outcomes.

The ClassAct website developed by the Research and Teacher Development Department at RIT/NTID has the following roles listed to help teachers involve deaf and hard of hearing students in the classroom through taking the initiative for their own learning. In order to do this several roles, such as listed below, are rotated through cooperative learning group members in
order for each group member to practice the necessary roles involved in group dynamics so they can effectively participate and communication in the classroom.

- **Leader** – Coordinated the group efforts
- **Checker** – Stops group at each “checkpoint” to compare work and calls on group members to explain their work to others.
- **Reporter** – This person writes up the official group work answer to be turned in for credit
- **Encourager** – This person encourages all group members to participate and assist each other towards the common goal. This person is also responsible for evaluating how well the group has worked together and gives suggestions for improvement.

Source: [www.rit.edu/classact](http://www.rit.edu/classact) (1016-319 Data Analysis - Group Work Guidelines)

**Mentors**

Those students who need more help can be assigned a student mentor to help them. Deaf students in non-mainstream environments often check with each other in the classroom to ensure they understand the material being covered. In a mainstream environment the student doesn’t have this luxury of checking with a peer and having a mentor assigned to them may help bridge this gap. (Natal, D., 1997) Some teachers promote peer to peer conversations and line of questioning in order for students to retain more knowledge by actively participating in the lesson. To this end, cooperative learning work groups are strategically set up and time allotted for conversations between deaf and hearing peer groups. Those groups using an interpreter need to be allotted time for interpreter or captioning lag time. Group work done through instant messaging or real time communications on a computer have the potential to reduce this lag time.
Teaching the Teacher

In addition to teaching the students how to perform and involve themselves in their own learning, it is necessary to also teach the classroom teacher cooperative learning techniques as they apply to deaf students. Also critical is for the teacher to practice these techniques; particularly with mediating deaf students within a hearing mainstream classroom. Special detail must be paid to the success of student roles, responsibilities and equitable knowledge and communication within these groups. (Natal, D., 1997) Support personnel, teachers of the deaf and interpreters also play a large role in the effectiveness of classroom communication. (Stirson, M., Liu, Y., 1999).

While social roles and skills can help, in all it takes a team effort to ensure smooth and meaningful classroom discourse and interactions.

V. METHOD

This project focuses on qualitative exploratory research that analyzes the potential need for and possible inclusion of Tablet PC technology and teaching strategies to enhance cooperative learning in the mainstream classroom environment. After observations, suggestions for use of the technology and assigning student roles, and additional teaching strategies will be shared.

Feedback via interview and survey will be solicited from the teachers or TODs involved in the study.

The goals of the project include:

- To observe a small group instruction and student interaction (deaf and hearing) to identify cooperative learning opportunities utilizing the Tablet PC.

- To identify opportunities for enhanced classroom participation and communication using Tablet PC technology in the mainstream environment.
• To identify opportunities for facilitating sharing of classroom work through Tablet PC technology.

• To identify opportunities where the Tablet PC technology may enhance deaf student’s peer relationships within the classroom.

• To identify teaching strategies that may supplement use of the Tablet PC and that may enhance deaf students’ communication, participation and cooperative learning experiences.

Participants

Three deaf students within the mainstream environment and their classroom teachers and TODs in the Rochester, New York area will be observed. Two students will be in middle school and one student will be in elementary (Science) school. The classes to be observed will either be math or science. Students for inclusion in the study will be identified by the Director of Deaf Education BOCES of Monroe County. TODs that take part in the survey portion will be asked to sign an Informed Consent form in order participate in the study. See Appendix D for this form.

The signed forms will be kept with Dr. Michael Stinson at NTID and will not be published in this report so that the names of the participating TODs will remain anonymous.

Measures

After agreeing to participate in the study, students and their teacher will be observed during normal class periods. After the observations, a meeting with the TOD for the classroom will be set up to share suggestions and demonstration of the Tablet PC technology. The following measures of evaluation will be used. An interview and survey of perceptions will be conducted with the TODs to gain feedback on the following:
1. **After sharing of suggestions from the observations:**

   - **Interview** teachers or TOD to gain feedback and insights on suggestions developed from the classroom observations and their insight to experiences to cooperative learning for deaf and hard of hearing students in the mainstream. See Appendix B.

2. **After modeling the Tablet PC technology**

   - **Survey of teacher’s perceptions** of proposed modeled technology inclusions – Increased student participation, communication and enhanced learning. See Appendix C.

**The Activity**

**Part 1**

In part 1 of the study teachers and students in the mainstream elementary (1) and middle (2) school settings will be observed for at least one classroom period that includes group activities.

During the observations, data will be collected on student interactions, quality of communication and participation in group activities. An observation checklist will be used as a guide that includes items such as seating of student and service provider, class content, activities, technology used in the classroom and documentation of student interactions.

Suggestions will be formulated regarding the inclusion of various technologies and Tablet PC technology in the classroom to facilitate cooperative learning among deaf and hearing students. Particularly with regard to ways in which the Tablet PC can help facilitate: deaf student participation and communications between the deaf student and their hearing peers, teacher or support personnel; and real time communication. See Appendix A for Checklist for Observations of Mainstream Classroom Environment.
Part 2

Part 2 of the activity will have two components. The first will be an interview of the teachers or TOD to share the suggestions for teaching strategies for cooperative learning with deaf students in the mainstream environment and to gain feedback on these suggestions. The interview will include questions regarding deaf student’s participation and communication during cooperative learning and also successful strategies already in use within the classroom.

The second component will be a modeling of the various Tablet PC technology for the TOD. Feedback will be solicited via survey regarding whether or not the modeled technology and suggestions would facilitate:

- Deaf student participation in cooperative learning
- Communications between the deaf student and their hearing peers, teacher or support personnel
- Direct real time communication
- Deaf student involvement with the class. Enhanced sociability in the classroom.
- Features of technology (Tablet PC Technology)
- Appropriate types of cooperative learning activities (i.e. worksheet collaboration, research on the Internet, debates, etc.)

Analyses

Field notes will be analyzed for recurring themes, based on major topics that emerge in the observations. The analysis will occur in stages. The observation field notes and checklists from the different observations will be reviewed, and a set of code categories developed. The investigator will then code the field notes. A report will be generated in which the major themes are described and supported through use of quotations and observations.
Analysis of the interview and survey feedback will be done to determine if the recommended Tablet PC technology and associated strategies would be of benefit for the mainstream classroom environment. The final product will be a reference report with the following:

- A summary listing of cooperative learning strategies and observed behaviors identified from the elementary and middles school mainstream classroom observations.
- A summary listing of the technology inclusions identified from the elementary and middles school mainstream classroom observations.
- A summary of the interview results regarding teacher’s experiences and recommendations for cooperative learning for the deaf/hh student in the mainstream environment.
- A summary of the Tablet PC survey results with teacher’s perceptions of the modeled Tablet PC Technology to determine if they feel: the Tablet PC would help deaf/hh students communicate and participate better in class; promote self directed learning by giving the student the option to annotate note taker notes; and finally enhance cooperative learning strategies in the mainstream classroom.
- Recommendations for further research including interventions using the Tablet PC if warranted.
- Recommendations for features of small group activities
- Recommendations for features of Tablet PC use

Questions to be answered:

- Does the modeled use of the Tablet PC appear to help cooperative learning through leveling the playing field between the deaf and hearing students in the mainstream classroom?
• Would the modeled use of the Tablet PC have the potential to facilitate participation of the deaf student in the mainstream classroom for group work?

• Would the modeled use of the Tablet PC have the potential to facilitate discourse opportunities for the deaf and hard of hearing student in the mainstream?

• Would the use of wirelessly connected Tablet PCs between the note taker and the deaf/hh student allow deaf/hh students to take charge of their own learning by giving them the ability to annotate notes taken by the note taker?

• Can the Tablet PC foster peer relationships by allowing students to “speak for themselves”?

VI. ANALYSIS

Recurring themes from the 3 observations for cooperative learning are as follows:

SUMMARY OF COOPERATIVE LEARNING - FROM OBSERVATIONS

1. Deaf and hard of hearing students had a tendency to communicate more with the interpreter than with their partner in the group. Particularly for clarification on answers to the questions it often seems desirable for students work with their partners to find answers to questions.

2. Deaf and hard of hearing students sought guidance on what to do next in an activity with the interpreter rather than confer with their partner.

3. Deaf and hh students sought clarification of answers with interpreter and not the other student in their group.

4. Hearing students can get frustrated with the deaf student when they don’t appear to be communicating with them and appear to be communicating more with the interpreter. Similarly both the hearing and deaf students can become disengaged from the assigned activity if communication breaks down between the deaf/hh and hearing student or if the
deaf/hh student relies too heavily on the interpreter to help them do the activity rather than
the assigned partner.

5. Hearing students appeared to sometimes resent the amount of attention given to the deaf/hh
student by the interpreter. In all three observations of classes I noted that the hearing student
at least once during the activity became frustrated with the lack of attention from the deaf/hh
student because they were too quick to ask for clarification and help from the interpreter
rather than work on the problem with the hearing student. This would hint at an underlying
problem that deaf/hh students may not know how to work with a hearing student on an
activity and they may need to learn the student roles within a group activity. There is also the
issue of what is the type if information that the deaf/hh student needs and where can they get
it.

6. The deaf/hh and hearing students working in groups together had a tendency to lapse into
silence and work independently. Meaningful in depth communications were had between the
interpreter and the deaf/hh students and the interpreter and hearing student but not between
the deaf/hh and hearing students.

7. When both students need to write answers on their own sheets there is a lot of time with their
heads down and no communication possible – if the students were sharing one sheet they
could concentrate on the task together. If the worksheet were displayed on a Tablet PC, it
would give the students in the group a single focus and encourage students to work together -
including writing their answers together.

8. Group instructions from the teacher are often verbal and interpreted for the deaf student. If
the student has his or her head down writing, they may miss critical information pertaining to
the activity. The interpreter often gave this information after the fact.
9. Communication with the other group members tends to be slower and more labored with an interpreter. For example, in one group activity observation the two hearing students working with the deaf and hard of hearing student became frustrated with the lack of time given by the teacher to come up with answers to the worksheet and they began talking to come up with the answers rather than collaborating as a group through the interpreter because it took too much time. There was also a time when the hearing students rolled their eyes when trying to make communication work through the interpreter.

10. Division of attention can be a problem for a deaf student when placed within a busy work group where there are time limits to complete activities. For instance, if the teacher says talk among yourselves to see if you can arrive at an answer, if all the students in the group communicate at once the deaf student doesn’t know where to look – at the other students, the interpreter or should they start communicating themselves. This chaotic approach to communication should be avoided with deaf/hh students.

11. The deaf students will interact with the student they are placed with in their group but during the three observations I noted that they rarely interacted with other groups around them. Many of the hearing students shouted to each other what problem they were on, that they had found an answer or shared hints for solving the problems with other groups. The interpreter should encourage this type of exchange with other students in the classroom.

12. While the deaf/hh students didn’t interact with the other groups, they did look around to see what others were doing and how they were doing relative to others in the class. This may be a source of anxiety for the student because they don’t know what is happening with the other groups. One deaf student, using residual hearing, heard a loud whoop from another group that found an answer and immediately looked over, he asked the interpreter for a reason that
the group was excited. When the interpreter told the student that they had found one of the answers, the deaf student asked which number – this I believe was in an effort to gage where he and his partner were in comparison to the others in the class.

13. Technology when used in the classroom to make activity instructions and the activities themselves in the room more visual helped the deaf/hh student know what to do better. In one of the classroom observations, the teacher did not use written instructions and simply spoke the instructions for the activity to the students. These instructions were given to the deaf student through the interpreter, however, the instructions needed to be explained further by the interpreter before the group could start the activity.

14. When the interpreter is working so closely with the group for the activity there was a tendency, at least in these three instances, for them to give answers rather than let the students arrive at the answers. In addition there was also a tendency for the interpreter to give confirmation or hints if the answers were wrong to the deaf student when they should encourage the group to try again to figure out themselves how to solve the problem. This help to the students was well intentioned.

15. Further study would be needed to determine if having the same partner or group for activities would increase comfort level and ability to communicate smoother if the students were accustomed to each other in a group. One of the teachers noted that she changes the groups every unit and the students would need to work with a different set of people at each unit change.

16. For all three observations, the deaf/hh students used gestures, body language, pointing and tapping to gain hearing student's attention and to express ideas. While no formal sign
language occurred during these communications, the non-verbal cues helped to convey meaning and to accomplish the task at hand.

17. Two of the deaf/hh students used their voice to gain attention from their hearing partner; however, most of the time deaf/hh students used tapping or waving to gain attention. Either way the hearing students didn’t seem to mind being tapped or waved at and these methods were successful at getting student’s attention.

18. Deaf/hh students usually communicated ideas through the interpreter or through “doing” the activity or assigned task. One of the students found this “hands-on” approach to be off putting in that they felt the deaf student was “taking over” rather than communicating through action. The interpreter explained this action to the hearing student who adjusted and again worked with the deaf student to solve the problem.

SUMMARY OF SUGGESTED TECHNOLOGY INCLUSIONS - FROM OBSERVATIONS

LCD projector – use LCD projector instead of an overhead projector

1. An LCD projector enables real time populating of worksheets using computing tools such as MS PowerPoint or MS Word in comparison to a white board.

2. An LCD projector provides neater display of information because it can be typed.

3. Using any kind of projector makes answers visual instead of just verbal. In one observation none of the answers were shown on an overhead they were all verbally given.

Smart Board

4. A Smart Board may be used to display worksheets – again to make answers and work more visible.
5. A Smart Board may be used to highlight key phrases with color and to make materials more visually distinct.

6. A Smart Board can be used to show how to arrive at answers to various problems – especially those more visual

**Tablet PC**

7. A Tablet PC may be used to wirelessly connect the note taker and student’s computer displays so that all information can be captured without the student having to write the majority. This means students will spend less time with their head down so they can pay attention to the interpreter.

8. Wirelessly connecting the student to the note taker also gives the added benefit of allowing the deaf/hh student to annotate the notes being taken with information they obtain incidentally such as student discussions and information given by the teacher. This gives the deaf/hh student the opportunity to take charge of their own education by helping them manage or direct their own learning.

9. A Tablet PC may be used for communication. In some situations it may be used for chatting in group instead of an interpreter for direct communications. The benefit of this is that students learn how to communicate for themselves. The deaf/hh student gains experience conveying meaning and self correcting any miscommunications that arise which are important communication skills to have. In addition the Tablet PC can also have the benefit of slowing conversations and making the conversations visual instead of auditory. There is less chance for chaotic communications with all members in a group speaking at one time.

10. The Tablet PC gives a single focal point for both content material (worksheets) and conversations (chat feature).
11. The Tablet PC may be used to show students how to arrive at answers to different activities, especially those that are visual such as tangrams and building circuits.

12. With a Tablet PC, students can write on worksheets and try answers, erase them and try again with the eraser function.

13. With the Tablet PC students can communicate for themselves (either by writing, typing or drawing).

14. The Tablet PC may be used for collaboration with a partner through use of - chat feature, drawing features, erasing features.

15. Using the Tablet PC to save all information captured from class for future reference, study and self directed learning.

C Print - For appropriate students, C Print can be used to:

16. Capture terminology and definitions without a lot of finger-spelling.

17. Capture communications and discussions.

18. Keep a log of what was said in class so nothing is missed.

From these observations, use of the Tablet PC to show TODs was formulated. This list is below:

**TABLET PC FUNCTIONALITY TO SHOW TODS**

The following activities were conducted to demonstrate the possible applications of Tablet PC’s to support deaf/hard of hearing students.

1. Wirelessly connect note taker and student Tablet PCs so the student can view all information without having to write themselves. This arrangement would help students pay attention to the interpreter and class discussion. (Example: Worksheet filling in vocabulary and definitions)
2. Wirelessly connect note taker and student - Student can annotate notes being taken by note taker so they can take charge of their own learning.

3. Using Tablet PCs for students to collaborate on a worksheet - single focal point for attention between partners or group members.

4. Using Tablet PC - as communication device. Used for chatting in group instead of interpreter – direct, real time communications. Show using handwriting, drawing and typing.

5. Tablet PC for ease of eraser function - tangram example moving objects after traced on computer for easy manipulation.

6. Tablet PC for completing worksheet shown in science class. Show how to highlight key phrases and important information for future reference.

7. Show saving of notes for future reference.

8. Show use of CPrint on Tablet PC and how students can annotate CPrint captioning.

INTERVIEW RESULTS - COOPERATIVE LEARNING
The interview results were captured using a Clipboard Survey tool which managed each TOD’s answer with respect to each of the 7 questions on cooperative learning. The results can be seen in Appendix E of this report.

SUMMARY - COOPERATIVE LEARNING SURVEY
Four Teachers of the Deaf (TODs) were surveyed with regard to cooperative learning strategies for deaf/hh students in the mainstream classroom. When “all of the TODs” is used this means all four of the TODs surveyed, otherwise the number of TODs with similar opinions are indicated.

Participation
The TODs interviewed for the survey had current experiences with very oral deaf or hard of hearing students; because of this, their answers with regard to how a student participates and
communicates within a group centered around oral methods such as using voice, lip-reading, using an FM system and residual hearing.

In general the TODs did not indicate a general lack of participation effort on the part of the deaf or hard of hearing students with regard to group work. One TOD did mention that sometimes hearing students sit back and let the deaf student take over the activity because it's easier than communicating with them. Another TOD indicated that the deaf student may have trouble participating because of lag time from the interpreter, fast pace of group work, misunderstanding of the material leading to a lack of confidence on the part of the deaf student.

One major theme throughout the interview answers was that a significant barrier to participation in group work by the deaf or hh students was pace of the communications during group work. If the pace is too fast the deaf student had trouble attending to the discussion.

**Communication**

Typical communication for group work is done through an interpreter (sign) or through the deaf student using their voice. All of the TODs surveyed indicated that sign and voice are used for group work. Two of the four TODs indicated that the hearing students in the class know some basic signs and will try to communicate through signing to the student.

One challenge to communication mentioned throughout the survey by the TODs was pace of the class and trying to attend to the speaker in the classroom or in their group – in other words visually following a fast paced conversation.

With basic signing skills it would be hard to hold a meaningful conversation in depth enough to have true interactions. This is an area where the Tablet PC could help because students are able to speak for themselves through the computer, continuously, in real time.
One typical method for controlling communication turn taking and group communication pace is for students to pass the FM microphone from one group member to the next.

**Role of the Interpreter – Cooperative Learning**

The role of the interpreter is seen as a facilitator of communications for the deaf student in the group; either to clarify what is being said or to communicate what the deaf student has signed. Another role mentioned is that the interpreter should help control group communications – as a moderator. One TOD pointed out that this role is particularly important in group work in that sometimes it may be hard for the deaf student to keep up with the conversation, if the conversation isn’t moderated, the activity will break down and no learning occurs.

All of the TODs surveyed indicated that the interpreter should be part of group work to let the deaf student know what is being said and to voice what the deaf student wants to communicate.

Three of the TODs mentioned “understanding” of classroom discussions. This suggests not only a conveyance of what is being verbalized, but also a derivation of meaning from the conversation that needs to be conveyed to the deaf student. Two of the TODs specifically mentioned that sometimes the interpreter’s role is to clarify information to the deaf student so they can understand what the group is saying or what the group needs to do next.

**Deaf Students Communicating for Themselves**

All of the TODs interviewed feel that it is important for a deaf child to “speak for themselves”. Two of the TODs indicated that speaking for themselves would show their thought processes or intellect.

NOTE: this interview was before the modeling of the Tablet PC chat program. Two TODs were unsure if chat programs would help a deaf student “speak for themselves” because
they had not seen chat programs before, another TOD thought that it would help deaf students “speak for themselves” and the final TOD had trepidations whether the use of chat programs would produce anxiety in deaf students due to their lack of English proficiency.

One of the TODs felt that using a chat program could help foster peer relationships within a mainstream classroom – however the TOD cautioned that some would embrace technology and others might fear it.

**Typical Cooperative Learning Challenges for Mainstreamed Deaf**

The TODs identified these typical challenges with deaf students and group work: a tendency to withdraw from group activities, pace of communications, chaotic communications with everyone talking at one time and the deaf student doesn’t know where to attend and too large a group size.

One challenge noted by two TODs is that deaf students have a tendency to take over the group activity and focus on it themselves without sharing the work load with the other student. This was noted during the observations – the deaf students would eventually separate and work independently from the group or from their partner.

All of the TODs indicated small group size as a factor to successful cooperative learning experiences for deaf/hh students (either in the question pertaining to challenges for cooperative learning or how to improve cooperative learning experiences for deaf /hh students). If there is more than one or two other students working with the deaf student, there is a tendency for the deaf student to let the others in the group do the work. This may be due to the nature of group work pace and too many conversations to pay attention to.

With regard to pace of communications, one TOD mentioned the lag time from the interpreter as a challenge to group work for deaf/hh students.
Another challenge noted by one TOD was a lack of confidence in the material to be worked on in group work. The deaf/hh student may not have exposure to the vocabulary being used and therefore has a harder time interacting on the subject material.

**Strategies to Improve Cooperative Learning Experiences for Mainstreamed Deaf**

For improving participation and communication during mainstream group work for deaf and hard of hearing students, the TODs all suggested using the FM microphone as an object for turn taking within groups of students if an FM system is utilized. This would work for those students with residual hearing.

Three of the TODs suggested limiting the group size to 2 or 3 so that there are less people to divide attention between. Two of the TODs suggested teaching successful attention strategies used by deaf individuals such as waving and tapping.

All of the TODs surveyed suggested a slower pace for communications. A slower pace will allow for students to follow conversations – this includes allowing enough time for deaf students to write before communicating again.

One TOD mentioned the set up of the group so that the deaf/hh student could see everyone. This TOD also mentioned that the interpreter could physically move to sign behind each speaker so that the student could watch both the interpreter and the speaker at the same time. The TOD did say this would be logistically hard in a classroom though.

Assigning roles to the students in the group was mentioned by a TOD so that the students know what to do in the groups. Another suggestion was to have the teacher give the student a flow chart of what to do in the group activity – what steps to take to complete the task. This would make the instructions more visible to the deaf/hh student.
Study Experiences Vs. Typical Mainstream Deaf Cooperative Learning Experiences

The TODs surveyed all agreed that the experiences and suggestions listed above are typical for deaf and hard of hearing students within the mainstream.

