

GIFT Atlantic Liberated Learning High School Pilot Project

*“PHASE III: A Study of the Transfer of Speech Recognition Technology
from University Classrooms to High School Classrooms”*

FINAL RESEARCH REPORT

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One University. One World. Yours.

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AUTHOR'S NOTE AND SPECIAL THANKS

Data from our Phase II study of Speech Recognition Technology and Halifax West High School in 2006 was not integrated into the data collected from the three high schools in Phase III. This decision was made because the testing at Halifax West was exploratory in nature and represented an opportunity for the GIFT Project to "cut its teeth" and thus prepare for the second phase of testing in Year III.

We remain extremely grateful to the generosity of spirit at Halifax West High School, reflected in their enthusiasm and willingness to open their doors to our research interest. The results of the preliminary testing of Speech Recognition Technology at Halifax West are included in their entirety in Appendix "O".

Abstract

In the past, access to school resources, lecture material and supports has been a challenge for students with disabilities trying to attain academic success in the classroom (Leitch and MacMillan, 2001)¹. In recent years under the auspices of the Atlantic Centre of Research, Access and Support (Atlantic Centre), the Liberated Learning Consortium undertook a mission to understand how speech recognition technology (SRT) may contribute to an improved learning environment for university students with disabilities. The Liberated Learning Consortium has since been committed to understanding if SR can assist in creating a positive and beneficial learning environment for high school students. This study is a continuation of research that has been occurring in the university environment and the research presented here pertains to high school students and teachers.

Introduction

The primary rationale for the research continues to be the evaluation of how the technology might enhance accessibility, facilitate inclusion and promote academic success for students with disabilities.

The Liberated Learning Project at the Atlantic Centre, from 1999-2002, used a collaborative model with universities, community colleges, IBM and Aliant (a telecommunication company) to explore the use of SR as an accessibility technology in the classroom. The concept was relatively simple; a professor's lectures would be digitized and displayed on a screen in real time and the digitized lectures would be made available for students after the lecture on-line. From the start we believed this combination of access would be helpful for students who are deaf, hard of hearing, learning disabled or mobility impaired. And we felt confident that students would react positively especially if they could both see and hear the lecture. Furthermore, the provision of post-lecture edited online notes would be superior to the conventional dependence on other persons to take notes for those who could not take their own lecture notes. However, most of us know that making assumptions can be risky. For now, suffice it to say that for several years, challenges associated with attaining high accuracy, reducing the cost of editing the transcript of the lecture and the application upgrades have made us cautious about making definitive statements on the impact of the technology for students with disabilities, non-disabled students and teachers.

Although our primary concern for the research supported by GIFT (Grocery Industry Foundation Together) was to examine the benefits for Students with Disabilities (SWD) there was inherent need and obligation to also evaluate the impact of SRT on non-disabled students and on pedagogy and teachers. Teachers were integral to the success of the project and without their support there could be no project.

¹ This Report can be found on the Liberated Learning Website...www.liberatedlearning.com
GIFT Atlantic Liberated Learning High School Pilot Project

Background for the High School Pilot Project

Subsequent to the initial three years of funding for Liberated Learning Project from the J. W. McConnell Family Foundation, the Atlantic Centre received an additional year of funding from the Foundation. This fourth and final year was intended to help us find new ways to sustain and grow our efforts to gain a broad acceptance of Liberated Learning Technology (LLT) as an accessibility feature in classrooms. It was during this period of time that we reached out to organizations, corporations and Foundations which would allow us to continue our work and goal of having LL technology accepted on a broader scale. The Gift Atlantic Foundation responded by providing a three year grant to run from January, 2005 through to January, 2008. The purpose of this funding was to allow us to investigate the potential of transferring the LL concept of displayed text and online notes from university classrooms to the high school classrooms. The title of the project as previously mentioned was: “The Gift Atlantic Liberated Learning High School Pilot Project” which henceforth in these writings will be known as the “Gift Project”.

Year I of the GIFT Project was a planning year and Years II and III were designed to be testing in actual classrooms and expanding the test to as many classrooms and schools as possible. The focus for this report will be on providing a general discussion of the findings and of course the challenges.

Before proceeding with a discussion on what happened in the high schools, a brief discussion on our readiness for transferring LL technology in the past few years might be helpful. By 2005 the contributions of various members of our Liberated Learning Consortium had resulted in substantive improvements in the Liberated Learning technology. For example, the costs of hardware for a classroom had been reduced from approximately \$16,000 to a couple of hundred dollars, and the number of steps to engage the technology was reduced from 50 down to 2 or 3 steps. In other words the technology was becoming relatively inexpensive and much more user friendly. It seemed also that the LL Consortium was well on its way to improving the efficiency of training; in fact the time spent training by individuals for an improved voice profile and increased accuracy was being drastically reduced by a feature called ‘batch enrolment’². The support team at Saint Mary’s also had a better understanding of what was required to achieve relative high accuracy in displayed text including such factors as type and positioning of the microphone, rate of speech and importance of clear annunciation and practice. There were also wonderful improvements in the process of providing online notes which included producing multi media presentations with many special features such as linking text to power points. Software developments also enabled students to personalize the display of the text and lecture material. The list of enhanced features associated with online notes and a thorough explanation of batch enrolment can be fully examined by going on the LL web site³.