Survey Results

The results of the Tablet PC survey can be found in Appendix F of this report.

SUMMARY - TABLET PC SURVEY RESULTS

Years of Experience

The four Teachers of the Deaf (TODs) surveyed had the following years of experience as a TOD: one had 3-5 years, one had 6-10 years and two had over 15 years of experience as a TOD.

Communication and Participation – 5 Answer Scale

A five point rating scale was used to collect opinions regarding the facilitation of communication and participation for deaf/hh students using a Tablet PC within the mainstream classroom for group work. The five categories that the TODs chose from for the individuals questions were: Strongly Agree, Agree, No Opinion, Disagree, and Strongly Disagree. The following summary indicates responses to the communication and participation scaled questions.
Wirelessly connecting the Note Taker and the deaf/hh student so the student can annotate notes would help them learn better.

Having class group work saved on the Tablet PC for future reference for the student would be of benefit to them.

It would be helpful to use the Tablet PC to write the answers on the group worksheet.

The Tablet PC makes learning more visual for the deaf/hh student.

The drawing tool on the Tablet PC would help deaf/hh students communicate with partner during group work.

Deaf students would communicate more easily with hearing group members during group work using the Tablet PC.

I think the Tablet PC would improve deaf student's participation in group work.

I feel that the use of a Tablet PC would facilitate group work between deaf and hearing students.

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**Potential Use – 5 Answer Scale**

A five point rating scale was used to collect opinions regarding the potential use of Tablet PC Technology by mainstream deaf/hh students for group work. The five categories that the TODs chose from for the individuals questions were: Always, Often, Half of the time, Sometimes, and Never.

The following is a summary indicates the teacher’s ratings for the potential use items.
Deaf/hh students would use the Tablet PC if we had one for group work.

Tablet PC - Potential Use

- I feel that I could implement the Tablet PC into the classroom for group work.
- Deaf/hh students would use the Tablet PC if we had one for group work.
- The Tablet PC could help deaf students feel more part of the class by allowing them to communicate for themselves.
- It would be of benefit for the deaf/hh student to be able to communicate with their partner for themselves.

Ease of Use

All of the TODs surveyed indicated they thought the Tablet PC was easy to use.

Potential use in different Grade Levels

Given the option to choose one or all of the different school settings including elementary, middle school and high school for mainstream deaf/hh students, the following answers were given by the four TODs surveyed. Two TODs thought it would be helpful for elementary school and four TODs thought it would be helpful to both middle school and high school deaf/hh mainstream students.
"Likes" - Tablet PC

One of the things I liked about the Tablet PC is:

1. How easy it is to use
2. Variety of uses, collaboration among kids, etc.
3. Many things...versatility
4. There is no lag time [for communications]

The TODs were brief in their answers regarding their likes of the Tablet PCs. In general it was found to be versatile by two TODs, easy to use by another and finally one TOD liked the elimination of lag time [from use of an interpreter].

"Dislikes" – Tablet PC

One of the things I did not like about the Tablet PC is:

1. Nothing
2. I suppose it would require more time to use this with younger kids. (less writing)
3. Expense
4. One PC froze ... it is not the first time that I have seen technical problems with the Tablet PC

One TOD had no dislikes regarding the Tablet PC. One referred to expense of the Tablet PC (note – cost of the Tablet PC was not discussed with the TODs), another mentioned a perception of needing more time to use with younger kids due to writing skills, and finally one referred to potential technical problems with the Tablet PC. During the presentation of the Tablet PC functionality to the last TOD, one of the two connected Tablet PCs froze and needed to be rebooted.
Direct Communications with Tablet PC vs. Interpreter or Captioning

Compare the deaf/hh student using a Tablet PC for direct communications during group work to using an interpreter or captioning:

1. Obviously the tablet PC is more direct to other students and with an interpreter there are no written records. Captioning does provide written record to the student and for the classroom teacher and/or TOD/interpreter

2. More direct, helps students connect to their peers, more 'kid leveled' discussion.

3. Direct communication is always better than through a third person

4. Depending on the task ... the student might experience a greater sense of participation and less lag time.

Three of the TODs mentioned that the Tablet PC would be a more direct means of communicating with other students during group work. The responses appear to favor direct communication with their peers during group work. Two of the TODs thought it would help students connect to their peers.

The benefit of a written record of class activity which can be followed up with the TOD at a later time was also mentioned.

How to Improve use of Tablet PC for Mainstream Group Work

How would you improve the use of the Tablet PC for group work with hearing peers for the deaf/hh student?

1. I would include Smart Board technology for the overhead style presentation and then have the same worksheet or note paper included on the Tablet PC

2. Not sure yet how I would improve it...
3. I would think that it would be most successful if we were able to give the student time to 'play' with it with peers to get used to the use and to get play time 'out of their system'.

4. Make it not freeze ... make sure you allow time for set up of the system ... make sure that there are several people who know how to set it up.

The TODs offered several suggestions for improving use of Tablet PC for mainstream deaf/hh group work including: use in conjunction with other technology such as the Smart Board, allowing time to become adjusted to the technology and giving proper instruction and time to get used to the technology to those both using and setting up the technology for the classroom.

**Other Potential Uses for Tablet PC**

Can you think of any other way to use the Tablet PC other than what was demonstrated for you? This can be for either group work or general class time for the deaf/hh student.

1. With the TOD/HH for studying for a test, completing homework, working on long term assignments like research paper, journal. For the organizationally impaired student, it is less paper management.

2. Shared writings with teachers, tutoring, etc.

3. One-on-one meetings between student and a teacher when interpreter might not be available

4. Not right now

The TODs gave answers for both group work and for outside of group work. While this study focused on Tablet PC technology for group work and annotated note taking, the TODs made some interesting suggestions for uses other than group work and annotated note taking.


**Reservations about Tablet PC Use**

Do you have any reservations about using the Tablet PC? If so, please share them.

1. No I would think this would make the student feel cool.

2. No!!!!! I can't wait!!!

3. For younger kids...yes, lack of language would inhibit use and for some deaf kids who might be self-conscious about their language skills

4. Technological break downs

Two of the TODs expressed concern: one regarding the language skills of the deaf/hh student using the technology and their confidence level and ability to effectively communicate through the chat features and writing on the Tablet PC. The other expressed concern regarding technological breakdowns; this is the same TOD that during the technology demonstration, one of the Tablet PCs froze and had to be rebooted.

**Other Comments**

None of the TODs had additional comments.

**Roles of TOD and Others in Classroom for Tablet PCs**

If you were involved in helping to arrange use of Tablet PCs in class with deaf/hh students, what would you see as your role? What other people would need to be involved?

1. Training teacher and student, piloting!

2. Role could be all-encompassing: training for students, both deaf and hearing, training for teachers. The classroom teacher, parent, hearing students, school speech therapist (if used), and probably many more.

3. Establishing an in-service with Tablet PC trained note taker and classroom teacher. I would expect the Tablet PC trained note taker to explain the use. I would be there to
explain or suggest education strategies ... if not addressed by the Tablet PC trained note taker.

Only three of the TODs answered this question. With regard to the TOD’s role for use of Tablet PC Technology in the classroom the TOD’s were split on their perceptions. Two of the TODs thought they might be involved in training the teacher and student how to use the technology. The other TOD felt that it would be the responsibility of the note taker to explain the use of the technology.

The underlying theme with regard to this question is that all those involved in the use of technology such as this in the mainstream classroom would need to be trained and given ample time to become accustomed to the technology. The key to successful implementation as alluded to in the literature review of this report is that there must be ample training and practice time for all using or setting up any technology in the classroom to be successful.

VII. STUDY QUESTIONS AND GOAL ANALYSIS

ORIGINAL STUDY QUESTIONS ANSWERED

1. Does the modeled use of the Tablet PC appear to help cooperative learning through leveling the playing field between the deaf and hearing students in the mainstream classroom?

The TODs surveyed agreed that it was of benefit for the deaf student in the classroom to speak for themselves. They also agreed that the Tablet PC would help students communicate for themselves and would also help deaf/hh students feel more like part of the class by allowing them to communicate for themselves.

A leveling of the playing field of communication for group work between deaf/hh and hearing students by: having a single focal point for group work; chatting between 2 Tablet PCs
or a single Tablet PC; slowing the pace of communications to one-to-one instead of multiple to multiple; and making conversations visible and in real time where deaf/hh students can speak for themselves can be of benefit to the deaf/hh student.

2. **Would the modeled use of the Tablet PC have the potential to facilitate participation of the deaf student in the mainstream classroom for group work?**

   Of the four TODs surveyed, two strongly agreed, one agreed and one had no opinion that the Tablet PC would improve deaf/hh student’s participation in group work. Three strongly agreed and one agreed that the Tablet PC would facilitate group work between deaf and hard of hearing students. The TODs all indicated that the equipment looked easy to use.

3. **Would the modeled use of the Tablet PC have the potential to facilitate discourse opportunities for the deaf and hard of hearing student in the mainstream?**

   The TODs surveyed generally agreed that the Tablet PC, in particular the drawing tool, would allow a deaf/hh student to communicate more easily with hearing group members during group work. When looking at all the data and statements from the TODs surveyed and interviewed, the Tablet PC would benefit the deaf/hh mainstream student by allowing them to speak for themselves, in real time – no lag, with a pace that can be managed by the students using the Tablet PC(s).

4. **Would the use of wirelessly connected Tablet PCs between the note taker and the deaf/hh student allow deaf/hh students to take charge of their own learning by giving them the ability to annotate notes taken by the note taker?**

   All of the TOD’s surveyed strongly agreed that wirelessly connecting the note taker with the deaf/hh student so the student could annotate notes would help the student learn better. They also
agreed that the ability to save the annotated notes for future reference would benefit the deaf/hh mainstream student.

5. Can the Tablet PC foster peer relationships by allowing students to “speak for themselves”?

There were several comments made by the TODs interviewed and surveyed that indicate that the Tablet PC technology could possibly foster peer relationships in the mainstream classroom they are as follows.

Do you feel that the Tablet PC would best be utilized by one specific age range of student? Why?

“Middle school-to foster interaction and peer socialization, especially considering that middle school students tend to be resistant to utilizing notes from a note taker. If they were contributing to their own, I think they would be more apt to use them”

Compare the deaf/hh student using a Tablet PC for direct communications during group work to using an interpreter or captioning:

“More direct, helps students connect to their peers, more "kid leveled" discussion”

“Depending on the task ... the student might experience a greater sense of participation and less lag time.”

“I would think this would make the student feel cool. ” This could help self perception problems with students who are struggling with acceptance.

“Definitely. I think that in general presenting that as an option to all deaf students would be fantastic. Some would grab that up and some wouldn't. I think it would foster peer relationships”.

PROJECT GOALS - ANALYSIS

- To observe a small group instruction and student interaction (deaf and hearing) to identify cooperative learning opportunities utilizing the Tablet PC.
Goal Met – see observation reports

- To identify opportunities for enhanced classroom participation and communication using Tablet PC technology in the mainstream environment.

Goal Met- See THINGS TO SHOW TODS ON TABLET PC

- To identify opportunities for facilitating sharing of classroom work through Tablet PC technology.

Goal Met – see THEMES FROM POSSIBLE TECHNOLOGY INCLUSIONS

- To identify opportunities where the Tablet PC technology may enhance deaf student’s peer relationships within the classroom.

Goal Met—see TOD Tablet PC Survey

- To identify teaching strategies that may supplement use of the Tablet PC and that may enhance deaf students’ communication, participation and cooperative learning experiences.

Goal Met—see TOD Tablet PC Survey

VIII. LIMITATIONS OF STUDY

1. There were only three students observed in the mainstream for this study. This is a very limited study with a small scope meant to simply to assess the need for technology intervention utilizing the Tablet PC in the classroom.

2. The three schools selected by BOCES were all in predominantly white upper class suburban areas where school districts were fairly affluent. This would effect what technology I did see in the classroom. Other school districts may not have the resources that the school districts I observed had.

3. There were only four TODs who were interviewed and surveyed for this project. This is a very small number indicative of the limited time available to complete the project. Due to
the nature of observation then meeting with the TOD for interview, modeling of the
technology and subsequent surveying, time did not allow for more participants to the study.

4. While other technologies were not excluded from the study, and there were suggestions made
for using other technology than the Tablet PC, the main focus for the study was to determine
if Tablet PC would be a viable option for enhancing student participation and communication
within the mainstream classroom for group work.

5. Group dynamics of the students chosen for inclusion in the study cooperative learning groups
did influence the suggested outcomes of the study.

6. There was no high school observation available at the time of this study; therefore the
observations were done in the elementary and middle schools only.

IX. RECOMMENDATIONS

RECOMMENDATIONS FOR MAINSTREAM DEAF COOPERATIVE LEARNING

The following recommendations were identified for cooperative learning with deaf/hh students
within the mainstream environment.

- Keep groups small to give the deaf/hh student fewer people to attend to.
- Use an object, typically the FM microphone if an FM system is used, for turn taking
during conversations.
- Allow time for the deaf/hh student to write information before speaking again.
- Teach students successful attention strategies used by deaf individuals such as waving
  and tapping.
- Try slowing the pace for communications to allow students to follow conversations.
- Assign roles to students within the groups so they know what to do and keep the activity
going.
• Provide a flow chart of how the cooperative learning activity should be accomplished.
• Provide written instructions or project instructions for the class to make them more visible.
• In addition to telling answers, write answers to work using any means possible (white board, projector, Smart Board, Tablet PC) to make learning more visual for the deaf/hh student.
• Teach interpreters to foster group communication and work so that they are not giving answers or simply confirming answers with the deaf/hh student but ensure that the students work together to come up with their own methods and answers.

RECOMMENDATIONS FOR FURTHER STUDY – TABLET PC USE

With the favorable responses to ease of use given by the TODs surveyed, the Tablet PC functionality with regards to facilitating communication and participation for group work should be explored further. All of the TODs either strongly agreed or agreed that the Tablet PC would facilitate group work between deaf/hh and hearing students in the mainstream classroom. In addition the TODs felt the drawing tool would help the deaf/hh student communicate better with their hearing partners during group work. In light of these findings, I would recommend a trial intervention in a mainstream classroom utilizing the Tablet PC Technology during cooperative learning.

All of the TODs surveyed felt that the Tablet PC could be used to help students take charge of their own learning by giving them the opportunity to annotate their own notes being taken by a note taker. I would also recommend a trial of wirelessly connecting the note taker with the deaf/hh student so that they can annotate notes to determine if this promotes self directed learning for the deaf/hh student.
I also recommend that whoever is involved in the trials with the Tablet PC (student, classroom teachers, TODs, interpreters) should all be trained on and given time to become accustomed to the Tablet PC technology before it is implemented in the classroom – even for a trial. Proper instruction in the use of technology can make a difference between a successful trial and an unsuccessful trial.

X. CONCLUSION

I set out to determine if the Tablet PC could help facilitate participation and communication for cooperative learning experiences for deaf/hh students placed within mainstream classrooms. I feel I can conclude from the observations I made, the TOD interview results, and Tablet PC TOD survey results that the Tablet PC could help facilitate participation, communication and level the playing field by allowing deaf/hh students to communicate directly for themselves for cooperative learning experiences within the mainstream environment.

The deaf/hh students are able to “speak for themselves” utilizing the Tablet PC chat features during group work. The students can communicate through hand written words, pictures, drawings and even typing. This reduces the lag time for communications and the students set the pace for the discussion using the one focal point. The versatility of the Tablet PC allows for versatility in communication styles and between the students. By allowing both deaf/hh and hearing students to participate in cooperative learning through collaborative tools such as drawing, writing, typing and focusing on one area for content the Tablet PC also allows for versatility in how the student participates. This could lead to greater participation in group work.

Finally, the TODs felt that the ability for the student to annotate notes will help them self direct and manage their own learning. Students may take a more active role in their education
managing what they know and what they don't know. In addition, all notes can be saved for future reference, all in one place. Those students with organizational trouble may also benefit from having all school information saved on a computer, such as the Tablet PC, for future reference.

XI. REFERENCES:


XII. APPENDIX SUMMARY

APPENDIX A  Observation Checklist used for observations.

APPENDIX B  Interview of TODs for Cooperative Learning Experiences with Deaf/hh students in the mainstream environment. See attached Clipboard Survey.

APPENDIX C  Tablet PC survey for use with TODs

APPENDIX D  Informed Consent form

APPENDIX E  Clipboard Interview results

APPENDIX F  Clipboard Survey Results
APPENDIX A

Checklist for Mainstream Classroom Observations – Tablet PC Potential for Group Work

PLACEMENT:

Diagram of classroom

- Student placement
- Teacher placement
- Service provider placement

CLASS CONTENT:

Lesson Content

TEACHING METHODS:

Cooperative learning

- Worksheets
- Research – look up information
- Debate
- Solving of problem
- Lab work or detail

Style of class – lecture, discussion

- Lecture
- Discussion

Equipment used during class:

- Chalk board
- PowerPoint
- Video
- SmartBoard
- Other
APPENDIX A - Continued

Activities during class

Use of notetaking by deaf student?  Y  N

Service Providers what type?

<table>
<thead>
<tr>
<th>Interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student participation in class discussion</td>
</tr>
<tr>
<td>Student interaction with service provider</td>
</tr>
<tr>
<td>Student interaction with teacher</td>
</tr>
<tr>
<td>Student interaction with other support service providers</td>
</tr>
<tr>
<td>Student interaction with other students in class</td>
</tr>
<tr>
<td>Student participation in activities in class</td>
</tr>
</tbody>
</table>
APPENDIX B  Interview of TODs for Cooperative Learning Experiences with Deaf/hh students in the mainstream environment. See attached Clipboard Survey.

See attached Clipboard Interview
1. From your experience, please describe how the deaf/hh student you recently work with typically participates in small group work?

2. How does the deaf/hh student you work with communicate with the other members of their group when engaged in cooperative learning?

3. What is the role of the interpreter in these communications? What should it be and why?

4. Do you believe that deaf students can benefit from “speaking for themselves”? Such as using chat programs via computer tablets? Why or why not?
5. What challenges have you noted with group work with the deaf or hard of hearing student you work with?

6. What strategies can you suggest to improve participation and communication for group work with deaf/hh students and hearing students?

7. Does your experience with group work for deaf/hh students you work with now match that of other deaf/hh students you have worked with in the past or other deaf/hh students in general?
APPENDIX C  Tablet PC survey for use with TODs

See attached Clipboard Survey
Thank you for participating in the observation and interview for inclusion of Tablet PC technology into the mainstream classroom. I want your opinions on the strategies I presented. I will NOT share your individual responses with each other or with anyone other than my advisor. Your responses to the interview and following survey will be summarized to identify future work to be done within the classroom.

1. I have the following years of experience as a TOD
   - [ ] 0-2
   - [ ] 3-5
   - [ ] 6-10
   - [ ] 11-15
   - [ ] 15+

2. I feel that the use of a Tablet PC would facilitate group work between deaf and hearing students
3. I think the Tablet PC would improve deaf student's participation in group work
4. Deaf students would communicate more easily with hearing group members during group work using the Tablet PC
5. The drawing tool on the Tablet PC would help deaf/hh students communicate with partner during group work
6. The Tablet PC makes learning more visual for the deaf/hh student
7. It would be helpful to use the Tablet PC to write the answers on the group worksheet. (One focal point)
8. Having class group work saved on the Tablet PC for future reference for the student would be of benefit to them.
9. Wirelessly connecting the Note Taker and the deaf/hh student so the student can annotate notes would help them learn better.
Please click the corresponding button
Always
Often
Half of the time
Sometimes
Never

10. It would be of benefit for the deaf/hh student to be able to communicate with their partner for themselves.
11. The Tablet PC could help deaf students feel more part of the class by allowing them to communicate for themselves.
12. Deaf/hh students would use the Tablet PC if we had one for group work.
13. I feel that I could implement the Tablet PC into the classroom for group work.

14. The Tablet PC looks
   [ ] Easy to use
   [x] Hard to use

15. Knowing students can either draw, write or type with a Tablet PC; I think the Tablet PC would be best utilized for group work in:
   [ ] Elementary School
   [ ] Middle School
   [ ] High School
   [ ] Other...

16. I think the Tablet PC would be best utilized for annotated note taking in:
   [ ] Elementary School
   [ ] Middle School
   [ ] High School
   [ ] Other...

17. Do you feel that the Tablet PC would best be utilized by one specific age range of student? Why?

18. One of the things I liked about the Tablet PC is:
19. One of the things I did not like about the Tablet PC is:

20. Compare the deaf/hh student using a Tablet PC for direct communications during group work to using an interpreter or captioning:

21. How would you improve the use of the Tablet PC for group work with hearing peers for the deaf/hh student?

22. Can you think of any other way to use the Tablet PC other than what was demonstrated for you? This can be for either group work or general class time for the deaf/hh student.
23. Do you have any reservations about using the Tablet PC? If so, please share them.

24. Please share any other comments you may have.

25. If you were involved in helping to arrange use of Tablet PCs in class with deaf/hh students, what would you see as your role? What other people would need to be involved?
Appendix D Teacher Informed Consent Form

Project Title: A Needs Assessment & Exploration for Cooperative Learning Incorporating Tablet PC Technology: Participation, Communication, and Leveling the Playing Field Between Deaf and Hearing Students in the Mainstream Classroom

Introduction
You have been invited to join a research study to look at the possibility of including Tablet PC technology into the mainstream classroom to help deaf and hard of hearing students have greater access to class participation and real-time communications during group work. The Tablet PC is a portable computer that allows students to communicate through chat programs, instant messaging, and collaboration through visual means—writing on top of given assignments and representing concepts through drawings or graphic representations. The Tablet PC has a stylus pen that students can use to visually represent ideas through drawing or handwriting. These technology tools have the potential to eliminate some of the communication and social barriers that exist in cooperative learning environments for deaf students in the mainstream. Please take whatever time you need to discuss the study with your family and friends, or anyone else you wish to. The decision to participate or not participate is up to you.

In this research study, I am investigating the potential need for, and possible inclusion of, Tablet PC technology and teaching strategies to enhance cooperative learning in the mainstream classroom environment. It is well known that cooperative learning with meaningful exchanges between students and exchanges between students and their teacher leads to better academic success. From this investigation I hope to learn ways in which the Tablet PC may facilitate deaf or hard of hearing students’ classroom participation, real-time communications, enhancement of peer relationships; and ways in which cooperative learning can enhance the deaf student’s academic experiences.

Students in cooperative learning work groups will be observed. After the observations, suggestions for use of Tablet PC technology and additional teaching strategies will be shared. Feedback via interview and survey will be solicited from you, the classroom teacher.

What Is Involved in the Study
I will observe you and your students during the normal class period. Either one or two class periods will be observed. After the observations, a meeting will be set up with either you or the Teacher of the Deaf (TOD) so you can observe a demonstration of Tablet PC Technology and how it can be used for cooperative learning along with teaching strategies for the mainstream classroom. I estimate this will take 15 to 20 minutes. Immediately following the demonstration, you will be asked to participate in an interview with the researcher to give your opinions on the Tablet PC Technology and teaching strategies demonstrated. I think the interview will take approximately 15 minutes. After the interview, you will be asked to fill out a survey regarding your opinions of the Tablet PC Technology demonstrated. The survey will take approximately 10 minutes or less to complete. You may stop participating at any time.

Risks
There are no likely risks are involved in this study.
BENEFITS TO TAKING PART IN THE STUDY:
The benefit of the study is that I will learn if the Tablet PC technology is perceived to be helpful
to deaf and hard of hearing students in the mainstream environment for facilitation of
participation and real time communications during cooperative learning. The teacher may learn
about ways in which they can better incorporate a deaf or hard of hearing student into the
mainstream classroom. However, there is no guarantee that you personally will experience
benefits from participating in this study. Others may benefit in the future from the information I
find in this study.

CONFIDENTIALITY
Your name will not be used when data from this study is published. Every effort will be made to
keep all research records, and other personal information confidential. None of the student’s
names from the observations will be included in any publication or report.

I will take the following steps to keep information confidential, and to protect it from
unauthorized disclosure, tampering, or damage:

The data generated from the observations, interview and survey will be kept at RIT with the head
researcher/advisor for the project. This information will be housed in a locked office without
general access. No outside agencies or other subcontractors will be utilized during the study, and
therefore, all data will be housed and contain at RIT.

INCENTIVES
There are no monetary or other incentives for participating in this study.

YOUR RIGHTS AS A RESEARCH PARTICIPANT
Participation in this study is voluntary. You have the right not to participate at all or to leave the
study at any time.

If you decide to leave the study, the procedure is: to contact the researcher: Sarah Remelt at
sbrndp@rit.edu or 585-475-7545.

CONTACTS FOR QUESTIONS OR PROBLEMS:
Call Sarah Remelt at 585-475-7545 or email sbrndp@rit.edu or contact Dr. Michael Stinson
(research advisor) at 585-385-6596 or email msserd@rit.edu if you have questions about
the study.

Consent to Participate in Research
I (Print Name) __________________________ agree to become a participant in the research
study described in this form.

______________________________ Signature

______________________________ Title
Appendix E – Clipboard Survey Results for Cooperative Learning Survey
1. From your experience, please describe how the deaf/hh student you recently work with typically participates in small group work? (4 responses)

[We use the FM microphone and I put it in the center of the table or give it to individual speakers. He is a conscientious user of the FM and his CI. The interpreter or TOO will join the group and provide sign language for the student. The hardest part is the student following the speaker as the speaker goes from student to student or turn taking. We have to slow down the conversation. Sometimes the student tunes out at the most crucial times. It is hard for the student to do group work and be a full participant.]

[Deaf students are unique in their needs. The student you observed uses an interpreter. The student makes an attempt to participate regularly. The participation - there is an attempt to participate equally as all student. Most times the student is successful in this due to interpreter lag or a misunderstanding or the student themselves is not confident in the material this is not always possible. They may not participate at the same level as the other kids because of this. They do a lot of watching catching verbal and non verbal cues. They use their hearing aids. Some students use the FM microphone as a turn taking device.]

[Some of the students use their voice and lipread when with the groups. They have residual hearing. They do a lot of lipreading and use an fm system. They also use an interpreter. Several other students use residual hearing too but they really rely on the interpreter to clarify and gain information. The one girl always clarifies that she "heard" right. The other students heavily rely on an interpreter to work with the group and to facilitate communication within the group.

Sometimes they don't look at the interpreter because they feel like they want to be "hearing" and listen like the rest of the class. Sometimes this is defiance.

Another student use no hearing aids and fm systems. The group work for them is completely through the interpreter, fingerspelling and pointing.]

[They participate by doing what the hearing students do. In elementary level the type of work most often for group work is Science. They gather in groups usually at their tables. The deaf student utilizes the interpreter to participate and communicate in group work. The hearing students don't hesitate to communicate with the deaf student. They use tapping and waving for attention. They will sometimes just talk but they get the interpreter to help convey the message.]

2. How does the deaf/hh student you work with communicate with the other members of their group when engaged in cooperative learning? (4 responses)

[He half talks to the other students and half talks to the interpreter or TOO. Between both methods of speaking and signing there is good expressive communication. I feel his classmates understand him well.]

[Through voice and sign. The student goes through the interpreter or if voicing without the interpreter. A lot of the other students in the group tend to know some signs so communications are understood. If something needs to be said quickly the deaf student will say it. The student won't wait for the interpreter.]

[They either use their voice, signing and through the interpreter. Sometimes using simple signs or even gestures with the group if the hearing group members know them. The student in the groups use FM system and the microphone is passed or turn taking in the group.]
Analyze Survey http://clipboard.rit.edu/admin/ANALYZE.cfm?setID=7914

3. What is the role of the interpreter in these communications? What should it be and why? (4 responses)

The role of the interpreter and the TOO alternate in working with the group with the deaf student. If it is a time when I'm not there the interpreter does all of it or if I'm there we share or do part. If the interpreter is working with the student, I will help a hearing group. This is also true of the interpreter if he is not working with the deaf student they will work with a hearing group.

The role of the interpreter or TOO is that they need to be there. There is an interpretation that needs to occur. Given classroom dynamics it works.

During group work the interpreter should encourage the student interact and ask questions of their partners or group members.

The role should be is what the role is and that is to be instrumental in sharing information between ASL and English and deaf and hearing. Sometimes that entails the interpreter stopping the activity for a moment and clarifying that the deaf student is getting what is being said in the group. To make sure that the deaf student understands.

For math work group of 2 or 3 students to practice a strategy or technique that they just learned is typical. Often it is necessary for the adult that signs to intervene temporarily to ensure the deaf child's understanding of what's expected. If this doesn't happen the deaf child when they make mistakes often are not corrected by the hearing student and the activity breaks down. Neither kid is learning at that point.

4. Do you believe that deaf students can benefit from "speaking for themselves"? Such as using chat programs via computer Tablet PCs? Why or why not? (4 responses)

Yes they definitely can benefit from speaking for themselves. It is a mainstream setting everyone else speaks. We always say our student can do anything that any one else can.

Communicating for themselves is definitely important it shows their thought processes in discussions and shows participation to the teacher in the room.

I don't know if chat program would help or not. I think kids who would like to participate in a demo of using a chat program. Kids love computers this may help with the group participation.

They typically speak for themselves anyway all the time. The interpreter doesn't keep the student from thinking for themselves.

I don't about chat programs or via computer so I don't know.

Yes I do. I think that direct communication is always the best. However I have had another student have problems. At times students misunderstand what the deaf child is trying to say. The level of thought of what is being said is not being conveyed in their writing. Their thought is intelligent, however it could be lost through having ineffectual English words to express it. Depending on the English proficiency of the student an adult should be there to clarify what they said and get the meaning correct.

Definitely. I think that general presenting that as an option to all deaf students would be fantastic. Some would grab that up and some wouldn't. I think it would foster peer relationships.

5. What challenges have you noted with group work with the deaf or hard of hearing student you work with? (4 responses)

The student may tune out. Don't know why the student tunes out in middle of instructions or working with a partner or group. If it is one on one partner work it is much easier for the student to stay focused and participate. When it is 3 or more students, he doesn't strive to keep up his end of the group work. He doesn't strive to be a full participant in the group. It is ok if he observes and thinks but there is a tendency to sit back and withdraw from the activity.

One is vocabulary being used within the group work the student is unfamiliar with this and therefore the student lacks the confidence to participate. If the teacher happens to be pre-teaching and is aware of problems with vocabulary and pre-teaches the vocabulary the deaf student does better. Confidence level.
Lag time with the interpreter.

When people don't take turns communicating.

3. [Pacing. Wait time for communications. Chaotic communications everyone talking at one time.]
   [The hearing students sometimes have a tendency to allow the deaf student to take control, do things wrong, not follow the procedure outlined by the teacher. It is cool to be a deaf kid in my district to be a deaf kid's friend and sign with them so the hearing kids want the deaf kid to like them.
   There is also the instance of the hearing student allowing the deaf student to take over because they are deaf and they feel they don't know any better so they just let them. This is if the adult doesn't intervene.]

6. What strategies can you suggest to improve participation and communication for group work with deaf/hh students and hearing students? (4 responses)

1. [Passing the microphone from speaker to speaker within the group helps everyone maintain focus. It also serves as a turn taking tool and it slows down conversation.]
   [FM mic for turn taking or ball for turn taking. Smaller groups as opposed to larger groups. Logistics of sitting - sitting in semi circle pattern so everyone can see.
   Use the interpreter to stand behind who is speaking and let them see the student communicating and the interpreter. It's distracting and asking a lot though.
   Provide roles ahead of time with a flow chart of what do to in the activity - so the student has an agenda of what will happen. The students take on roles and it can be unclear on what to do. Teacher should assign roles - leader - note taker etc.]

2. [Passing microphone for turn taking. More than one microphone will help. Limiting the group size for 2 or 3 then the conversations don't get out of control. Teach effective attention getting strategies tapping waving etc. Making sure other students know that they need to wait to let students write things down.]

3. [Slow the pace down. Ask teacher to slow the pace. Allow more time for activities. Usually this isn't possible due to time constraints. Hand pick the groups to ensure good interaction.]

7. Does your experience with group work for deaf/hh students you work with now match that of other deaf/hh students you have worked with in the past or other deaf/hh students in general? (4 responses)

1. [Yes what I have said is typical of deaf/hh group work.]

2. [Both Yes they match.]

3. [Yes.] [There are a lot of individual differences that happen with deaf ed. As educators we assume deaf kids are all the same but they aren't and each is individual and you have treat them as such.

4. The students I work with now have more acceptance of themselves as deaf individuals there is less stigma attached with deafness now than before. In the past they hid deafness and were ashamed now it's cool to be their friend.]
Tablet PC - communication and participation

Please indicate your answer by clicking corresponding buttons.

Strongly Agree
Agree
No Opinion
Disagree
Strongly Disagree
Did Not Answer

1. I feel that the use of a Tablet PC would facilitate group work between deaf and hearing students
2. I think the Tablet PC would improve deaf student's participation in group work
3. Deaf students would communicate more easily with hearing group members during group work using the Tablet PC
4. The drawing tool on the Tablet PC would help deaf/hh students communicate with partner during group work
5. The Tablet PC makes learning more visual for the deaf/hh student
6. It would be helpful to use the Tablet PC to write the answers on the group worksheet. (One focal point)

Total Submissions: 4
Refresh Data  Filter Data

1. I have the following years of experience as a TOO
   0-2 0
   3-5 1
   6-10 1
   11-15 0
   15+ 2
   Did Not Answer 0
8. Having class group work saved on the Tablet PC for future reference for the student would be of benefit to them.

9. Wirelessly connecting the Note Taker and the deaf/hh student so the student can annotate notes would help them learn better.

### Tablet PC - potential use

<table>
<thead>
<tr>
<th>Button</th>
<th>Always</th>
<th>Often</th>
<th>Half of the time</th>
<th>Sometimes</th>
<th>Never</th>
<th>Did Not Answer</th>
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<td>0</td>
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</tr>
</tbody>
</table>

10. It would be of benefit for the deaf/hh student to be able to communicate with their partner for themselves.

11. The Tablet PC could help deaf students feel more part of the class by allowing them to communicate for themselves.

12. Deaf/hh students would use the Tablet PC if we had one for group work.

13. I feel that I could implement the Tablet PC into the classroom for group work.

14. The Tablet PC looks

<table>
<thead>
<tr>
<th>Easy to use</th>
<th>Hard to use</th>
<th>Did Not Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
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</tr>
</tbody>
</table>

15. Knowing students can either draw, write or type with a Tablet PC; I think the Tablet PC would be best utilized for group work in:

- Elementary School: 2
- Middle School: 4
- High School: 4
- Other: 0
- Did Not Answer: 0

16. I think the Tablet PC would be best utilized for annotated note taking in:

- Elementary School: 2
- Middle School: 4
- High School: 4
- Other: 1
- Did Not Answer: 0

17. Do you feel that the Tablet PC would best be utilized by one specific age range of student? Why? (4 responses)

1. [no but one specific type of student, one who is motivated to communicate with classmates]
2. [Middle and high school because it requires a level of maturity.]
3. [Students need to be somewhat proficient in their writing in order to use, but I feel they would be empowered to communicate on their own.]

5/13/2008 7:21 PM
18. One of the things I liked about the Tablet PC is: (4 responses)
1. [how easy it is to use]
2. [There is no lag time]
3. [Variety of uses, collaboration among kids, etc.]
4. [many things...versatility]

19. One of the things I did not like about the Tablet PC is: (4 responses)
1. [nothing]
2. [One PC froze...it is not the first time that I have seen technical problems with the Tablet PC]
3. [I support it would require more time to use this with younger kids. (less writing)]
4. [expense]

20. Compare the deaf/hh student using a Tablet PC for direct communications during group work to using an interpreter or captioning: (4 responses)
1. [obviously the tablet PC is more direct to other students and with an interpreter there is no written records. Captioning does provide written record to the student and for the classroom teacher and/or TOD/interpreter]
2. [depending on the task...the student might experience a greater sense of participation and less lag time.]
3. [More direct, helps students connect to their peers, more "kid level" discussion.]
4. [direct communication is always better than through a third person]

21. How would you improve the use of the Tablet PC for group work with hearing peers for the deaf/hh student? (4 responses)
1. [I would include SmartBoard technology for the overhead style presentation and then have the same worksheet or note paper included on the Tablet PC]
2. [Make it not freeze...make sure you allow time for set up of the system...make sure that there are several people who know how to set it up.]
3. [not sure yet how I would improve it...]
4. [I would think that it would be most successful if we were able to give the student time to "play" with it with peers to get used to the use and to get play time "out of their system"]

22. Can you think of any other way to use the Tablet PC other than what was demonstrated for you? This can be for either group work or general class time for the deaf/hh student. (4 responses)
1. [With the TOD/HH for studying for a test, completing homework, working on long term assignments like research paper, journal. For the organizationally impaired student, it is less paper management.]
2. [Not right now]
3. [Shared writings with teachers, tutoring, etc.]
4. [one-on-one meetings between student and a teacher when interpreter might not be available]

23. Do you have any reservations about using the Tablet PC? If so, please share them. (4 responses)
1. [no I would think this would make the student feel cool]
2. [Technological break downs]
3. [No!!!! I can't wait!!!]
4. [for younger kids...yes, lack of language would inhibit use and for some deaf kids who might be self-conscious about their language skills]

24. Please share any other comments you may have. (1 responses)
1. [none at the moment]

25. If you were involved in helping to arrange use of Tablet PCs in class with deaf/hh students, what would you see as your role? What other people would need to be involved? (3 responses)
1. Establishing an inservice with Tablet PC trained notetaker and classroom teacher. I would expect the Tablet PC
trained notetaker to explain the use. I would be there to explain or suggest education strategies ... if not addressed by
the Tablet PC trained notetaker]

2. [Training teacher and student, piloting!]

3. [role could be all-encompassing: training for students, both deaf and hearing. training for teachers. The classroom
teacher, parent, hearing students, school speech therapist (if used), and probably many more.]
Form C
IRB Decision Form

TO: Sarah Remelt; Michael Stinson
FROM: RIT Institutional Review Board
DATE: April 30, 2008
RE: Decision of the RIT Institutional Review Board

Project Title – A Needs Assessment & Exploration for Cooperative Learning Incorporating Tablet PC Technology: Participation, Communication, and Leveling the Playing Field Between Deaf and Hearing Students in the Mainstream Classroom

The Institutional Review Board (IRB) has taken the following action on your project named above.

☑ Exempt 46.101 (b) (2)

Now that your project is approved, you may proceed as you described in the Form A.

You are required to submit to the IRB any:
• Proposed modifications and wait for approval before implementing them,
• Unanticipated risks, and
• Actual injury to human subjects.

Heather Foti, MPH
Associate Director
Office of Human Subjects Research

Revised 10-18-06
**FORM A: Request for IRB Review of Research Involving Human Subjects**

- Submit an electronic version of the completed form along with a hard copy to Jennifer Rivera, RIT IRB Administrator, IT Collaboratory, jhrpop@rit.edu.

<table>
<thead>
<tr>
<th>Project Title: A Needs Assessment &amp; Exploration for Cooperative Learning Incorporating Tablet PC Technology: Participation, Communication, and Leveling the Playing Field Between Deaf and Hearing Students in the Mainstream Classroom</th>
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<tbody>
<tr>
<td>Investigator's Name:</td>
</tr>
<tr>
<td>Sarah Remelt</td>
</tr>
<tr>
<td>Investigator's Phone:</td>
</tr>
<tr>
<td>585-475-7545</td>
</tr>
<tr>
<td>Investigator's Email:</td>
</tr>
<tr>
<td><a href="mailto:sbemel@rit.edu">sbemel@rit.edu</a></td>
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<tr>
<td>Investigator's College and Department:</td>
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</tr>
<tr>
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<td>Date of IRB Request:</td>
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<td>2/12/2008</td>
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<tr>
<td>If Student, Name of Faculty Supervisor:</td>
</tr>
<tr>
<td>Dr. Michael Stinson</td>
</tr>
<tr>
<td>Faculty's Phone:</td>
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<tr>
<td>585-475-6596</td>
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<td>Faculty's Email:</td>
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<tr>
<td><a href="mailto:msserd@rit.edu">msserd@rit.edu</a></td>
</tr>
<tr>
<td>If Not Employed or a Student at RIT, List Name, College &amp; Dept. of RIT Collaborator:</td>
</tr>
<tr>
<td>RIT Collaborator's Phone:</td>
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<td>RIT Collaborator's Email:</td>
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<tr>
<td>Will this project be funded externally?</td>
</tr>
<tr>
<td>Yes [X] No</td>
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<tr>
<td>Is the Investigator a student?</td>
</tr>
<tr>
<td>Yes [X] No</td>
</tr>
<tr>
<td>If yes, name of funding agency:</td>
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<tr>
<td>Status of project:</td>
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<tr>
<td>Submitted on 2/12/2008 [X] Funding pending [ ] Funding confirmed</td>
</tr>
<tr>
<td>Do you have a personal financial relationship with the sponsor?</td>
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<tr>
<td>Yes [ ] No [X]</td>
</tr>
<tr>
<td>If yes, please read RIT policy C4.0 – Conflict of Interest Policy Pertaining to Externally Funded Projects. Complete the Investigator's Financial Disclosure Form and attach it to this Form A. All information will be kept confidential.</td>
</tr>
</tbody>
</table>

**BY MY SIGNATURE BELOW, I ATTEST TO AN UNDERSTANDING OF AND AGREE TO FOLLOW ALL APPLICABLE RIT, SPONSOR, NEW YORK STATE, AND FEDERAL POLICIES AND LAWS RELATED TO CONDUCTING RESEARCH WITH HUMAN SUBJECTS. If significant changes in investigative procedures are needed during the course of this project, I agree to seek approval from the IRB prior to their implementation. I further agree to immediately report to the IRB any adverse incidents with respect to human subjects that occur in connection with this project.**

**Signature of Investigator:** [Sarah Remelt] 3/12/08

**Signature of Department Chair or Supervisor:** [John A. Albrecht] 3/13/08

Complete the attached Research Protocol Outline* and attach to this cover form with other required attachments.

Attachments required for all projects:
Form A (continued): Research Protocol Outline

The RIT Institutional Review Board (IRB) categorizes Human Subjects Research into three Risk Types (Exempt, No Greater than Minimal Risk, and Greater than Minimal Risk, defined at the end of this form). The IRB makes the final determination of risk type.

Please complete this entire form (1 through 10 below). ENTER A RESPONSE FOR EVERY QUESTION. If a question does not apply to your project, please enter “N/A”. Leaving questions blank may result in the form being returned to you for completion before it is reviewed by the IRB.

Underlined terms are defined at the end of this form.

FOR ALL PROJECTS, please complete 1-10 below.

1) If you believe your project qualifies for Exemption, which exemption number(s) apply? The project does not qualify for an exemption because there are children as subjects that will be interviewed and surveyed. (Note: The IRB makes the final determination of Exemption)

Which Risk Type (Type I-IV) do you believe applies to your project?

The RIT IRB no longer requires Investigators to determine a Risk Type (Type I-IV)

2) Describe the research problem(s) your project addresses.
The project involves observations of mainstream classroom cooperative learning environments to find ways in which Tablet PC technology can be utilized to increase communication and participation of deaf students in this environment. In addition, teachers or teachers of the deaf (TOD) for the classrooms will be interviewed and surveyed regarding their opinions of the technology.

3) Describe expected benefits to subjects and/or knowledge to be gained from your project.
The benefits are that the suggestions formulated from the observations can help to improve communication and participation of deaf and hard of hearing mainstream students. Successful teaching strategies for enhanced cooperative learning will also be addressed.

4) Describe the population sample for your project.
a) How many subjects will participate in this project?
Three different deaf students in the mainstream environments 2 from middle school and 1 from the elementary school environments and their teachers will be observed. The classroom teachers or TOD will be the only ones interviewed and surveyed in the study.

b) How will these subjects be identified and selected for participation?
Dr. Stinson will ask the Coordinator of BOCES Deaf Ed Program in Monroe County to identify those students within the mainstream environment to work with. Complete – 2 middle school and 1 elementary student and their teachers and TODs have been identified.

c) Describe the rationale for inclusion or exclusion of any subpopulation.
The inclusion of the mainstream deaf students and their teacher in the observations so I can review current cooperative learning strategies for math and science and identify ways in which
to incorporate Tablet PC Technology. Only the teachers or TODs will be interviewed and survey in order to keep permissions to a minimum.

d) How will you recruit subjects?
Dr. Stinson has asked Marty Nelson- Nasca Coordinator of Deaf Ed program at Monroe Boces to help identify teachers to work with. I will ask the teachers or TODs for their permission to conduct the observation and to participate in an interview and survey about Tablet PC Technology. (see attached permission form)

e) Describe any incentives for participation you plan to use.
The only incentive for the program is the knowledge that the participants will be helping to identify ways in which Tablet PC technology could improve learning and participation of deaf or hard of hearing mainstream students in their environment. There is no monetary or other reward for participation.

5) Will you include any of the following vulnerable populations in your research? (Check any that apply)

- [ ] Children
- [ ] Mentally III
- [ ] Mentally Handicapped/Retarded
- [x] Pregnant Women
- [ ] Fetuses

If any of these populations are to be included, please addresses the following:

a) Rationale for selecting or excluding a specific population:
Children will be observed in their normal class periods. No interaction will take place with the students. Interactions to gather opinions and information about using Tablet PC technology in the classroom will be solicited only from the classroom teacher or TOD for the classroom.

b) Description of the expertise of project personnel for dealing with vulnerable populations:
The investigator, Sarah Remelt, is in a program designed for working with K-12 deaf children (MSSE program). Also the advisor, Dr. Stinson, has considerable experience working with and observing children.

c) Description of the suitability of the facilities for the special needs of subjects:
The students will be observed in their own school environment in normal class periods so there should be no difference in the suitability of facilities for the research project.

d) Inclusion of sufficient numbers of subjects to generate meaningful data:
While the numbers of students to participate in the study is only 3, this is an exploratory research project meant to determine if classroom intervention utilizing Tablet PC Technology is warranted.

6) Describe the data collection process.

a) Will the data collected from human subjects be anonymous? [x] Yes [ ] No

b) Will the data collected from human subjects be kept confidential? [x] Yes [ ] No

c) Describe your procedures for ensuring anonymity and/or confidentiality:
The interview process has questions regarding the current practices in the classroom for group work in addition to questions designed to give feedback on the Tablet PC technology demonstrated after the class observations. The interview will include the teacher or the TOD only.

Questions will be general and designed for individuals to express opinions. Teachers or TODs participating in the study will be asked to share what they feel comfortable sharing. Information obtained from the interview will be kept confidential and names of individuals will not be associated with the comments made within reports.

No data from the survey will be shared with anyone other than the researchers. No names will be used in any publications or reports.
d) **How much time is required of each subject?** Classroom observations will be two standard class periods and require no additional or outside classroom work from the students. The teachers or TODs will be asked to watch while Tablet PC technology is demonstrated for them. This will take approximately 15-20 mins. The subsequent interview of the classroom teachers or TOD will take approximately 15 mins. The teacher or TOD will then be asked to fill out a survey regarding their perceptions of the Tablet PC technology which will take approximately 15 minutes.

e) **If subjects are students, will their participation involve class time?** Yes they will be observed for two normal class periods. Students may be told they will be observed by the classroom teacher depending on whether or not they want to tell the students.

f) **What methods, instruments, techniques, and/or other sources of material will you use to gather data from human subjects?**

Information will be gathered from teachers or TOO by both interview and paper survey.

7) **Will this research be conducted at another university or site other than RIT?** Yes No

If yes, describe location: The research will be conducted at the schools where the students attend.

Note: If you will be conducting human subjects research at another university or college, you will also need to obtain IRB approval from that institution. **Attach a copy of that approval to this application.**

8) **Describe potential risks (beyond minimal risk) to subjects:**

a) **Are the risks physical, psychological, social, legal or other?**

There is no risk to the students involved in the study. There is minimal risk to the teachers involved in the study with respect to the interview and surveys used to gather information regarding the Tablet PC technology demonstrated. Everyone (all three teachers or TODs and the researchers) in the interview will be told to share only what they feel comfortable sharing. Also, the paper survey will be an opportunity for the individuals to express opinions without the others in the study knowing what they are saying.

No students will be interviewed or surveyed as part of this study.

b) **Assess their likelihood and seriousness to subjects:**

There is no risk to the subjects.

c) **Discuss the potential benefits of the research to the population from which your subjects are drawn:**

The benefits of the research are the identification of beneficial teaching strategies for working with deaf students in the mainstream classroom and the identification of participation and communication strategies for deaf students in the mainstream utilizing Tablet PC technology.

d) **Discuss why the risks to subjects are reasonable in relation to the anticipated benefits to subjects and others, or in relation to the importance of the knowledge to be gained as a result of the proposed research:**

There is no risk to students or students involved in the study. The benefits to the inclusion of deaf students in group work within the classroom outweighs the risks.

e) **Describe the planned procedures for protecting against or minimizing potential risks, including risks to confidentiality, and assess their likely effectiveness:**

The procedure of observation, interview and survey help to gather information in a non threatening way. Suggestions are made with regard to teaching strategies to increase deaf
students participation in the classroom, including use of Tablet PC technology, and opinions will be solicited in an interview format from the teachers or TODs involved in the study.

f) Where appropriate, describe plans for ensuring necessary medical or professional intervention in the event of adverse effects to the subjects:
N/A

9) Will you be seeking informed consent?  
☐ Yes  ☐ No
If yes, describe:

a) What information will be provided to prospective subjects?
A brief paragraph telling about the project on the consent form for the teachers to sign. (see attached consent form)
No consent will be solicited from the students as they will only be observed in the classroom and will not interact with by the researchers in any way.

b) What (if any) information will be concealed prior to participation, and why?
No information will be concealed.

c) How will you ensure consent is obtained without real or implied coercion?
It will be made clear that participation in the study is voluntary and not required. The consent form will indicate that participation is voluntary and that no reward will be given for participation.

d) How will you obtain and document consent?
I will give consent forms to the classroom teachers and TODs and ask them to sign them. I will then collect them and save them with the research file.

As the students for participation in the study were identified by the head of BOCES deaf ed program, and they will only be observed, no consent will be asked from them or their parents.

e) Who will be obtaining consent? Provide names of specific individuals, where available, and detail the nature of their preparation and instructions for obtaining consent.
Researcher, Sarah Remelt will obtain forms from the teacher.

f) Attach a copy of your consent materials (forms, protocol, script, etc.) to this application. SEE BELOW

TITLE: A Needs Assessment & Exploration for Cooperative Learning Incorporating Tablet PC Technology: Participation, Communication, and Leveling the Playing Field Between Deaf and Hearing Students in the Mainstream Classroom

Method

This project focuses on qualitative exploratory research that analyzes the potential need for and possible inclusion of Tablet PC technology and teaching strategies to enhance cooperative learning in the mainstream classroom environment. After observations, suggestions for use of the technology and assigning student roles, and additional teaching strategies will be shared.

Feedback via interview and survey will be solicited from the teachers involved in the study.
The goals of the project include:

- To observe a small group instruction and student interaction (deaf and hearing) to identify cooperative learning opportunities utilizing the Tablet PC.
- To identify opportunities for enhanced classroom participation and communication using Tablet PC technology in the mainstream environment.
- To identify opportunities for facilitating sharing of classroom work through Tablet PC technology.
- To identify opportunities where the Tablet PC technology may enhance deaf student’s peer relationships within the classroom.
- To identify teaching strategies that may supplement use of the Tablet PC and that may enhance deaf students’ communication, participation and cooperative learning experiences. Particularly with regard to student roles and how they can enhance the cooperative learning experience for deaf students.

Participants

Three deaf students within the mainstream environment and their classroom teachers and TODs in the Rochester, New York area will be observed. Two students will be in middle school (Math and Science) and one student will be in elementary (Science) school. The classes to be observed will either be math or science. Students for inclusion in the study will be identified by the director of BOCES of Monroe County. The study will also include a high school student if one can be identified for the study.

Teachers and TODs will be asked to sign an Informed Consent form in order to participate in the study. See Appendix C for this form.
Measures
After agreeing to participate in the study, students and their teacher will be observed during normal class periods. After the observations, a meeting with the classroom teacher or the TOD for the classroom will be set up to share suggestions and demonstration of the Tablet PC technology and student role strategies. The following measures of evaluation will be used. An interview and survey of perceptions will be conducted with the classroom teachers or TOD to gain feedback on the following:

1. After sharing of suggestions from the observations:
   - Interview teachers or TOD to gain feedback and insights on suggestions developed from the classroom observations.

3. After modeling the Tablet PC technology with student roles
   - Survey of teacher’s perceptions of proposed modeled technology inclusions – Increased student participation, communication and enhanced learning. See Appendix A.

The Activity

Part 1
In part 1 of the study teachers and students in the mainstream elementary, middle school and high school settings will be observed for at least one classroom period that includes group activities. During the observations, data will be collected on student interactions, quality of communication and participation in group activities. An observation checklist will be used as a guide that includes items such as seating of student and service provider, class content, activities, technology used in the classroom and documentation of student interactions. See Appendix B.

Suggestions will be formulated regarding the inclusion of Tablet PC technology in the classroom to facilitate cooperative learning among deaf and hearing students. Particularly with
regard to ways in which the Tablet PC can help facilitate: deaf student participation and communications between the deaf student and their hearing peers, teacher or support personnel; and real time communication.

See Appendix B for Checklist for Observations of Mainstream Classroom Environment.

Part 2

Part 2 of the activity will have two components. The first will be an interview of the teachers or TOD to share the suggestions for the inclusion of Tablet PC technology and student role strategies for cooperative learning in the classroom and to gain feedback on these suggestions. The interview will include questions regarding barriers to social interaction and communication during lesson activities during cooperative groups and solicitation of examples of successful strategies already in use within the classroom.

The second component will be a modeling of the various Tablet PC technology and student roles inclusion strategies for the classroom teacher or the TOD. Feedback will be solicited via survey regarding whether or not the modeled technology and suggestions would facilitate:

- Deaf student participation in cooperative learning
- Communications between the deaf student and their hearing peers, teacher or support personnel
- Direct real time communication
- Deaf student involvement with the class. Enhanced sociability in the classroom.
- Development of natural use of student roles with in the classroom
- Features of technology (Tablet PC Technology)
- Appropriate types of cooperative learning activities (i.e. worksheet collaboration, research
Analyses

Field notes will be analyzed for recurring themes, based on major topics that emerge in the observations. The analysis will occur in stages. The observation field notes and checklists from the different observations will be reviewed, and a set of code categories developed. The investigator will then code the field notes. A report will be generated in which the major themes are described and supported through use of quotations and observations.

Analysis of the interview and survey feedback will be done to determine if the recommended Tablet PC technology and associated strategies would be of benefit for the mainstream classroom environment. The final product will be a reference/resource report with the following:

- A summary of observations made from the different mainstream environments including elementary and middle school levels
- A summary of the interview and survey results of the teacher’s or TOD’s perceptions to determine if they feel the proposed teaching strategies, technology interventions and the Tablet PC would help deaf/hh students communicate and participate better in class and promote cooperative learning strategies in the mainstream classroom.
- A summary of the pros and cons as perceived by the teachers in the study for the inclusion of the Tablet PC and teaching strategies in the classroom.
- Recommendations for further research including interventions using the Tablet PC if warranted.
- Recommendations for features of small group activities
- Recommendations for features of Tablet PC Software
Sarah Remelt Capstone proposal Spring 2008

Questions to be answered:

- Does the modeled use of the Tablet PC appear to help cooperative learning through leveling the playing field between the deaf and hearing students in the mainstream classroom?
- Would the modeled use of the Tablet PC have the potential to facilitate participation of the deaf student in the mainstream classroom for group work?
- Would the modeled use of the Tablet PC have the potential to facilitate real time communication opportunities and reduce lag time from third party interventions for deaf students in the mainstream classroom for group work?
- Would the modeled use of the Tablet PC have the potential to facilitate classroom discourse opportunities for the deaf and hard of hearing student in the mainstream?
- Would the modeled use of student role strategies incorporated in cooperative learning groups using Tablet PC technology enhance student participation?
- Would the use of student role assignments during group activities have the potential to increase peer learning relationship?

Timeline

December 2007 — Select Advisor, finish proposal, present project proposal presentation.

January 2007 — Finish written project proposal. Start Literature Review

February 2007 — Finish Literature Review, finish proposal paper.

March 2007 — Marty at BOCES to identify students to work with. Gain approval for working with human subjects. Contact teachers to set up observations. Perform observations.

April 2007 — Formulate suggestions and demonstrated Tablet PC technology presentation.

Perform demonstration and do interview and survey of teachers, support staff and student.
May 2007 – Complete final report based on interview and survey findings from project and defend research project.
APPENDIX A  TEACHER or TOD SURVEY

Thank you for participating in the observation and interview for inclusion of Tablet PC technology into the mainstream classroom. I want your opinions on the strategies I presented. I will NOT share your individual responses with each other or with anyone other than my advisor. Your responses to the interview and following survey will be summarized to identify future work to be done within the classroom.

Please be completely honest in sharing your opinions and ideas – it is the only way we can make improvements!

When you have completed the survey, please hand it to me (Sarah Remelt).

Part 1 Short Answers – Please circle your answer for each question.

1. I am
   Deaf       Hard of Hearing       Hearing

2. I feel that the Tablet PC would facilitate group work between deaf and hearing students:
   Strongly Agree   Agree   No Opinion   Disagree   Strongly Disagree

3. I feel that using the Tablet PC would help me communicate better with my deaf student
   Strongly Agree   Agree   No Opinion   Disagree   Strongly Disagree

4. I think the Tablet PC would facilitate deaf student’s participation in class.
   Strongly Agree   Agree   No Opinion   Disagree   Strongly Disagree

5. Deaf students would communicate more with the class with a Tablet PC
   Strongly Agree   Agree   No Opinion   Disagree   Strongly Disagree

6. Deaf students would communicate more easily with hearing group members during group work using the Tablet PC
   Strongly Agree   Agree   No Opinion   Disagree   Strongly Disagree

7. The Tablet PC would help deaf students feel more part of the class:
   Never   Sometimes   Half of the Time   Often   Always
APPENDIX A Continued.

8. Students would use the Tablet PC if we had one for group work:

Never   Sometimes   Half of the Time   Often   Always

9. Do you feel the students would use the Tablet PC to communicate rather than an interpreter or captioning during group work?

Never   Sometimes   Half of the Time   Often   Always

10. I would use the Tablet PC to have deaf students ask questions during a class lecture if I had one

Never   Sometimes   Half of the Time   Often   Always

11. Answer if note taker provided: Students would use the Tablet PC to annotate notes and class materials.

Never   Sometimes   Half of the Time   Often   Always

12. It would be of benefit to deaf students to be able to communicate with the class in real time?

Never   Sometimes   Half of the Time   Often   Always

13. It would be of benefit not to have to use third party communication (interpreter, captioning) to communicate with the class during group work.

Never   Sometimes   Half of the Time   Often   Always

14. feel that I could implement the Tablet PC into the classroom for group work

Never   Sometimes   Half of the Time   Often   Always

15. The Tablet PC looks:

Hard to use   Easy to use

16. I can type:

Very well   Good   Ok   Not very well

17. I would like to try to use the Tablet PC for group work:

Yes   No
APPENDIX A Continued.

Please use as much space as you need to answer these questions

18. One of the things I liked about the Tablet PC is:
19. One of the things I did not like about the Tablet PC is:
20. Compare using a Tablet PC to work in a group to using an interpreter or captioning for group work
21. How would you improve the use of the Tablet PC for working in a group with hearing peers?
22. Can you see any other way to use the Tablet PC other than what was demonstrated for you?
23. Do you have any reservations about using the Tablet PC?
24. Any other comments you may have?

THANK YOU!
APPENDIX B

Checklist for Mainstream Classroom Observations – Tablet PC Potential for Group Work

**PLACEMENT:**

Diagram of classroom
- Student placement
- Teacher placement
- Service provider placement

**CLASS CONTENT:**

Lesson Content ____________________________

**TEACHING METHODS:**

<table>
<thead>
<tr>
<th>Cooperative learning</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Worksheets</td>
<td></td>
</tr>
<tr>
<td>Research – look up of information</td>
<td></td>
</tr>
<tr>
<td>Debate</td>
<td></td>
</tr>
<tr>
<td>Solving of problem</td>
<td></td>
</tr>
<tr>
<td>Lab work or detail</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Style of class – lecture, discussion</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment used during class:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalk board</td>
<td></td>
</tr>
<tr>
<td>PowerPoint</td>
<td></td>
</tr>
<tr>
<td>Video</td>
<td></td>
</tr>
<tr>
<td>SmartBoard</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B - Continued

Activities during class

Use of notetaking by deaf student? Y N

Service Providers what type?

<table>
<thead>
<tr>
<th>Interactions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Student participation in class discussion</td>
<td></td>
</tr>
<tr>
<td>Student interaction with service provider</td>
<td></td>
</tr>
<tr>
<td>Student interaction with teacher</td>
<td></td>
</tr>
<tr>
<td>Student interaction with other support service providers</td>
<td></td>
</tr>
<tr>
<td>Student interaction with other students in class</td>
<td></td>
</tr>
<tr>
<td>Student participation in activities in class</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C

Teacher Informed Consent form

PROJECT TITLE: A Needs Assessment & Exploration for Cooperative Learning Incorporating Tablet PC Technology: Participation, Communication, and Leveling the Playing Field Between Deaf and Hearing Students in the Mainstream Classroom

INTRODUCTION
You have been invited to join a research study to look at the possibility of including Tablet PC technology into the mainstream classroom to help deaf and hard of hearing students have greater access to class participation and real time communications during group work. The Tablet PC is a portable computer that allows students to communicate through chat programs, instant messaging, and collaboration through visual means – writing on top of given assignments and representing concepts through drawings or graphic representations. The Tablet PC has a stylus pen that students can use to visually represent ideas through drawing or handwriting. These technology tools have the potential to eliminate some of the communication and social barriers that exist in cooperative learning environments for deaf students in the mainstream. Please take whatever time you need to discuss the study with your family and friends, or anyone else you wish to. The decision to participate or not participate is up to you.

In this research study, I am investigating the potential need for, and possible inclusion of, Tablet PC technology and teaching strategies to enhance cooperative learning in the mainstream classroom environment. It is well known that cooperative learning with meaningful exchanges between students and exchanges between students and their teacher leads to better academic success. From this investigation I hope to learn ways in which the Tablet PC may facilitate deaf or hard of hearing student’s classroom participation; real time communications; enhancement of peer relationships; and ways in which cooperative learning can enhance the deaf student’s academic experiences.

Students in cooperative learning work groups will be observed. After the observations, suggestions for use of Tablet PC technology and additional teaching strategies will be shared. Feedback via interview and survey will be solicited from you, the classroom teacher.

WHAT IS INVOLVED IN THE STUDY
I will observe you and your students during the normal class period. Either one or two class periods will be observed. After the observations, a meeting will be set up with either you or the Teacher of the Deaf (TOD) so you can observe a demonstration of Tablet PC Technology and how it can be used for cooperative learning along with teaching strategies for the mainstream classroom. I estimate this will take 15 to 20 minutes. Immediately following the demonstration, you will be asked to participate in an interview with the researcher to give your opinions on the Tablet PC Technology and teaching strategies demonstrated. I think the interview will take approximately 15 minutes. After the interview, you will be asked to fill out a survey regarding your opinions of the Tablet PC Technology demonstrated. The survey will take approximately 10 minutes or less to complete. You may stop participating at any time.
RISKS
There are no likely risks are involved in this study.

BENEFITS TO TAKING PART IN THE STUDY:
The benefit of the study is that I will learn if the Tablet PC technology is perceived to be helpful to deaf and hard of hearing students in the mainstream environment for facilitation of participation and real time communications during cooperative learning. The teacher may learn about ways in which they can better incorporate a deaf or hard of hearing student into the mainstream classroom. However, there is no guarantee that you personally will experience benefits from participating in this study. Others may benefit in the future from the information I find in this study.

CONFIDENTIALITY
Your name will not be used when data from this study is published. Every effort will be made to keep all research records, and other personal information confidential. None of the student’s names from the observations will be included in any publication or report.

I will take the following steps to keep information confidential, and to protect it from unauthorized disclosure, tampering, or damage:

The data generated from the observations, interview and survey will be kept at RIT with the head researcher /advisor for the project. This information will be housed in a locked office without general access. No outside agencies or other subcontractors will be utilized during the study, and therefore, all data will be housed at and contain at RIT.

INCENTIVES
There are no monetary or other incentives for participating in this study.

YOUR RIGHTS AS A RESEARCH PARTICIPANT
Participation in this study is voluntary. You have the right not to participate at all or to leave the study at any time.

If you decide to leave the study, the procedure is: to contact the researcher: Sarah Remelt at sbrndp@rit.edu or 585-475-7545.

CONTACTS FOR QUESTIONS OR PROBLEMS:
Call Sarah Remelt at 585-475-7545 or email sbrndp@rit.edu or contact Dr. Michael Stinson (research advisor) at 585- 585-475-6596 or email msserd@rit.edu if you have questions about the study.
Consent to Participate in Research

I (Print Name) __________________________ agree to become a participant in the research study described in this form.

______________________________
Signature

______________________________
Title
THINGS TO SHOW ON TABLET PC

1. Wirelessly connect note taker and student so student can capture all information without having to write themselves. Less time with their head down so they can pay attention to the interpreter and class discussion. (Worksheet filling in vocabulary and definitions) If I can't show two Tablet PCs how can I show this with one?

2. Tablet PC - wirelessly connect note taker and student - Student can annotate notes being taken by note taker so they can take charge of their own learning. Again if I can only use one Tablet PC how can I show this with only one Tablet PC?

3. Using 1 or 2 different Tablet PCs for students to collaborate on a worksheet or to have a chat for cooperative learning. Again if I can't use 2 Tablet PCs for this, I could try to show functionality with only 1.

4. Tablet PC - as communication device. Used for chatting in group instead of interpreter – direct, real time communications.

5. Tablet PC for ease of eraser function - tangram example moving objects after traced on computer for easy manipulation.

6. Tablet PC for populating worksheet shown in science class

7. Show use of Cprint on Tablet PC
Human Body Systems

Groups of organs that carry out major body activities

Skeletal
Provides body framework and organ protection

Circulatory
Brings nutrients, hormones and O₂, removes CO₂

Muscular
Body movement and mass

Respiratory
Exchanges O₂ and CO₂

Nervous
Carries messages to all parts of the body

Excretory
Removes wastes (Includes Integumentary)

Endocrine
Controls growth and body functions

Digestive
Converts food to nutrients

Immune - Lymphatic
Reproductive - Offspring
If \[ \square = \frac{1}{4} \]

form a triangle equal to 2.

Prove it!

Think of each tangram piece as a fractional part. Prove 2 sets of tangrams available!

Fraction Tangrams

© 1992
Tangram 4

\[
\begin{align*}
&\frac{1}{4} X 6 = 1.5 \\
&1.5 + 5 = 2
\end{align*}
\]
Will the bulb light or not? Below each picture, make your prediction by writing either "On" or "Off."
DATE: 4/3/08

PLACEMENT: Diagram of the Classroom

Student placement
- Female Deaf Student
- Female Hard of hearing student
- Hearing Male student
- Hearing female student

Teacher placement

Service provider placement
- Interpreter - initial spot 1, secondary spot 2
- Note taker

Observers
- 1
- 2

CLASS CONTENT:

Lesson Content 6th Grade Science Class – Human Body Systems

TEACHING METHODS:

Cooperative learning

| Worksheets | Yes see attached 1A (worksheet completed in class) and 1B (answer key) |

S. Remelt

Observation 1
Research – look up of information | No
Debate | No
Solving of problem | Yes – students discussed among themselves to try and come up with the 10 body systems
Lab work or detail | No

**Style of class – lecture, discussion**

| Lecture | ¼ class was basic lecture
| Discussion | ¾ of the class was hands on or discussion within groups
Students were frequently asked to talk among themselves in a group to discover answers.

**Equipment used during class:**

| Chalk board | No
| PowerPoint | No
| Video | No
| SmartBoard | No – although the teacher did say that several had been installed at the school recently.
| Other | Overhead projector – not LCD. Where the worksheet was displayed on the overhead and the teacher wrote answers into the blanks.

**APPENDIX B - Continued**

**Activities during class**

Lots of cooperative learning through group discussions. Checks of understanding and learning through group or neighbor discussions. The entire room was set up in groups through the seating arrangement. The teacher explained that she frequently – every unit which is about every 2 to 3 weeks—changes the students seats so they have new partners. This includes the two hearing impaired students, however they are kept together so that they may both use the interpreter for the class.

**Use of note taking by deaf student? Yes**

**Service Providers what type?**

There was an interpreter and a note taker for the class.

**Interactions**

| Student participation in class discussion | The female deaf student was very active in participation in class. She answered 5 questions and asked 3 of the teacher herself.
| | The female hard of hearing student did not ask any questions or volunteer answers; however the teacher did ask a question of her and she did answer the question with the correct answer.
| Student interaction with service provider | The female deaf student interacted a lot with the interpreter. During group discussions she relied on the interpreter for clarification of her answers. Rather than checking or as the teacher asked “discuss with your neighbor” the female deaf student checked with the interpreter. The deaf student did check with the hard of hearing student some of the time, however the majority of the time answers were checked with the interpreter.
<table>
<thead>
<tr>
<th><strong>Student interaction with</strong></th>
<th>The hard of hearing student had very little interaction with the interpreter and relied on the deaf student to get her point across.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>teacher</strong></td>
<td>The female deaf student asked 3 different questions of the teacher - all content related. The hard of hearing student only interacted with the teacher when called upon that one time. The teacher called upon her to engage her in the class.</td>
</tr>
<tr>
<td><strong>Student interaction with</strong></td>
<td>None – no interaction noted with the note taker.</td>
</tr>
<tr>
<td><strong>other support service</strong></td>
<td>The entire classroom was set up in groups. The table that the deaf and hard of hearing females were stationed at had two hearing females. While they were constantly called upon to share answers, discuss the topic or check their work and understanding, it was observed that during “group discussions” that the deaf and hard of hearing students tended to share answers and work together and the 2 hearing students tended to work together.</td>
</tr>
<tr>
<td><strong>providers</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Student interaction with</strong></td>
<td>The deaf and hard of hearing students tried to interact with the hearing students however I did note the hearing student’s resentment of the attention of the interpreter. Having to work through the interpreter or the delay in relay of information was frustrating for the two hearing females. I noted a little rolling of the eyes and then a giving up where they only talked among themselves. Attempts were made towards the end of class to engage in discussion with the hard of hearing student; however the deaf student mainly communicated to and through the interpreter.</td>
</tr>
<tr>
<td><strong>other students in class</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Student participation in</strong></td>
<td>The interpreter did not always voice for the deaf student in the class. The hard of hearing student is fairly oral. The interpreter would give feedback on the deaf female’s answers but would not convey the answers to the others in the group. This appeared to have a tendency to isolate the deaf student from the group with the exception of the few times discussion was had between the deaf and hard of hearing student.</td>
</tr>
<tr>
<td><strong>activities in class</strong></td>
<td>Both the deaf female and the hard of hearing female students were expected to participate in class discussions. Both did, however they relied on the interpreter or discussed among themselves. I would have to wonder how successful participation for the class would be without the dynamic of two hearing impair individuals.</td>
</tr>
</tbody>
</table>

**OBSERVATIONS:**
1. I observed the class before this one. I noted that when this class started the teacher spoke slower. This was to accommodate the interpreter and to speak clearer into the FM system she wore for the hard of hearing student.
2. The teacher asked the students to turn their papers over and try to list the 10 different body systems by discussing them within their groups. The teacher was talking while the students were looking down to number their papers. She realized she was doing this and self corrected the problem.
3. The interpreter when she came up to the table where the students were discussing the 10 different systems started offering the answers instead of allowing discussion within the group.
4. The two hearing females in the group with the deaf and hard of hearing females started to show frustration at having to communicate through the interpreter. They showed some halting of communications and
frustration at having to wait for the interpreter to finish communicating. I did note that hearing student did
look at the deaf student when speaking instead of the interpreter.

5. The interpreter did sign but rarely voiced for the deaf student. This was a missed opportunity to engage the
deaf student into the group activity.

6. Once the groups had time to adjust to communicating together, there was interaction between the deaf/hard
of hearing students and the hearing students. However, primarily the deaf and hard of hearing student
collaborated together and the two hearing students collaborated together a majority of the time.

7. The teacher told the students that because the visual aid they were using had small boxes they needed short
definitions for the terms they identified. She also explained that shorter definitions were easier to learn.
(Good use of diagrams and visual aids) as projected on screen.

8. Because the interpreter was relying on the definitions being written on the screen, she did not sign or voice
the discussion the class had as a whole to come up with the definitions this incidental learning was lost to
the deaf student. Making this process more visual would help - perhaps an implementation of CPrint.

9. While the teacher did a GREAT job of standing near the podium in the room, there were a few times the
field of the interpreter was blocked for the deaf student.

10. While the writing to learn activity was completed by the class – filling in the worksheet with terms and
definitions – the deaf students missed a lot of side comments, discussions and information by simply
looking down to write. This information could help the student understand what is happening in the
classroom as well as comprehension of the content. It was hard to follow which answers had been given
and which weren’t if they weren’t written down yet. (The hearing students were calling out of answers and
building on ideas that the deaf and hard of hearing student missed – they had their heads down writing).

11. In addition the interpreter didn’t sign the information that the students bantered in the classroom and simply
let the teacher point to the now compiled and finished definitions she was writing on the overhead.

12. The majority of the time the deaf student checks her answers or had the group discussion with the interpreter
and not the others in the group. She did interact some of the time with the hard of hearing student but rarely
with the hearing students.

13. The teacher asked the students to give one term and its definition to their neighbor before leaving class as a
closure activity to the class. One of the hearing students made the effort to engage the hard of hearing
student and they interacted well together during this activity. Again because it was a shorter task there was
less risk of frustration or prolonged discussion. The deaf student again clarified her answer with the
interpreter. This left the other hearing student in the group essentially without a partner and she played with
the purple tassel on her pen while spouting out an answer to the group in general.

AFTER CLASS DISCUSSION WITH CLASSROOM TEACHER AND INTERPRETER

The classroom teacher and interpreter initiated a discussion of the class after the observation.

• Both the teacher and interpreter conveyed that the hard of hearing and deaf student in the class were
typically grouped together in classes. This is so they can build a friendship (socialization) and because the
hard of hearing student recently started to loose her hearing and therefore is picking up sign language from
the deaf student.

• They also commented that the two females work very well together and have become close friends outside
of class.

• The classroom teacher wanted to ensure that the observers knew that the classroom seating had just changed
the day before. The students were not used to working together yet and that some of the frustration and
hesitation in communications could be due to working in a new group.
• When asked, both the teacher and interpreter did say that the deaf student and the hard of hearing student work together in most of their other classes and typically in this class. They are used to communicating together and often do.

RECOMMENDATIONS:

Teaching Strategies
1. When working in groups always be sure to give students enough time to engage in an activity particularly when deaf and hard of hearing students are involved. There is a lag time or delay going through an interpreter which causes students to need additional time to communicate.

2. Give students enough time to write down information before speaking again. It is too much for a deaf child, whose language is visual, to pay attention to when writing, working with group members and trying to pay attention to the information being written on the board and finally the interpreter giving side comments, information and incidental learning opportunities.

3. Try to ensure that there are roles in the groups so it is not a free for all when you set them loose to collaborate. Particularly when working with deaf or hard of hearing students. The interpreter if used should point at the students to indicate who is talking and who to pay attention to.

4. Using a toy, ball or other object to indicate whose turn it is to “talk” or communicate can help group members regulate communications.

5. Try not to speak when the student’s heads are turned or they are writing. They need the information you are giving whether it is a funny story, additional information or a sharing of experience from another student in the class - all of this information is needed. The interpreter will need to convey this information. Careful facilitation of communication in the classroom can ensure that all students receive the communications in the classroom.

6. Pay close attention to the pace of the information related in class. The pace increased and time went on in the class. This is to be expected as class times are short and all the necessary material needs to be covered. Try to balance pace so that students are not so rushed to complete group work that they don’t effectively communicate – particularly with regard to the deaf.

7. Divided attention leads to miscommunications. The interpreter should stand near the information being shown to the class to interpret. That way the student can see both the material being covered and the interpreter and attention need not be divided by material coverage and communication. Point to the critical pieces of information.

8. Having the deaf students complete a writing task and pay attention to an interpreter, the teacher and the board is a bit much to ask. Perhaps they can have the information on the worksheet populated for them either by the note taker – preferably on some form of electronic device so it’s captured and saved. Then they would only have to divide their attention between the interpreter and the board that shows the material.

9. This teacher made a point of keeping definitions short and to the point. This is a good way to look at information exchange for the deaf who typically have a hard time mastering English.

10. The teacher also made a point to tell me that she rarely uses video streaming of movies or even information off the web because it is never closed captioned and the deaf or hard of hearing have a difficult time following it. She makes a point to get closed captioned movies. If she is unable to get closed captioned movies she tells the students ahead of time what the movie is about and what to look for, then the interpreter stands near the movie and tries to interpret it.

11. Do call on the deaf and hard of hearing in the class -- engage them in the learning process. Lecture in an interactive way – engage students by asking them questions.

12. The teacher was very expressive and used body language and facial expressions to indicate questions, mood and silent information to the students.

13. Make information more visible – write down key words from having students shout out definition or answers to a question. This enables the deaf or hard of hearing students to capture more of the information.
Another suggestion is to include C-Print so that all side and other comments are captured in real time and that the students can read for themselves all of the class comments, information and experiences. To do this the note taker would take notes on a Tablet PC which can be connected to another Tablet PC to be with the deaf or hard of hearing student.

**Technology**
The teacher used a regular overhead projector with the worksheet IA displayed on a pull down screen. She also used a marker to populate the worksheet as the class progressed.

**LCD Projector** – A regular overhead projector was utilized in the classroom. The teacher had to manually populate the worksheet covered in class with a marker on the overhead. This was often times messy, illegible and sometimes smeared. With the use of an LCD projector, the worksheet could be populated on a computer with the information typed out as the class progressed, or with the information popping up as needed utilizing programs as simple as Microsoft PowerPoint.

**Smart Board** – The inclusion of a Smart Board would enable the teacher to display the worksheet and instead of writing on top of the worksheet during class, the answers could be pre-populated on the worksheet but hidden from the class until they class has generated the answers. Something to the effect of click the box and instead of being blank, the answer pops up. This would eliminate the need for the teacher to do so much writing in the class and free up time for discussion instead of writing on the part of the teacher.

The other thing the Smart Board could do is enable the teacher to use colors to highlight information. All information contained and captured on the worksheet can be saved for future reference and given to the class as a study guide for future tests.

**Tablet PC** – A good portion of the class was “writing to learn” based. Students were asked to copy down words and definitions for their worksheets. The deaf students missed side conversations and additional information conveyed through the interpreter because their heads were down writing a lot of the time. The interpreter tried to make up the information but some comments and side conversations were lost.

The deaf student in the class had a note taker that did not interact with her during the class. Notes were being taken on paper to be given to the student later. Even with this service, the deaf student wrote the answers to the questions in class on her worksheet. With the inclusion of the Tablet PC in the classroom the note taker could be wirelessly connected to the deaf student in the classroom. The deaf student could annotate the notes being taken and take charge of their learning process. In addition the deaf student could spend their time watching the interpreter instead of writing down information so that they could get more of the conversation happening in the classroom. In addition, having the notes there in front of them would help them understand missed or misunderstood information for self corrections and better understanding of content being covered.

There were a significant amount of larger words being used in the class with a significant amount of finger spelling occurring. The teacher warned the observers before the class started that there would be a lot of finger spelling and this was unavoidable. With the words showing up on the Tablet PC in front of the student, the student may be better able to read and comprehend them.

The second way the Tablet PC could be used in the classroom is for conversations between students in the group. They could collaborate on the worksheet together. Given at least two different Tablet PCs to work with, the students could use a chat program to have real time communications.

**CPrint** – Cprint may help the student with the terminology used in this classroom as well. Because a lot of the words are finger spelled, the student could see in real time what was being said in the classroom including terminology. Several of the students in the class shared stories about their answers and those two would be
captured. If the deaf student were looking down writing or communicating with another person in the class, they could “catch up” with what was said by reading the CPrint log, C-Print so that all side and other comments are captured in real time and that the students can read for themselves all of the class comments, information and experiences. To do this the note taker would take notes on a Tablet PC which can be connected to another Tablet PC to be with the deaf or hard of hearing student.
Human Body Systems

Groups of organs that carry out major body activities

Skeletal
Provides body framework and organ protection

Muscular
Body movement and mass

Nervous
Carries messages to all parts of the body

Endocrine
Controls growth and body functions

Digestive
Converts food to nutrients

Excretory
Removes wastes (Includes Integumentary)

Circulatory
Brings nutrients, hormones and O₂, removes CO₂

Respiratory
Exchanges O₂ and CO₂

Immune - Lymphatic
Reproductive - Offspring
DATE: 4/8/08

PLACEMENT:
Diagram of classroom

Student placement
- Female Deaf Student
- Hearing Male student
- Hearing female student

Teacher placement – Note: after homework discussion teacher wandered room to help groups

Service provider placement
- Interpreter
- Note taker

Observer


Chalk Board

Smart Board

Table

Table/Podium

Teacher's Desk

TV

Closet
CLASS CONTENT:

**Lesson Content**: 6th grade Math lesson – Tangrams (using shapes to create one big shape based on mathematical formulas)

TEACHING METHODS:

**Cooperative learning**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worksheets</td>
<td>Yes – several worksheets to complete based on tangrams and math formulas</td>
</tr>
<tr>
<td>Research – look up of information</td>
<td>No</td>
</tr>
<tr>
<td>Debate</td>
<td>No</td>
</tr>
<tr>
<td>Solving of problem</td>
<td>Yes – solving of problems fractions as expressed in tangrams</td>
</tr>
<tr>
<td>Lab work or detail</td>
<td>Yes – students worked in pairs on completing the tangram puzzles.</td>
</tr>
</tbody>
</table>

**Style of class – lecture, discussion**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>Very little – simple instructions</td>
</tr>
<tr>
<td>Discussion</td>
<td>A lot of discussion within the pairs on how to complete the worksheets.</td>
</tr>
</tbody>
</table>

**Equipment used during class**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalk board</td>
<td>No</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>No</td>
</tr>
<tr>
<td>Video</td>
<td>No</td>
</tr>
<tr>
<td>SmartBoard</td>
<td>Yes – Smart board was utilized to show the answers for the homework given yesterday. The homework problems were displayed with problem work shown and answers in a different color than the questions. Hints were displayed for the different tangram puzzles the students were working on in their groups.</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
</tbody>
</table>

APPENDIX B - Continued

**Activities during class**

Completed worksheets in groups of two.

**Use of note taking by deaf student? Yes**

The note taker kept conferring with the students to ensure that she had the correct answers recorded. The deaf student also took notes on the activity herself so this was a duplication of effort.

**Service Providers what type?**

An interpreter – who voiced for the hearing student in the pair and signed for the deaf student.
A note taker – who recorded answers to the problems for the student. The note taker did volunteer that she is to receive a Tablet PC to help her take notes for the deaf student.
Student participation in class discussion
Answered – one question from homework
Question – asked 2 questions of the teacher
Sought confirmation on answers to group work from teacher 3 times.

Student interaction with service provider
The deaf student interacted continuously with the interpreter. She continuously sought confirmation on answers to the questions from the interpreter.

Student interaction with teacher
See participation

Student interaction with other support service providers
The deaf student did clarify answers for the note taker to ensure the correct answers were recorded.

Student interaction with other students in class
The deaf student interacted with several other students in the class but primarily with her female hearing partner. While this is the case, the deaf student interacted much more with the interpreter than with the hearing student in her group (pair).

Student participation in activities in class
The student was very engaged in the activity for the class – working on the tangram puzzle worksheets.

GENERAL OBSERVATIONS:
The deaf student immediately started working on the worksheets independently and asked for lots of clarification from the interpreter.

The answers to the puzzles needed to be written on the worksheets. This meant the deaf student spent time writing out answers only to erase them when they didn’t work out. The pair of students (deaf/hearing) as mentioned started out working independently with the small bag of shapes in solving the puzzles and came together to share and compare answers. They did work together for a short time after this, however they reverted to independent work often. Also, the deaf student, as mentioned, conferred and clarified through the interpreter more often than the hearing student in her group.

The deaf student did voice a bit for the hearing student in the group to try and engage her in the activity more and to confirm answers.

The project was inherently visual – moving puzzle pieces on the table and tracing them onto paper in order to create the tangram puzzle. The one on one nature of the project works well with the students when they work together.

Noted that the deaf student effectively used pointing and tapping effectively to get the hearing student’s attention.

These worksheets could be done on the Tablet PC where the students would trace the shapes onto the tablet pc and use the stylus to move the shapes around to arrive at the answer. This could just as effectively be accomplished with the shapes the teachers gave the students. The advantage of using the Tablet PC is that is has an erasing feature to save the students erasing wrong answers. They did that a lot during the time allotted. Also the answers could be saved for a later date.
Perhaps working with the Smart Board instead of shapes on the table where students take turns showing how to
build the different tangrams on the screen up front. It was certainly more fun and showed more aspects of
cooperative learning with the tiles at the table.

When the deaf student felt she and her partner arrived at the correct answer she immediately raised her hand to
clarify their answer with the classroom teacher.

Again I noted for about the 4th time that the deaf student and hearing student were working independently not
really together with the deaf student clarifying answers and ideas through the interpreter. Noted that the other
groups has some amount of independent work as well but most of they worked together.

Other groups checked with each other for answer confirmation, the deaf/hearing team only checked with the
teacher.

RECOMMENDATIONS:

Teaching Strategies
1. Ensure all students play a role in group. The deaf student can sometimes disengage from group work
   activity by communicating only to the interpreter instead of to their partner or other group members.
2. Avoid speaking when student is writing/head turned or down.
3. Avoid division of attention – board, interpreter, teacher, other students, worksheet
4. Have the interpreter to stand near worksheet displayed so they can point out important information or keep
   the student on track of material discussions.
5. Have deaf student’s worksheet populated by note taker or give one filled in at end of class.
6. Project was extremely visual – puzzle pieces this was a good exercise for group work with deaf and hearing
   students.
7. Try to engage students in working together – one set of worksheets for undivided attention and instead of
   the interpreter giving confirmation on correctness of answers, have the deaf /hh student check with their
   partner instead. This would encourage information exchanges and cooperative learning.
8. Avoid over reliance on interpreter – students should work together in the group not the deaf with the
   interpreter. The interpreter should allow students to come to their own conclusions and work together
   similar to the hearing students in the class.

Possible Technology Inclusions:
1. Smart Board to display worksheets – makes learning more visual
2. Smart Board to highlight with color and make materials more visually distinct
3. Smart Board to have students show answers to Tangrams and how they solved them using shapes and
   moving them around the board.
4. Tablet PC – wirelessly connect note taker and student so student can capture all information without having
   to write themselves. This would mean the deaf student would spend less time with their head down so they
   can pay attention to the teacher and the interpreter.
5. Tablet PC – wirelessly connect note taker and student – Student can annotate notes being taken by note
   taker so they can take charge of their own learning.
6. Tablet PC – as communication device. Used for chatting in group instead of interpreter – real time
   communications. Students would “speak for themselves” and practice interacting with hearing people.
7. Tablet PC – students can write on worksheet and try answers / erase them try again with ease.
8. Tablet PC – putting the worksheet on the Tablet PC would give the students one focal point to focus on and theoretically help students to concentrate on working together instead of drifting into independent work.
Marcy Cook
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Balboa Island, CA 92662

© 1992
If $\triangle = \frac{1}{4}$

form a quadrilateral equal to $2\frac{1}{4}$.

Prove it!

Fraction Tangrams

Think of each tangram piece as a fractional part. I have 2 sets of tangrams available!
If \( \frac{1}{2} \) form a quadrilateral equal to \( 2\frac{1}{2} \).

Prove it!

Think of each tangram piece as a fractional part. Have 2 sets of tangrams available!

Fraction Tangrams 1992
If \( \frac{2}{3} \) form a polygon (with the minimum number of pieces) equal to 6.

Prove it!

Think of each tangram piece as a fractional part. I have 2 sets of tangrams available!

Fraction Tangrams 1992
If $\frac{4}{4} = \frac{1}{4}$

form a triangle equal to 2.

Prove it!

Think of each Tangram piece as a fractional part. I have 2 sets of Tangrams available!

Fraction Tangrams © 1992
If $\triangle = \frac{3}{5}$

form a rhombus (with the minimum number of pieces) equal to $4\frac{4}{5}$.

Prove it!

Think of each tangram piece as a fractional part. Have 2 sets of tangrams available!
If \[ \frac{6}{3} = 2 \]

form 4 congruent figures each equal to 1.

Prove it!

Think of each tangram piece as a fractional part. There are 2 sets of tangrams available!

Fraction Tangrams

© 1992
If \( \frac{7 \times 4}{16 \times 4} = \frac{7 \times 1}{8 \times 2} = \frac{7}{16} \)

form 2 rhombi, each equal to \( 1 \frac{3}{4} \).

Prove it!

Think of each tangram piece as a fractional part. Have 2 sets of tangrams available!

Fraction Tangrams

© 1992
If \[
\begin{array}{c}
\text{If} \\
\begin{array}{c}
\text{If} \\
\end{array}
\end{array}
\right. = 1 \frac{1}{3}
\]
form 3 quadrilaterals
(different by most specific geometric name), each equal to 5 \(\frac{1}{3}\).
Prove it!

Think of each tangram piece as a fractional part. Have 2 sets of tangrams available!

Fraction Tangrams
If \[ \text{[square]} = \frac{4}{9} \]

form a polygon with bilateral symmetry equal to \( 3\frac{5}{9} \).
PROVE IT!

Think of each tangram piece as a fractional part. I have 2 sets of tangrams available!

Fraction Tangrams 1992
If \[ \frac{5}{10} = \frac{1}{2} \]

form 2 congruent polygons, each equal to \( 2 \frac{2}{5} \).

Prove it!

Think of each tangram piece as a fractional part. Have 2 sets of tangrams available.

Fraction Tangrams © 1992
If \[ \frac{6}{7} \]

form a hexagon equal to \( 5 \frac{1}{7} \).

Prove it!

Think of each tangram piece as a fractional part. Have 2 sets of tangrams available!

Fraction Tangrams © 1992
DATE: 4/22/08

PLACEMENT:
Diagram of classroom

Student placement
⊙ Male Deaf Student
● Hearing Male student
● Hearing female student

☀ Teacher placement – Note: after group work explanation teacher wandered room to help groups

◇ Teacher's Aide

Service provider placement
☆ Interpreter
Observer

Chalk Board

Overhead Projector

Cubbies

TV on cart

Closet

Bathroom

Computer Table

Work Table

S. Remelt

Observation 3
CLASS CONTENT:

Lesson Content: 4th grade Science lesson - Electricity, making a circuit

TEACHING METHODS:

<table>
<thead>
<tr>
<th>Cooperative learning</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Worksheets</td>
<td>Yes one worksheet with pictures of different things to try with the materials given (battery, wires, light bulb). If the light bulb lit, write ON for an answer if not, write OFF.</td>
</tr>
<tr>
<td>Research look up of information</td>
<td>No</td>
</tr>
<tr>
<td>Debate</td>
<td>No</td>
</tr>
<tr>
<td>Solving of problem</td>
<td>Yes - solving situational problems based on drawings</td>
</tr>
<tr>
<td>Lab work or detail</td>
<td>Yes - students worked in pairs on completing the worksheet examples</td>
</tr>
</tbody>
</table>

| Style of class – lecture, discussion |  |
| Lecture                          | Very little - simple instructions given and then pairs of students did work |
| Discussion                       | A lot of discussion within the pairs on how to complete the worksheet. |

| Equipment used during class |  |
| Chalk board                  | No |
| PowerPoint                   | No |
| Video                        | No |
| SmartBoard                   | No - none present |
| Other                        | Projector and TV were in the room but not utilized |

Activities during class
Groups were asked to "try and make the bulb light up."
Then students were given a worksheet of example circuits to try and write ON for if the light bulb lit and OFF if it didn’t.

Use of note taking by deaf student? No
There was no official note taker for the class. The TOD present said that if they are present for a class with the student, they will take notes as reminders as what was covered in class but not verbatim or specific class notes.

Service Providers what type?
An interpreter - who voiced for the hearing student in the pair and signed for the deaf student.
A TOD – Worked with interpreter and student when needed.

Interactions
Student participation in class

S. Remelt Observation 3
teacher asked a question of the class and the interpreter signed the question the student answered directly to the interpreter. Then the student looked for confirmation from the interpreter on the answer. 

Question – did not ask any questions of teacher in class. Did ask many times for clarification from the interpreter.

<table>
<thead>
<tr>
<th>Student interaction with service provider</th>
<th>The deaf student interacted continuously with the interpreter. He continuously sought confirmation on answers to the questions from the interpreter.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student interaction with teacher</td>
<td>This student had no interaction with the classroom teacher.</td>
</tr>
<tr>
<td>Student interaction with other support service providers</td>
<td>The student did interact with the TOD during class when the TOD asked him questions or interpreted for the interpreter when a bathroom break was needed.</td>
</tr>
<tr>
<td>Student interaction with other students in class</td>
<td>The deaf student interacted with his group partner in the classroom but with no other students in the class.</td>
</tr>
<tr>
<td>Student participation in activities in class</td>
<td>The student was very engaged in the activity for the class – working trying to make the bulb light.</td>
</tr>
</tbody>
</table>

GENERAL OBSERVATIONS:
The deaf student is a Cochlear Implant user and very oral. He does speak well and uses his voice, particularly with his partner. With the interpreter he will sign and use his voice. An FM system is in use in the classroom.

At the beginning of the class the interpreter sat at the front of the room and the deaf student had to crane their neck to see them around a group of students sitting in front of him. See position 1 for the interpreter.

After brief explanation of what to do, the teacher passed out a battery, light bulb and wire to the pairs of students. The students were given 15 minutes to work, in pairs, to try and make the bulb to light trying various things with the wire and the battery. Since this activity was very hands on and visual, the deaf and hearing student worked well together by “doing” rather than communicating or talking about what to do. The communication consisted mostly of hands on work and gestures for what to try rather than talking or communicating through the interpreter.

The deaf student regularly and continually seeks clarification on answers and attempts to make the light bulb light with the interpreter and not his partner. The interpreter regularly gives hints as to what to try to the deaf student. The interpreter sometimes gave answers instead of letting the pair work out the answer for themselves.

The hearing student in the pair became frustrated with the lack of attention from his partner and the interpreter and asks the interpreter to tell the deaf student to stop working ahead and wait for him. This was a bid to get the deaf student’s attention off the interpreter and onto the group work at hand. It worked and the students began working together again but with gestures and sharing of tools not really communicating in depth.

The deaf student looked around the room to see if he can determine what other groups are doing. He picks his head up and looks when he hears another group shout that they have the answer. Again I believe this was for confirmation of answers to the worksheet. When he can’t understand them he asked the interpreter what happened. The student is very engaged with his own learning.
Both students, deaf and hearing, write the answers on their respective worksheets. The pace of the class is leisurely and exploratory so there is time for this. While having the worksheet on a Tablet PC would help focus both students on the same worksheet, it probably would not be as helpful.

When the teacher was going over the answers to the worksheet with the class, the students were asked to take a look at the answer to one of the questions, then put their head down and raise their hand if the answer was ON. Now raise your head if the answer was OFF. This was so they had to speak for themselves instead of copying another group’s answer. This left the deaf child out of the exercise. The interpreter tried to include him by holding a sheet of paper up in front of his eyes and signing small to him, but the student simply looked at the other student’s answers anyway. This is not a good way to determine answers in a class with a deaf child. It singles out the deaf as different and does not promote inclusion. A simple ON paper and OFF paper to be held up would have been better so that the exercise was visible to all and the teacher would still gain feedback from the class on the level of understanding for the activity.

A better way to do this is to invest in clickers for the classroom where instant polls can be taken and immediate feedback to answers can be given anonymously through projected results on a screen. However, there was no computer projector in the classroom. Another less expensive way to show results is to have the students raise their hands as to what answer they got from their exploration and write the results in on the overhead. This would make the exercise more visible for the students in the classroom and to the deaf student. Simply showing an overhead with the results of the experiment would be a good idea for all of the students in the class. It gives visual feedback to the students in addition to verbal feedback. It would also ensure students record the correct answers for future reference.

When the teacher was going over the worksheet and asking questions as to why the students got the answers they did, the deaf student answered all the questions but to the interpreter. He did not attempt to share his answers with the teacher or the other students in the classroom.

RECOMMENDATIONS

Teaching Strategies

1. Ensure interpreter is visible to deaf/hh student
2. Ensure all students play a role in the activity and that they work together
3. Avoid division of attention - use one paper not two or more for the group. This will help the students pay attention to the same information. Also notes can be added to the paper for further clarification.
4. Give deaf student a copy of the filled in paper at the end of class. This way they can spend more time attending to the activity and less to writing with their head down.
5. Avoid duplication of effort - again both students writing the answer means double work with both of them with their heads down. A note taker would be ideal, however a worksheet with the answers filled in at the end of class would be sufficient for the student.
6. Make learning more visual by showing answers to the problems and questions on a board, overhead or ideally on a Tablet PC where the student can annotate the worksheet with their own ideas giving them better control over their own learning.

S. Remelt
Observation 3
7. Try to engage students in working together – one set of worksheets for undivided attention and instead of the interpreter giving confirmation on correctness of answers, have the deaf/hh student check with their partner instead. This would encourage information exchanges and cooperative learning.

8. Avoid over reliance on interpreter – students should work together in the group not the deaf with the interpreter. The interpreter should allow students to come to their own conclusions and work together similar to the hearing students in the class.

Technology Inclusions
1. Overhead projector – show worksheet answers instead of just verbally going through them with the class. This would make learning more visual for the entire class.
2. Smart Board – show how the circuits are built on the board. Show how to arrive at the correct answers.
3. Smart Board – have students take turns drawing the circuits and then explaining why they would or would not make the bulb light. Again this would make the learning more visual.
4. Tablet PC – show answers to the questions on the worksheet.
5. Tablet PC – use the tablet for collaboration with partner – chat feature, drawing features, erase features
6. Tablet PC – Drawing the answers to the problems would make the activity more visual for the deaf student.
7. Tablet PC – putting the worksheet on the Tablet PC would give the students one focal point to focus on and theoretically help students to concentrate on working together instead of drifting into independent work.
8. Tablet PC – Wirelessly connect note taker or TOD and student. Student can annotate notes being taken by note taker so they can take charge of their own learning.
Will the bulb light or not? Below each picture, make your prediction by writing either "On" or "Off."
THINGS TO SHOW ON TABLET PC

1. Wirelessly connect note taker and student so student can capture all information without having to write themselves. Less time with their head down so they can pay attention to the interpreter and class discussion. (Worksheet filling in vocabulary and definitions) If I can’t show two Tablet PCs how can I show this with one?

2. Tablet PC - wirelessly connect note taker and student - Student can annotate notes being taken by note taker so they can take charge of their own learning. Again if I can only use one Tablet PC how can I show this with only one Tablet PC?

3. Using 1 or 2 different Tablet PCs for students to collaborate on a worksheet or to have a chat for cooperative learning. Again if I can’t use 2 Tablet PCs for this, I could try to show functionality with only 1.

4. Tablet PC - as communication device. Used for chatting in group instead of interpreter – direct, real time communications.

5. Tablet PC for ease of eraser function - tangram example moving objects after traced on computer for easy manipulation.

6. Tablet PC for populating worksheet shown in science class

7. Show use of Cprint on Tablet PC
Human Body Systems

Name ____________________________  Science Period ______

[Diagram of a human body with empty boxes around it]
Human Body Systems

Groups of organs that carry out major body activities.

Skeletal
Provides body framework and organ protection.

Muscular
Body movement and mass.

Nervous
Carries messages to all parts of the body.

Endocrine
Controls growth and body functions.

Digestive
Converts food to nutrients.

Immune-Lymphatic

Reproductive: Offspring.

Circulatory
Brings nutrients, hormones and $O_2$, removes $CO_2$.

Respiratory
Exchanges $O_2$ and $CO_2$.

Excretory
Removes wastes (Includes Integumentary).
If $\frac{1}{4} = \frac{2}{8}$

form a triangle

equal to 2.

Prove it!

Think of each tangram piece as a fractional part. I have 2 sets of tangrams available.

Fraction Tangrams

© 1992
$\square = \frac{1}{4}$
$\square \times 6 + \frac{1}{2} \square \times 4 =$

$\frac{1}{4} \times 6 = 1.5$ and $\frac{1}{8} \times 4 = 0.5$
$1.5 + 0.5 = 2$
Will the bulb light or not? Below each picture, make your prediction by writing either "On" or "Off."
DATE: 4/3/08

PLACEMENT: Diagram of the Classroom

Student placement
- Female Deaf Student
- Female Hard of hearing student
- Hearing Male student
- Hearing female student
- Teacher placement

Service provider placement
- Interpreter - initial spot 1, secondary spot 2
- Note taker

Observers

CLASS CONTENT:

6th Grade Science Class – Human Body Systems

TEACHING METHODS:

Cooperative learning

| Worksheets | Yes see attached 1A (worksheet completed in class) and 1B (answer key) |

S. Remelt

Observation 1
### Research – look up of information
No

### Debate
No

### Solving of problem
Yes – students discussed among themselves to try and come up with the 10 body systems

### Lab work or detail
No

### Style of class – lecture, discussion

<table>
<thead>
<tr>
<th>Lecture</th>
<th>¼ class was basic lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion</td>
<td>¾ of the class was hands on or discussion within groups</td>
</tr>
<tr>
<td>Students were frequently asked to talk among themselves in a group to discover answers.</td>
<td></td>
</tr>
</tbody>
</table>

### Equipment used during class:

<table>
<thead>
<tr>
<th>Chalk board</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>PowerPoint</td>
<td>No</td>
</tr>
<tr>
<td>Video</td>
<td>No</td>
</tr>
<tr>
<td>SmartBoard</td>
<td>No – although the teacher did say that several had been installed at the school recently.</td>
</tr>
<tr>
<td>Other</td>
<td>Overhead projector – not LCD. Where the worksheet was displayed on the overhead and the teacher wrote answers into the blanks.</td>
</tr>
</tbody>
</table>

### APPENDIX B - Continued

### Activities during class
Lots of cooperative learning through group discussions. Checks of understanding and learning through group or neighbor discussions. The entire room was set up in groups through the seating arrangement. The teacher explained that she frequently – every unit which is about every 2 to 3 weeks—changes the students seats so they have new partners. This includes the two hearing impaired students, however they are kept together so that they may both use the interpreter for the class.

### Use of note taking by deaf student? Yes

### Service Providers what type?
There was an interpreter and a note taker for the class.

### Interactions

<table>
<thead>
<tr>
<th>Student participation in class discussion</th>
<th>The female deaf student was very active in participation in class. She answered 5 questions and asked 3 of the teacher herself.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The female hard of hearing student did not ask any questions or volunteer answers; however the teacher did ask a question of her and she did answer the question with the correct answer.</td>
<td></td>
</tr>
<tr>
<td>Student interaction with service provider</td>
<td>The female deaf student interacted a lot with the interpreter. During group discussions she relied on the interpreter for clarification of her answers. Rather than checking or as the teacher asked “discuss with your neighbor” the female deaf student checked with the interpreter. The deaf student did check with the hard of hearing student some of the time, however the majority of the time answers were checked with the interpreter.</td>
</tr>
<tr>
<td>Student interaction with teacher</td>
<td>The hard of hearing student had very little interaction with the interpreter and relied on the deaf student to get her point across.</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Student interaction with other support service providers</td>
<td>The female deaf student asked 3 different questions of the teacher- all content related. The hard of hearing student only interacted with the teacher when called upon that one time. The teacher called upon her to engage her in the class.</td>
</tr>
<tr>
<td>Student interaction with other students in class</td>
<td>None – no interaction noted with the note taker.</td>
</tr>
<tr>
<td>Student participation in activities in class</td>
<td>The entire classroom was set up in groups. The table that the deaf and hard of hearing females were stationed at had two hearing females. While they were constantly called upon to share answers, discuss the topic or check their work and understanding, it was observed that during “group discussions” that the deaf and hard of hearing students tended to share answers and work together and the 2 hearing students tended to work together. The deaf and hard of hearing students tried to interact with the hearing students however I did note the hearing student’s resentment of the attention of the interpreter. Having to work through the interpreter or the delay in relay of information was frustrating for the two hearing females. I noted a little rolling of the eyes and then a giving up where they only talked among themselves. Attempts were made towards the end of class to engage in discussion with the hard of hearing student; however the deaf student mainly communicated to and through the interpreter. The interpreter did not always voice for the deaf student in the class. The hard of hearing student is fairly oral. The interpreter would give feedback on the deaf female’s answers but would not convey the answers to the others in the group. This appeared to have a tendency to isolate the deaf student from the group with the exception of the few times discussion was had between the deaf and hard of hearing student.</td>
</tr>
</tbody>
</table>

**OBSERVATIONS:**
1. I observed the class before this one. I noted that when this class started the teacher spoke slower. This was to accommodate the interpreter and to speak clearer into the FM system she wore for the hard of hearing student.
2. The teacher asked the students to turn their papers over and try to list the 10 different body systems by discussing them within their groups. The teacher was talking while the students were looking down to number their papers. She realized she was doing this and self corrected the problem.
3. The interpreter when she came up to the table where the students were discussing the 10 different systems started offering the answers instead of allowing discussion within the group.
4. The two hearing females in the group with the deaf and hard of hearing females started to show frustration at having to communicate through the interpreter. They showed some halting of communications and...
frustration at having to wait for the interpreter to finish communicating. I did note that hearing student did look at the deaf student when speaking instead of the interpreter.

5. The interpreter did sign but rarely voiced for the deaf student. This was a missed opportunity to engage the deaf student into the group activity.

6. Once the groups had time to adjust to communicating together, there was interaction between the deaf /hard of hearing students and the hearing students. However, primarily the deaf and hard of hearing student collaborated together and the two hearing students collaborated together a majority of the time.

7. The teacher told the students that because the visual aid they were using had small boxes they needed short definitions for the terms they identified. She also explained that shorter definitions were easier to learn. (Good use of diagrams and visual aids) as projected on screen.

8. Because the interpreter was relying on the definitions being written on the screen, she did not sign or voice the discussion the class had as a whole to come up with the definitions this incidental learning was lost to the deaf student. Making this process more visual would help - perhaps an implementation of CPrint.

9. While the teacher did a GREAT job of standing near the podium in the room, there were a few times the field of the interpreter was blocked for the deaf student.

10. While the writing to learn activity was completed by the class – filling in the worksheet with terms and definitions – the deaf students missed a lot of side comments, discussions and information by simply looking down to write. This information could help the student understand what is happening in the classroom as well as comprehension of the content. It was hard to follow which answers had been given and which weren’t if they weren’t written down yet. (The hearing students were calling out of answers and building on ideas that the deaf and hard of hearing student missed – they had their heads down writing).

11. In addition the interpreter didn’t sign the information that the students bantered in the classroom and simply let the teacher point to the now compiled and finished definitions she was writing on the overhead.

12. The majority of the time the deaf student checks her answers or had the group discussion with the interpreter and not the others in the group. She did interact some of the time with the hard of hearing student but rarely with the hearing students.

13. The teacher asked the students to give one term and its definition to their neighbor before leaving class as a closure activity to the class. One of the hearing students made the effort to engage the hard of hearing student and they interacted well together during this activity. Again because it was a shorter task there was less risk of frustration or prolonged discussion. The deaf student again clarified her answer with the interpreter. This left the other hearing student in the group essentially without a partner and she played with the purple tassel on her pen while spouting out an answer to the group in general.

AFTER CLASS DISCUSSION WITH CLASSROOM TEACHER AND INTERPRETER
The classroom teacher and interpreter initiated a discussion of the class after the observation.

- Both the teacher and interpreter conveyed that the hard of hearing and deaf student in the class were typically grouped together in classes. This is so they can build a friendship (socialization) and because the hard of hearing student recently started to loose her hearing and therefore is picking up sign language from the deaf student.

- They also commented that the two females work very well together and have become close friends outside of class.

- The classroom teacher wanted to ensure that the observers knew that the classroom seating had just changed the day before. The students were not used to working together yet and that some of the frustration and hesitation in communications could be due to working in a new group.
When asked, both the teacher and interpreter did say that the deaf student and the hard of hearing student work together in most of their other classes and typically in this class. They are used to communicating together and often do.

RECOMMENDATIONS:

Teaching Strategies
1. When working in groups always be sure to give students enough time to engage in an activity particularly when deaf and hard of hearing students are involved. There is a lag time or delay going through an interpreter which causes students to need additional time to communicate.
2. Give students enough time to write down information before speaking again. It is too much for a deaf child, whose language is visual, to pay attention to when writing, working with group members and trying to pay attention to the information being written on the board and finally the interpreter giving side comments, information and incidental learning opportunities.
3. Try to ensure that there are roles in the groups so it is not a free for all when you set them loose to collaborate. Particularly when working with deaf or hard of hearing students. The interpreter if used should point at the students to indicate who is talking and who to pay attention to.
4. Using a toy, ball or other object to indicate whose turn it is to “talk” or communicate can help group members regulate communications.
5. Try not to speak when the student’s heads are turned or they are writing. They need the information you are giving whether it is a funny story, additional information or a sharing of experience from another student in the class - all of this information is needed. The interpreter will need to convey this information. Careful facilitation of communication in the classroom can ensure that all students receive the communications in the classroom.
6. Pay close attention to the pace of the information related in class. The pace increased and time went on in the class. This is to be expected as class times are short and all the necessary material needs to be covered. Try to balance pace so that students are not so rushed to complete group work that they don’t effectively communicate - particularly with regard to the deaf.
7. Divided attention leads to miscommunications. The interpreter should stand near the information being shown to the class to interpret. That way the student can see both the material being covered and the interpreter and attention need not be divided by material coverage and communication. Point to the critical pieces of information.
8. Having the deaf students complete a writing task and pay attention to an interpreter, the teacher and the board is a bit much to ask. Perhaps they can have the information on the worksheet populated for them either by the note taker - preferably on some form of electronic device so it’s captured and saved. Then they would only have to divide their attention between the interpreter and the board that shows the material.
9. This teacher made a point of keeping definitions short and to the point. This is a good way to look at information exchange for the deaf who typically have a hard time mastering English.
10. The teacher also made a point to tell me that she rarely uses video streaming of movies or even information off the web because it is never closed captioned and the deaf or hard of hearing have a difficult time following it. She makes a point to get closed captioned movies. If she is unable to get closed captioned movies she tells the students ahead of time what the movie is about and what to look for, then the interpreter stands near the movie and tries to interpret it.
11. Do call on the deaf and hard of hearing in the class -- engage them in the learning process. Lecture in an interactive way - engage students by asking them questions.
12. The teacher was very expressive and used body language and facial expressions to indicate questions, mood and silent information to the students.
13. Make information more visible - write down key words from having students shout out definition or answers to a question. This enables the deaf or hard of hearing students to capture more of the information.
14. Another suggestion is to include C-Print so that all side and other comments are captured in real time and that the students can read for themselves all of the class comments, information and experiences. To do this the note taker would take notes on a Tablet PC which can be connected to another Tablet PC to be with the deaf or hard of hearing student.

Technology
The teacher used a regular overhead projector with the worksheet 1A displayed on a pull down screen. She also used a marker to populate the worksheet as the class progressed.

**LCD Projector** – A regular overhead projector was utilized in the classroom. The teacher had to manually populate the worksheet covered in class with a marker on the overhead. This was often times messy, illegible and sometimes smeared. With the use of an LCD projector, the worksheet could be populated on a computer with the information typed out as the class progressed, or with the information popping up as needed utilizing programs as simple as Microsoft PowerPoint.

**Smart Board** – The inclusion of a Smart Board would enable the teacher to display the worksheet and instead of writing on top of the worksheet during class, the answers could be pre-populated on the worksheet but hidden from the class until they class has generated the answers. Something to the effect of click the box and instead of being blank, the answer pops up. This would eliminate the need for the teacher to do so much writing in the class and free up time for discussion instead of writing on the part of the teacher. The other thing the Smart Board could do is enable the teacher to use colors to highlight information. All information contained and captured on the worksheet can be saved for future reference and given to the class as a study guide for future tests.

**Tablet PC**—A good portion of the class was “writing to learn” based. Students were asked to copy down words and definitions for their worksheets. The deaf students missed side conversations and additional information conveyed through the interpreter because their heads were down writing a lot of the time. The interpreter tried to make up the information but some comments and side conversations were lost.

The deaf student in the class had a note taker that did not interact with her during the class. Notes were being taken on paper to be given to the student later. Even with this service, the deaf student wrote the answers to the questions in class on her worksheet. With the inclusion of the Tablet PC in the classroom the note taker could be wirelessly connected to the deaf student in the classroom. The deaf student could annotate the notes being taken and take charge of their learning process. In addition the deaf student could spend their time watching the interpreter instead of writing down information so that they could get more of the conversation happening in the classroom. In addition, having the notes there in front of them would help them understand missed or misunderstood information for self corrections and better understanding of content being covered.

There were a significant amount of larger words being used in the class with a significant amount of finger spelling occurring. The teacher warned the observers before the class started that there would be a lot of finger spelling and this was unavoidable. With the words showing up on the Tablet PC in front of the student, the student may be better able to read and comprehend them.

The second way the Tablet PC could be used in the classroom is for conversations between students in the group. They could collaborate on the worksheet together. Given at least two different Tablet PCs to work with, the students could use a chat program to have real time communications.

**CPrint** – Cprint may help the student with the terminology used in this classroom as well. Because a lot of the words are finger spelled, the student could see in real time what was being said in the classroom including terminology. Several of the students in the class shared stories about their answers and those two would be
captured. If the deaf student were looking down writing or communicating with another person in the class, they could “catch up” with what was said by reading the CPrint log. C-Print so that all side and other comments are captured in real time and that the students can read for themselves all of the class comments, information and experiences. To do this the note taker would take notes on a Tablet PC which can be connected to another Tablet PC to be with the deaf or hard of hearing student.
Human Body Systems

Name ____________________________  Science Period ______

observation 1  4/3/08

[Diagram of a human figure with empty boxes around it]
DATE: 4/8/08

PLACEMENT:
Diagram of classroom

Student placement
○ Female Deaf Student
○ Hearing Male student
○ Hearing female student

Teacher placement – Note: after homework discussion teacher wandered room to help groups

Service provider placement
★ Interpreter
⊗ Note taker

Observer
😊 1
CLASS CONTENT:

Lesson Content: 6th grade Math lesson – Tangrams (using shapes to create one big shape based on mathematical formulas)

TEACHING METHODS:

Cooperative learning

<table>
<thead>
<tr>
<th></th>
<th>Yes – several worksheets to complete based on tangrams and math formulas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worksheets</td>
<td>Yes – several worksheets to complete based on tangrams and math formulas</td>
</tr>
<tr>
<td>Research – look up of</td>
<td>No</td>
</tr>
<tr>
<td>information</td>
<td></td>
</tr>
<tr>
<td>Debate</td>
<td>No</td>
</tr>
<tr>
<td>Solving of problem</td>
<td>Yes – solving of problems fractions as expressed in tangrams</td>
</tr>
<tr>
<td>Lab work or detail</td>
<td>Yes – students worked in pairs on completing the tangram puzzles.</td>
</tr>
</tbody>
</table>

Style of class – lecture, discussion

<table>
<thead>
<tr>
<th></th>
<th>Very little – simple instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>A lot of discussion within the pairs on how to complete the worksheets.</td>
</tr>
</tbody>
</table>

Equipment used during class:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalk board</td>
<td>No</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>No</td>
</tr>
<tr>
<td>Video</td>
<td>No</td>
</tr>
<tr>
<td>SmartBoard</td>
<td>Yes – Smart board was utilized to show the answers for the homework given yesterday. The homework problems were displayed with problem work shown and answers in a different color than the questions. Hints were displayed for the different tangram puzzles the students were working on in their groups.</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
</tbody>
</table>

APPENDIX B - Continued

Activities during class

Completed worksheets in groups of two.

Use of note taking by deaf student? Yes

The note taker kept conferring with the students to ensure that she had the correct answers recorded. The deaf student also took notes on the activity herself so this was a duplication of effort.

Service Providers what type?

An interpreter – who voiced for the hearing student in the pair and signed for the deaf student.
A note taker – who recorded answers to the problems for the student. The note taker did volunteer that she is to receive a Tablet PC to help her take notes for the deaf student.
**Interactions**

| Student participation in class discussion | Answered – one question from homework  
Question – asked 2 questions of the teacher  
Sought confirmation on answers to group work from teacher 3 times. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Student interaction with service provider</td>
<td>The deaf student interacted continuously with the interpreter. She continuously sought confirmation on answers to the questions from the interpreter.</td>
</tr>
<tr>
<td>Student interaction with teacher</td>
<td>See participation</td>
</tr>
<tr>
<td>Student interaction with other support service providers</td>
<td>The deaf student did clarify answers for the note taker to ensure the correct answers were recorded.</td>
</tr>
<tr>
<td>Student interaction with other students in class</td>
<td>The deaf student interacted with several other students in the class but primarily with her female hearing partner. While this is the case, the deaf student interacted much more with the interpreter than with the hearing student in her group (pair).</td>
</tr>
<tr>
<td>Student participation in activities in class</td>
<td>The student was very engaged in the activity for the class – working on the tangram puzzle worksheets.</td>
</tr>
</tbody>
</table>

**GENERAL OBSERVATIONS:**

The deaf student immediately started working on the worksheets independently and asked for lots of clarification from the interpreter.

The answers to the puzzles needed to be written on the worksheets. This meant the deaf student spent time writing out answers only to erase them when they didn’t work out. The pair of students (deaf/hearing) as mentioned started out working independently with the small bag of shapes in solving the puzzles and came together to share and compare answers. They did work together for a short time after this, however they reverted to independent work often. Also, the deaf student, as mentioned, conferred and clarified through the interpreter more often than the hearing student in her group.

The deaf student did voice a bit for the hearing student in the group to try and engage her in the activity more and to confirm answers.

The project was inherently visual – moving puzzle pieces on the table and tracing them onto paper in order to create the tangram puzzle. The one on one nature of the project works well with the students when they work together.

Noted that the deaf student effectively used pointing and tapping effectively to get the hearing student’s attention.

These worksheets could be done on the Tablet PC where the students would trace the shapes onto the tablet pc and use the stylus to move the shapes around to arrive at the answer. This could just as effectively be accomplished with the shapes the teachers gave the students. The advantage of using the Tablet PC is that is has an erasing feature to save the students erasing wrong answers. They did that a lot during the time allotted. Also the answers could be saved for a later date.
Perhaps working with the Smart Board instead of shapes on the table where students take turns showing how to build the different tangrams on the screen up front. It was certainly more fun and showed more aspects of cooperative learning with the tiles at the table.

When the deaf student felt she and her partner arrived at the correct answer she immediately raised her hand to clarify their answer with the classroom teacher.

Again I noted for about the 4th time that the deaf student and hearing student were working independently not really together with the deaf student clarifying answers and ideas through the interpreter. Noted that the other groups has some amount of independent work as well but most of they worked together.

Other groups checked with each other for answer confirmation, the deaf/hearing team only checked with the teacher.

RECOMMENDATIONS:

Teaching Strategies
1. Ensure all students play a role in group. The deaf student can sometimes disengage from group work activity by communicating only to the interpreter instead of to their partner or other group members.
2. Avoid speaking when student is writing/head turned or down.
3. Avoid division of attention – board, interpreter, teacher, other students, worksheet
4. Have the interpreter to stand near worksheet displayed so they can point out important information or keep the student on track of material discussions.
5. Have deaf student's worksheet populated by note taker or give one filled in at end of class.
6. Project was extremely visual – puzzle pieces this was a good exercise for group work with deaf and hearing students.
7. Try to engage students in working together – one set of worksheets for undivided attention and instead of the interpreter giving confirmation on correctness of answers, have the deaf/hh student check with their partner instead. This would encourage information exchanges and cooperative learning.
8. Avoid over reliance on interpreter – students should work together in the group not the deaf with the interpreter. The interpreter should allow students to come to their own conclusions and work together similar to the hearing students in the class.

Possible Technology Inclusions:
1. Smart Board to display worksheets – makes learning more visual
2. Smart Board to highlight with color and make materials more visually distinct
3. Smart Board to have students show answers to Tangrams and how they solved them using shapes and moving them around the board.
4. Tablet PC – wirelessly connect note taker and student so student can capture all information without having to write themselves. This would mean the deaf student would spend less time with their head down so they can pay attention to the teacher and the interpreter.
5. Tablet PC – wirelessly connect note taker and student – Student can annotate notes being taken by note taker so they can take charge of their own learning.
6. Tablet PC – as communication device. Used for chatting in group instead of interpreter – real time communications. Students would “speak for themselves” and practice interacting with hearing people.
7. Tablet PC – students can write on worksheet and try answers / erase them try again with ease.

S. Remelt

Observation 2
8. Tablet PC – putting the worksheet on the Tablet PC would give the students one focal point to focus on and theoretically help students to concentrate on working together instead of drifting into independent work.
Marcy Cook
P.O. Box 5840
Balboa Island, CA 92662

© 1992
If \( \frac{1}{2} \) form a quadrilateral equal to \( 2 \frac{1}{2} \).

Prove it!

Think of each tangram piece as a fractional part. Have 2 sets of tangrams available!

Fraction Tangrams

1992
If \[
\begin{array}{c}
\text{= } \\
\text{4}
\end{array}
\]

form a triangle equal to 2.

Prove it!

Think of each tangram piece as a fractional part. I have 2 sets of tangrams available.

Fraction Tangrams
If \( \triangle = \frac{1}{3} \)

form 4 congruent figures each equal to 1.

Prove it!

Think of each tangram piece as a fractional part. Have 2 sets of tangrams available!

Fraction Tangrams
If \[ \square = 1 \frac{1}{3} \]

form 3 quadrilaterals (different by most specific geometric name), each equal to \[ 5 \frac{1}{3} \].

Prove it!

Think of each Tangram piece as a fractional part. Have 2 sets of Tangrams available!

Fraction Tangrams
If $\frac{3}{5} = \frac{5}{10}$

form 2 congruent polygons, each equal to $2 \frac{2}{5}$.
Prove it!

Think of each tangram piece as a fractional part. Have 2 sets of tangrams available!

Fraction Tangrams © 1992
DATE: 4/22/08

PLACEMENT:
Diagram of classroom

Student placement
- Male Deaf Student
- Hearing Male student
- Hearing female student

Teacher placement – Note: after group work explanation teacher wandered room to help groups
- Teacher’s Aide

Service provider placement
- Interpreter
- Observer

Diagram:
- Chalk Board
- Overhead Projector
- Cubbies
- TV on cart
- Closet
- Bathroom
- Computer Table
- Work Table
- Shelf
<table>
<thead>
<tr>
<th>class discussion</th>
<th>teacher asked a question of the class and the interpreter signed the question the student answered directly to the interpreter. Then the student looked for confirmation from the interpreter on the answer. Question - did not ask any questions of teacher in class. Did ask many times for clarification from the interpreter.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student interaction with service provider</td>
<td>The deaf student interacted continuously with the interpreter. He continuously sought confirmation on answers to the questions from the interpreter.</td>
</tr>
<tr>
<td>Student interaction with teacher</td>
<td>This student had no interaction with the classroom teacher.</td>
</tr>
<tr>
<td>Student interaction with other support service providers</td>
<td>The student did interact with the TOD during class when the TOD asked him questions or interpreted for the interpreter when a bathroom break was needed.</td>
</tr>
<tr>
<td>Student interaction with other students in class</td>
<td>The deaf student interacted with his group partner in the classroom but with no other students in the class.</td>
</tr>
<tr>
<td>Student participation in activities in class</td>
<td>The student was very engaged in the activity for the class – working trying to make the bulb light.</td>
</tr>
</tbody>
</table>

**GENERAL OBSERVATIONS:**
The deaf student is a Cochlear Implant user and very oral. He does speak well and uses his voice, particularly with his partner. With the interpreter he will sign and use his voice. An FM system is in use in the classroom.

At the beginning of the class the interpreter sat at the front of the room and the deaf student had to crane their neck to see them around a group of students sitting in front of him. See position 1 for the interpreter.

After brief explanation of what to do, the teacher passed out a battery, light bulb and wire to the pairs of students. The students were given 15 minutes to work, in pairs, to try and make the bulb to light trying various things with the wire and the battery. Since this activity was very hands on and visual, the deaf and hearing student worked well together by “doing” rather than communicating or talking about what to do. The communication consisted mostly of hands on work and gestures for what to try rather than talking or communicating through the interpreter.

The deaf student regularly and continually seeks clarification on answers and attempts to make the light bulb light with the interpreter and not his partner. The interpreter regularly gives hints as to what to try to the deaf student. The interpreter sometimes gave answers instead of letting the pair work out the answer for themselves.

The hearing student in the pair became frustrated with the lack of attention from his partner and the interpreter and asks the interpreter to tell the deaf student to stop working ahead and wait for him. This was a bid to get the deaf student’s attention off the interpreter and onto the group work at hand. It worked and the students began working together again but with gestures and sharing of tools not really communicating in depth.

The deaf student looked around the room to see if he can determine what other groups are doing. He picks his head up and looks when he hears another group shout that they have the answer. Again I believe this was for confirmation of answers to the worksheet. When he can’t understand them he asked the interpreter what happened. The student is very engaged with his own learning.

S. Remelt  Observation 3  Page 3
Will the bulb light or not? Below each picture, make your prediction by writing either "On" or "Off."
Form C
IRB Decision Form

TO: Sarah Remelt; Michael Stinson
FROM: RIT Institutional Review Board
DATE: April 30, 2008
RE: Decision of the RIT Institutional Review Board

Project Title – A Needs Assessment & Exploration for Cooperative Learning Incorporating Tablet PC Technology: Participation, Communication, and Leveling the Playing Field Between Deaf and Hearing Students in the Mainstream Classroom

The Institutional Review Board (IRB) has taken the following action on your project named above.

☒ Exempt 46.101 (b)(2)

Now that your project is approved, you may proceed as you described in the Form A.

You are required to submit to the IRB any:

- Proposed modifications and wait for approval before implementing them,
- Unanticipated risks, and
- Actual injury to human subjects.

Heather Foti, MPH
Associate Director
Office of Human Subjects Research

Revised 10-18-06
FORM A: Request for IRB Review of Research Involving Human Subjects


Submit an electronic version of the completed form along with a hard copy to Jennifer Rivera, RIT IRB Administrator, IT Collaboratory, jhrpop@rit.edu.

Project Title:
A Needs Assessment & Exploration for Cooperative Learning Incorporating Tablet PC Technology: Participation, Communication, and Leveling the Playing Field Between Deaf and Hearing Students in the Mainstream Classroom

Investigator's Name: Sarah Remelt
Investigator's Phone: 585-475-7545
Investigator's Email: sbrndp@rit.edu
Investigator's College and Department: MSSE - NTID
Project Start Date: 3/1/2008
Date of IRB Request: 2/12/2008

If Student, Name of Faculty Supervisor:
Dr. Michael Stinson
Faculty's Phone: 585-475-6596
Faculty's Email: msserd@rit.edu

If Not Employed or a Student at RIT, List Name, College & Dept. of RIT Collaborator:
RIT Collaborator's Phone:
RIT Collaborator's Email:

Will this project be funded externally? ☐ Yes ☒ No
Is the Investigator a student? ☒ Yes ☐ No

Status of project: ☒ Submitted on 2/12/2008 ☐ Funding pending ☐ Funding confirmed

If yes, name of funding agency:

Do you have a personal financial relationship with the sponsor? ☐ Yes ☒ No
If yes, please read RIT policy C4.0—Conflict of Interest Policy Pertaining to Externally Funded Projects. Complete the Investigator's Financial Disclosure Form and attach it to this Form A. All information will be kept confidential.

BY MY SIGNATURE BELOW, I ATTEST TO AN UNDERSTANDING OF AND AGREE TO FOLLOW ALL APPLICABLE RIT, SPONSOR, NEW YORK STATE, AND FEDERAL POLICIES AND LAWS RELATED TO CONDUCTING RESEARCH WITH HUMAN SUBJECTS. If significant changes in investigative procedures are needed during the course of this project, I agree to seek approval from the IRB prior to their implementation. I further agree to immediately report to the IRB any adverse incidents with respect to human subjects that occur in connection with this project.

Signature of Investigator: Sarah Remelt
Date: 3/12/08

Signature of Faculty Advisor (for Student) or RIT Collaborator (for External Investigator): Michael Stinson
Date: 3/13/08

Signature of Department Chair or Supervisor: John A. Alburnett
Date: 3/13/08

Complete the attached Research Protocol Outline and attach to this cover form with other required attachments.

Attachments required for all projects:
Sarah Remelt  
Capstone proposal  
Spring 2008

☑ Project Abstract
☐ Investigator Responsibilities and Informed Consent Training Certificate(s) from OHRP (see http://ohrp-ed.od.nih.gov/)

Attachments required where applicable:
☐ Informed Consent Materials
☐ Questionnaire or survey
☐ Relevant Grant Application(s)
☐ Cover letter to subjects and/or parents or guardians
☐ External site IRB approval
☐ Other

Form A (continued): Research Protocol Outline

- The RIT Institutional Review Board (IRB) categorizes Human Subjects Research into three Risk Types (Exempt, No Greater than Minimal Risk, and Greater than Minimal Risk, defined at the end of this form). The IRB makes the final determination of risk type.

- Please complete this entire form (1 through 10 below). ENTER A RESPONSE FOR EVERY QUESTION. If a question does not apply to your project, please enter “N/A”. Leaving questions blank may result in the form being returned to you for completion before it is reviewed by the IRB.

- Underlined terms are defined at the end of this form.

FOR ALL PROJECTS, PLEASE COMPLETE 1-10 BELOW.

1) If you believe your project qualifies for Exemption, which exemption number(s) apply? The project does not qualify for an exemption because there are children as subjects that will be interviewed and surveyed. (Note: The IRB makes the final determination of Exemption)

Which Risk Type (Type I-IV) do you believe applies to your project?
The RIT IRB no longer requires Investigators to determine a Risk Type (Type I-IV)

2) Describe the research problem(s) your project addresses.
The project involves observations of mainstream classroom cooperative learning environments to find ways in which Tablet PC technology can be utilized to increase communication and participation of deaf students in this environment. In addition, teachers or teachers of the deaf (TOD) for the classrooms will be interviewed and surveyed regarding their opinions of the technology.

3) Describe expected benefits to subjects and/or knowledge to be gained from your project.
The benefits are that the suggestions formulated from the observations can help to improve communication and participation of deaf and hard of hearing mainstream students. Successful teaching strategies for enhanced cooperative learning will also be addressed.

4) Describe the population sample for your project.
a) How many subjects will participate in this project?
Three different deaf students in the mainstream environments: 2 from middle school and 1 from the elementary school environments and their teachers will be observed. The classroom teachers or TOD will be the only ones interviewed and surveyed in the study.

b) How will these subjects be identified and selected for participation?
Dr. Stinson will ask the Coordinator of BOCES Deaf Ed Program in Monroe County to identify those students within the mainstream environment to work with. Complete – 2 middle school and 1 elementary student and their teachers and TODs have been identified.

c) Describe the rationale for inclusion or exclusion of any subpopulation.
The inclusion of the mainstream deaf students and their teacher in the observations so I can review current cooperative learning strategies for math and science and identify ways in which
to incorporate Tablet PC Technology. Only the teachers or TODs will be interviewed and 
survey in order to keep permissions to a minimum.

d) How will you recruit subjects?
Dr. Stinson has asked Marty Nelson- Nasca Coordinator of Deaf Ed program at Monroe Boces 
to help identify teachers to work with. I will ask the teachers or TODs for their permission to 
conduct the observation and to participate in an interview and survey about Tablet PC 
Technology. (see attached permission form)

e) Describe any incentives for participation you plan to use.
The only incentive for the program is the knowledge that the participants will be helping to 
identify ways in which Tablet PC technology could improve learning and participation of deaf or 
hard of hearing mainstream students in their environment. There is no monetary or other 
reward for participation.

5) Will you include any of the following vulnerable populations in your research? (Check any that apply)
   X Children   ☐ Mentally Ill
   ☐ Prisoners   ☐ Mentally Handicapped/Retarded
   ☐ Pregnant Women   ☐ Fetuses
   
   If any of these populations are to be included, please address the following:

a) Rationale for selecting or excluding a specific population:
   Children will be observed in their normal class periods. No interaction will take place with the 
   students. Interactions to gather opinions and information about using Tablet PC technology in the 
classroom will be solicited only from the classroom teacher or TOD for the classroom.

b) Description of the expertise of project personnel for dealing with vulnerable populations:
The investigator, Sarah Remelt, is in a program designed for working with K-12 deaf children (MSSE program). Also the advisor, Dr. Stinson, has considerable experience working with and observing children.

c) Description of the suitability of the facilities for the special needs of subjects:
The students will be observed in their own school environment in normal class periods so there 
should be no difference in the suitability of facilities for the research project.

d) Inclusion of sufficient numbers of subjects to generate meaningful data:
While the numbers of students to participate in the study is only 3, this is an exploratory 
research project meant to determine if classroom intervention utilizing Tablet PC Technology is 
worthwhile.

6) Describe the data collection process.

   a) Will the data collected from human subjects be anonymous? ☒ Yes  ☐ No
   b) Will the data collected from human subjects be kept confidential? ☒ Yes  ☐ No
   c) Describe your procedures for ensuring anonymity and/or confidentiality:
The interview process has questions regarding the current practices in the classroom for group 
work in addition to questions designed to give feedback on the Tablet PC technology 
demonstrated after the class observations. The interview will include the teacher or the TOD 
only.
   Questions will be general and designed for individuals to express opinions. Teachers or TODs 
participating in the study will be asked to share what they feel comfortable sharing. Information 
obtained from the interview will be kept confidential and names of individuals will not be 
associated with the comments made within reports.

   No data from the survey will be shared with anyone other than the researchers. No names will 
be used in any publications or reports.
d) How much time is required of each subject? Classroom observations will be two standard class periods and require no additional or outside classroom work from the students. The teachers or TODs will be asked to watch while Tablet PC technology is demonstrated for them. This will take approximately 15-20 mins. The subsequent interview of the classroom teachers or TOD will take approximately 15 mins. The teacher or TOD will then be asked to fill out a survey regarding their perceptions of the Tablet PC technology which will take approximately 15 minutes.

e) If subjects are students, will their participation involve class time? Yes they will be observed for two normal class periods. Students may be told they will be observed by the classroom teacher depending on whether or not they want to tell the students.

f) What methods, instruments, techniques, and/or other sources of material will you use to gather data from human subjects?
   Information will be gathered from teachers or TOD by both interview and paper survey.

7) Will this research be conducted at another university or site other than RIT? Yes ☒ No ☐
   If yes, describe location: The research will be conducted at the schools where the students attend.

Note: If you will be conducting human subjects research at another university or college, you will also need to obtain IRB approval from that institution. Attach a copy of that approval to this application.

8) Describe potential risks (beyond minimal risk) to subjects:
   a) Are the risks physical, psychological, social, legal or other?
      There is no risk to the students involved in the study. There is minimal risk to the teachers involved in the study with respect to the interview and surveys used to gather information regarding the Tablet PC technology demonstrated. Everyone (all three teachers or TODs and the researchers) in the interview will be told to share only what they feel comfortable sharing. Also, the paper survey will be an opportunity for the individuals to express opinions without the others in the study knowing what they are saying.
      No students will be interviewed or surveyed as part of this study.

b) Assess their likelihood and seriousness to subjects:
   There is no risk to the subjects.

c) Discuss the potential benefits of the research to the population from which your subjects are drawn:
   The benefits of the research are the identification of beneficial teaching strategies for working with deaf students in the mainstream classroom and the identification of participation and communication strategies for deaf students in the mainstream utilizing Tablet PC technology.

d) Discuss why the risks to subjects are reasonable in relation to the anticipated benefits to subjects and others, or in relation to the importance of the knowledge to be gained as a result of the proposed research:
   There is no risk to students or students involved in the study. The benefits to the inclusion of deaf students in group work within the classroom outweighs the risks.

e) Describe the planned procedures for protecting against or minimizing potential risks, including risks to confidentiality, and assess their likely effectiveness:
   The procedure of observation, interview and survey help to gather information in a non threatening way. Suggestions are made with regard to teaching strategies to increase deaf
students participation in the classroom, including use of Tablet PC technology, and opinions will be solicited in an interview format from the teachers or TODs involved in the study.

f) Where appropriate, describe plans for ensuring necessary medical or professional intervention in the event of adverse effects to the subjects:
N/A

9) Will you be seeking informed consent? ☑ Yes ☐ No
If yes, describe:

a) What information will be provided to prospective subjects?
A brief paragraph telling about the project on the consent form for the teachers to sign. (see attached consent form)
No consent will be solicited from the students as they will only be observed in the classroom and will not interact with by the researchers in any way.

b) What (if any) information will be concealed prior to participation, and why?
No information will be concealed.

c) How will you ensure consent is obtained without real or implied coercion?
It will be made clear that participation in the study is voluntary and not required. The consent form will indicate that participation is voluntary and that no reward will be given for participation.

d) How will you obtain and document consent?
I will give consent forms to the classroom teachers and TODs and ask them to sign them. I will then collect them and save them with the research file.

As the students for participation in the study were identified by the head of BOCES deaf ed program, and they will only be observed, no consent will be asked from them or their parents.

e) Who will be obtaining consent? Provide names of specific individuals, where available, and detail the nature of their preparation and instructions for obtaining consent.
Researcher, Sarah Remelt will obtain forms from the teacher.

f) Attach a copy of your consent materials (forms, protocol, script, etc.) to this application. SEE BELOW

TITLE: A Needs Assessment & Exploration for Cooperative Learning Incorporating Tablet PC Technology: Participation, Communication, and Leveling the Playing Field Between Deaf and Hearing Students in the Mainstream Classroom

Method

This project focuses on qualitative exploratory research that analyzes the potential need for and possible inclusion of Tablet PC technology and teaching strategies to enhance cooperative learning in the mainstream classroom environment. After observations, suggestions for use of the technology and assigning student roles, and additional teaching strategies will be shared.

Feedback via interview and survey will be solicited from the teachers involved in the study.
The goals of the project include:

- To observe a small group instruction and student interaction (deaf and hearing) to identify cooperative learning opportunities utilizing the Tablet PC.
- To identify opportunities for enhanced classroom participation and communication using Tablet PC technology in the mainstream environment.
- To identify opportunities for facilitating sharing of classroom work through Tablet PC technology.
- To identify opportunities where the Tablet PC technology may enhance deaf student’s peer relationships within the classroom.
- To identify teaching strategies that may supplement use of the Tablet PC and that may enhance deaf students’ communication, participation and cooperative learning experiences. Particularly with regard to student roles and how they can enhance the cooperative learning experience for deaf students.

Participants

Three deaf students within the mainstream environment and their classroom teachers and TODs in the Rochester, New York area will be observed. Two students will be in middle school (Math and Science) and one student will be in elementary (Science) school. The classes to be observed will either be math or science. Students for inclusion in the study will be identified by the director of BOCES of Monroe County. The study will also include a high school student if one can be identified for the study.

Teachers and TODs will be asked to sign an Informed Consent form in order participate in the study. See Appendix C for this form.
Measures
After agreeing to participate in the study, students and their teacher will be observed during normal class periods. After the observations, a meeting with the classroom teacher or the TOD for the classroom will be set up to share suggestions and demonstration of the Tablet PC technology and student role strategies. The following measures of evaluation will be used. An interview and survey of perceptions will be conducted with the classroom teachers or TOD to gain feedback on the following:

1. After sharing of suggestions from the observations:
   - Interview teachers or TOD to gain feedback and insights on suggestions developed from the classroom observations.

3. After modeling the Tablet PC technology with student roles
   - Survey of teacher’s perceptions of proposed modeled technology inclusions – Increased student participation, communication and enhanced learning. See Appendix A.

The Activity

Part 1
In part 1 of the study teachers and students in the mainstream elementary, middle school and high school settings will be observed for at least one classroom period that includes group activities. During the observations, data will be collected on student interactions, quality of communication and participation in group activities. An observation checklist will be used as a guide that includes items such as seating of student and service provider, class content, activities, technology used in the classroom and documentation of student interactions. See Appendix B.

Suggestions will be formulated regarding the inclusion of Tablet PC technology in the classroom to facilitate cooperative learning among deaf and hearing students. Particularly with
regard to ways in which the Tablet PC can help facilitate: deaf student participation and communications between the deaf student and their hearing peers, teacher or support personnel; and real time communication.

See Appendix B for Checklist for Observations of Mainstream Classroom Environment.

Part 2

Part 2 of the activity will have two components. The first will be an interview of the teachers or TOD to share the suggestions for the inclusion of Tablet PC technology and student role strategies for cooperative learning in the classroom and to gain feedback on these suggestions. The interview will include questions regarding barriers to social interaction and communication during lesson activities during cooperative groups and solicitation of examples of successful strategies already in use within the classroom.

The second component will be a modeling of the various Tablet PC technology and student roles inclusion strategies for the classroom teacher or the TOD. Feedback will be solicited via survey regarding whether or not the modeled technology and suggestions would facilitate:

- Deaf student participation in cooperative learning
- Communications between the deaf student and their hearing peers, teacher or support personnel
- Direct real time communication
- Deaf student involvement with the class. Enhanced sociability in the classroom.
- Development of natural use of student roles with in the classroom
- Features of technology (Tablet PC Technology)
- Appropriate types of cooperative learning activities (i.e. worksheet collaboration, research
Sarah Remelt Capstone proposal Spring 2008

Analyses

Field notes will be analyzed for recurring themes, based on major topics that emerge in the observations. The analysis will occur in stages. The observation field notes and checklists from the different observations will be reviewed, and a set of code categories developed. The investigator will then code the field notes. A report will be generated in which the major themes are described and supported through use of quotations and observations.

Analysis of the interview and survey feedback will be done to determine if the recommended Tablet PC technology and associated strategies would be of benefit for the mainstream classroom environment. The final product will be a reference/resource report with the following:

- A summary of observations made from the different mainstream environments including elementary and middle school levels
- A summary of the interview and survey results of the teacher’s or TOD’s perceptions to determine if they feel the proposed teaching strategies, technology interventions and the Tablet PC would help deaf/hh students communicate and participate better in class and promote cooperative learning strategies in the mainstream classroom.
- A summary of the pros and cons as perceived by the teachers in the study for the inclusion of the Tablet PC and teaching strategies in the classroom.
- Recommendations for further research including interventions using the Tablet PC if warranted.
- Recommendations for features of small group activities
- Recommendations for features of Tablet PC Software
Questions to be answered:

- Does the modeled use of the Tablet PC appear to help cooperative learning through leveling the playing field between the deaf and hearing students in the mainstream classroom?
- Would the modeled use of the Tablet PC have the potential to facilitate participation of the deaf student in the mainstream classroom for group work?
- Would the modeled use of the Tablet PC have the potential to facilitate real time communication opportunities and reduce lag time from third party interventions for deaf students in the mainstream classroom for group work?
- Would the modeled use of the Tablet PC have the potential to facilitate classroom discourse opportunities for the deaf and hard of hearing student in the mainstream?
- Would the modeled use of student role strategies incorporated in cooperative learning groups using Tablet PC technology enhance student participation?
- Would the use of student role assignments during group activities have the potential to increase peer learning relationship?

Timeline

**December 2007** – Select Advisor, finish proposal, present project proposal presentation.

**January 2007** – Finish written project proposal. Start Literature Review

**February 2007** – Finish Literature Review, finish proposal paper.

**March 2007** – Marty at BOCES to identify students to work with. Gain approval for working with human subjects. Contact teachers to set up observations. Perform observations.

**April 2007** – Formulate suggestions and demonstrated Tablet PC technology presentation.

- Perform demonstration and do interview and survey of teachers, support staff and student.
May 2007 – Complete final report based on interview and survey findings from project and defend research project.
APPENDIX A  TEACHER or TOD SURVEY

Thank you for participating in the observation and interview for inclusion of Tablet PC technology into the mainstream classroom. I want your opinions on the strategies I presented. I will NOT share your individual responses with each other or with anyone other than my advisor. Your responses to the interview and following survey will be summarized to identify future work to be done within the classroom.

Please be completely honest in sharing your opinions and ideas – it is the only way we can make improvements!

When you have completed the survey, please hand it to me (Sarah Remelt).

Part 1 Short Answers – Please circle your answer for each question.

1. I am
   Deaf   Hard of Hearing   Hearing

2. I feel that the Tablet PC would facilitate group work between deaf and hearing students:
   Strongly Agree   Agree   No Opinion   Disagree   Strongly Disagree

3. I feel that using the Tablet PC would help me communicate better with my deaf student
   Strongly Agree   Agree   No Opinion   Disagree   Strongly Disagree

4. I think the Tablet PC would facilitate deaf student’s participation in class.
   Strongly Agree   Agree   No Opinion   Disagree   Strongly Disagree

5. Deaf students would communicate more with the class with a Tablet PC
   Strongly Agree   Agree   No Opinion   Disagree   Strongly Disagree

6. Deaf students would communicate more easily with hearing group members during group work using the Tablet PC
   Strongly Agree   Agree   No Opinion   Disagree   Strongly Disagree

7. The Tablet PC would help deaf students feel more part of the class:
   Never   Sometimes   Half of the Time   Often   Always
APPENDIX A Continued.

8. Students would use the Tablet PC if we had one for group work:

Never Sometimes Half of the Time Often Always

9. Do you feel the students would use the Tablet PC to communicate rather than an interpreter or captioning during group work?

Never Sometimes Half of the Time Often Always

10. I would use the Tablet PC to have deaf students ask questions during a class lecture if I had one

Never Sometimes Half of the Time Often Always

11. Answer if note taker provided: Students would use the Tablet PC to annotate notes and class materials.

Never Sometimes Half of the Time Often Always

12. It would be of benefit to deaf students to be able to communicate with the class in real time?

Never Sometimes Half of the Time Often Always

13. It would be of benefit not to have to use third party communication (interpreter, captioning) to communicate with the class during group work

Never Sometimes Half of the Time Often Always

14. feel that I could implement the Tablet PC into the classroom for group work

Never Sometimes Half of the Time Often Always

15. The Tablet PC looks:

Hard to use Easy to use

16. I can type:

Very well Good Ok Not very well

17. I would like to try to use the Tablet PC for group work:

Yes No
Please use as much space as you need to answer these questions

18. One of the things I liked about the Tablet PC is:
19. One of the things I did not like about the Tablet PC is:
20. Compare using a Tablet PC to work in a group to using an interpreter or captioning for group work
21. How would you improve the use of the Tablet PC for working in a group with hearing peers?
22. Can you see any other way to use the Tablet PC other than what was demonstrated for you?
23. Do you have any reservations about using the Tablet PC?
24. Any other comments you may have?

THANK YOU!
APPENDIX B

Checklist for Mainstream Classroom Observations – Tablet PC Potential for Group Work

PLACEMENT:

Diagram of classroom

- Student placement
- Teacher placement
- Service provider placement

CLASS CONTENT:

Lesson Content

TEACHING METHODS:

Cooperative learning

<table>
<thead>
<tr>
<th>Cooperative learning</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Worksheets</td>
<td></td>
</tr>
<tr>
<td>Research – look up of information</td>
<td></td>
</tr>
<tr>
<td>Debate</td>
<td></td>
</tr>
<tr>
<td>Solving of problem</td>
<td></td>
</tr>
<tr>
<td>Lab work or detail</td>
<td></td>
</tr>
</tbody>
</table>

Style of class – lecture, discussion

<table>
<thead>
<tr>
<th>Style of class – lecture, discussion</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
</tr>
</tbody>
</table>

Equipment used during class:

<table>
<thead>
<tr>
<th>Equipment used during class:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalk board</td>
<td></td>
</tr>
<tr>
<td>PowerPoint</td>
<td></td>
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<tr>
<td>Video</td>
<td></td>
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<tr>
<td>SmartBoard</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B - Continued

Activities during class

Use of notetaking by deaf student? Y  N

Service Providers what type?

<table>
<thead>
<tr>
<th>Interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student participation in class discussion</td>
</tr>
<tr>
<td>Student interaction with service provider</td>
</tr>
<tr>
<td>Student interaction with teacher</td>
</tr>
<tr>
<td>Student interaction with other support service providers</td>
</tr>
<tr>
<td>Student interaction with other students in class</td>
</tr>
<tr>
<td>Student participation in activities in class</td>
</tr>
</tbody>
</table>
Appendix C

Teacher Informed Consent form

PROJECT TITLE: A Needs Assessment & Exploration for Cooperative Learning Incorporating Tablet PC Technology: Participation, Communication, and Leveling the Playing Field Between Deaf and Hearing Students in the Mainstream Classroom

INTRODUCTION
You have been invited to join a research study to look at the possibility of including Tablet PC technology into the mainstream classroom to help deaf and hard of hearing students have greater access to class participation and real time communications during group work. The Tablet PC is a portable computer that allows students to communicate through chat programs, instant messaging, and collaboration through visual means – writing on top of given assignments and representing concepts through drawings or graphic representations. The Tablet PC has a stylus pen that students can use to visually represent ideas through drawing or handwriting. These technology tools have the potential to eliminate some of the communication and social barriers that exist in cooperative learning environments for deaf students in the mainstream. Please take whatever time you need to discuss the study with your family and friends, or anyone else you wish to. The decision to participate or not participate is up to you.

In this research study, I am investigating the potential need for, and possible inclusion of, Tablet PC technology and teaching strategies to enhance cooperative learning in the mainstream classroom environment. It is well known that cooperative learning with meaningful exchanges between students and exchanges between students and their teacher leads to better academic success. From this investigation I hope to learn ways in which the Tablet PC may facilitate deaf or hard of hearing student’s: classroom participation; real time communications; enhancement of peer relationships; and ways in which cooperative learning can enhance the deaf student’s academic experiences.

Students in cooperative learning work groups will be observed. After the observations, suggestions for use of Tablet PC technology and additional teaching strategies will be shared. Feedback via interview and survey will be solicited from you, the classroom teacher.

WHAT IS INVOLVED IN THE STUDY
I will observe you and your students during the normal class period. Either one or two class periods will be observed. After the observations, a meeting will be set up with either you or the Teacher of the Deaf (TOD) so you can observe a demonstration of Tablet PC Technology and how it can be used for cooperative learning along with teaching strategies for the mainstream classroom. I estimate this will take 15 to 20 minutes. Immediately following the demonstration, you will be asked to participate in an interview with the researcher to give your opinions on the Tablet PC Technology and teaching strategies demonstrated. I think the interview will take approximately 15 minutes. After the interview, you will be asked to fill out a survey regarding your opinions of the Tablet PC Technology demonstrated. The survey will take approximately 10 minutes or less to complete. You may stop participating at any time.
RISKS
There are no likely risks involved in this study.

BENEFITS TO TAKING PART IN THE STUDY:
The benefit of the study is that I will learn if the Tablet PC technology is perceived to be helpful
to deaf and hard of hearing students in the mainstream environment for facilitation of
participation and real time communications during cooperative learning. The teacher may learn
about ways in which they can better incorporate a deaf or hard of hearing student into the
mainstream classroom. However, there is no guarantee that you personally will experience
benefits from participating in this study. Others may benefit in the future from the information I
find in this study.

CONFIDENTIALITY
Your name will not be used when data from this study is published. Every effort will be made to
keep all research records, and other personal information confidential. None of the student’s
names from the observations will be included in any publication or report.

I will take the following steps to keep information confidential, and to protect it from
unauthorized disclosure, tampering, or damage:

The data generated from the observations, interview and survey will be kept at RIT with the head
researcher/advisor for the project. This information will be housed in a locked office without
general access. No outside agencies or other subcontractors will be utilized during the study, and
therefore, all data will be housed at and contain at RIT.

INCENTIVES
There are no monetary or other incentives for participating in this study.

YOUR RIGHTS AS A RESEARCH PARTICIPANT
Participation in this study is voluntary. You have the right not to participate at all or to leave the
study at any time.

If you decide to leave the study, the procedure is: to contact the researcher: Sarah Remelt at
sbrndp@rit.edu or 585-475-7545.

CONTACTS FOR QUESTIONS OR PROBLEMS:
Call Sarah Remelt at 585-475-7545 or email sbrndp@rit.edu or contact Dr. Michael Stinson
(research advisor) at 585- 585-475-6596 or email msserd@rit.edu if you have questions about
the study.
Consent to Participate in Research

I (Print Name) ___________________________ agree to become a participant in the research study described in this form.

____________________________
Signature

____________________________
Title
THINGS TO SHOW ON TABLET PC

1. Wirelessly connect note taker and student so student can capture all information without having to write themselves. Less time with their head down so they can pay attention to the interpreter and class discussion. (Worksheet filling in vocabulary and definitions) If I can't show two Tablet PCs how can I show this with one?

2. Tablet PC - wirelessly connect note taker and student - Student can annotate notes being taken by note taker so they can take charge of their own learning. Again if I can only use one Tablet PC how can I show this with only one Tablet PC?

3. Using 1 or 2 different Tablet PCs for students to collaborate on a worksheet or to have a chat for cooperative learning. Again if I can't use 2 Tablet PCs for this, I could try to show functionality with only 1.

4. Tablet PC - as communication device. Used for chatting in group instead of interpreter – direct, real time communications.

5. Tablet PC for ease of eraser function - tangram example moving objects after traced on computer for easy manipulation.

6. Tablet PC for populating worksheet shown in science class

7. Show use of Cprint on Tablet PC
Human Body Systems

Name ___________________________  Science Period ___

[Diagram of a human figure with empty boxes for notes]
Human Body Systems

Groups of organs that carry out major body activities

Skeletal
Provides body framework and organ protection

Circulatory
Brings nutrients, hormones and O₂, removes CO₂

Muscular
Body movement and mass

Respiratory
Exchanges O₂ and CO₂

Nervous
Carries messages to all parts of the body

Excretory
Removes wastes (Includes Integumentary)

Endocrine
Controls growth and body functions

Digestive
Converts food to nutrients

Immune - Lymphatic

Reproductive - Offspring
If \[ \frac{1}{4} \] form a triangle equal to 2.

Prove it!

Think of each tangram piece as a fractional part. Each 2 sets of tangrams available!

Fraction Tangrams

© 1992
Human Body Systems

- Groups of organs that carry out major body activities
- Skeletal system: provides body framework and organ protection
- Circulatory system: brings nutrients, hormones, and O₂, removes CO₂
- Respiratory system: exchanges O₂ and CO₂
- Excretory system: removes wastes (includes integumentary)
- Endocrine system: controls growth and body functions
- Digestive system: converts food to nutrients
- Nervous system: carries messages to all parts of the body
- Immune - Lymphatic system
- Reproductive system: Offspring
Will the bulb light or not? Below each picture, make your prediction by writing either "On" or "Off."