² *Batch enrolment was a method for removing the burden of training for an improved voice model from the user.*

³ *www.liberatedlearning.com*

Literature Review

Schools have a long history of relying on technology to improve access for students and in particular for students with disabilities (Hill, 1997, Fichten, 1999). Equally important and on balance, educational theorists, such as Jerome Bruner (1966), have cautioned that technology ought not to be considered a panacea for fixing educational problems nor is it a substitute for good teaching. More recently and along the same line as Bruner, Edward Tufte (2003) expressed concerns with the role of technology in teaching focusing on the potential problems with assuming that the use of Power Point slides, even slick ones, equates with effective teaching or learning. On the other hand, especially in developing worlds where computers are practically ubiquitous, school age children are generally recognized for being technological savvy and for embracing new technology. At an institutional level, universities and community colleges, for the past decade, have experienced a profound expansion of information technology departments. A current and good example of the extent to which institutes of higher learning have enveloped technology is witnessed in the partnerships emerging with Google to have millions of University Library books scanned and thus available electronically. (Chronicle of Higher Education, 2007).

Speech Recognition technology (SRT) might be best known by the general public as an application for dictation outside of the classroom and/or telephony⁴ and has been researched in its many and varied manifestations for over 30 years by IBM(2002). However, over the past decade and a half, speech recognition, a research consortium at Saint Mary's University, has been exploring the possible use of speech recognition in the classroom. This research pursuit, particularly as it pertains to hearing impaired students, has had numerous sceptics relative the limitations of speech recognition for classroom use for Deaf students (Stinson, 1998; Larose, 1999). A paper presented at the Frank Lovejoy Symposium (1997) by Michael Picheny captured quite precisely the tantalizing promise of speech recognition for transcribing speech to text and all the wonderful benefits for Deaf persons while tempering the notion of the magic of the technology with the sobering reality of the all so common view of it's strongest proponents to 'just wait a few more years and it will be ready to go'.

Despite Picheny's cautions, SR continues to be pursued as an alternative to conventional note taking in classrooms for a host of reasons but certainly one main reason is that the literature on note taking has been unequivocal and replete in presenting the difficulties associated with note takers (Armbruster, nd; Kiewra, 1987). The pursuit of SR as an alternative to conventional note taking is appealing and has resulted in considerable research. (Leitch & MacMillan, 2002; Bain, Basson & Wald, 2002; Bain, Basson, Faisman & Kanevsky, 2005; Wald, 2002; Kheir & Way, 2007).

⁴ Telephony - designed to illicit limited speaker responses from customers. For example, asking a telephone banking customer to reply by saying "chequing account or savings account."

Because of favourable responses to SR (LLT)⁵ expressed by students with disabilities, non-disabled students and second-language learners in universities since 1999 (Leitch & MacMillan, 2002; McIvor, 2006), the Liberated Learning Consortium of researchers wanted to determine if the technology would also work in the secondary school system. The research on the transferability of LLT to the high school environment was guided by the writing and recommendations of Professor Mike Wald (2000). And the research methodology for determining the impact of transferring the technology would have on diverse learners and teachers was based, in part, on M. Hoepfl's insights from her meta-review, "Choosing Qualitative Research: A Primer for Technology Education Researchers" (1997). Hoepfl's review validates existing research perspectives. For instance, she quotes the view of Johnson (1995), "...qualitative methodologies are powerful tools for enhancing our understanding of teaching and learning, and that they have gained increasing acceptance in recent years" (p. 4).

Hoepfl (1997, also reminds the reader of Lincoln & Guba's (1985) view of the appropriateness of qualitative methodologies for naturalistic studies which in turn was supported by Patten (1990, p.172), for those occasions "when samples are small and there is a great deal of heterogeneity. These views were especially helpful and relevant to the research conditions for the GIFT Atlantic Liberated Learning High School Project.

The combination of Hoepfl's (1997) article and Glaser & Strauss's (1967) powerful and seminal work on grounded theory provided the underlying approach for the current research effort. Our goal was to be fastidious in making observations and to be careful connecting observations to the outcomes respecting that our overarching objective was to understand whether we could generalize about the workings of LLT in the university setting to the high school setting.

⁵ SR, in this context, refers to the development of an application, Liberated Learning ViaScribe, that works on the IBM speech engine to produce real-time transcription speech (natural/lectures) to text and post-lecture web-based multi-media online notes, which may be edited or unedited for inaccuracies in the text.

Method

Speech Recognition Technology: Research

The Liberated Learning Consortium has addressed the following three main issues as its research focus:

- How do students in a high school setting respond to and describe their experiences with speech recognition technology in the classroom?
- How do students utilize the online lecture notes and audio?
- How does speech recognition technology impact the manner in which teachers prepare and deliver course content?

The use of both qualitative and quantitative methods was employed. Due to the subject matter and the characteristics of our participants, it was felt that students would be more inclined to complete a questionnaire consisting of a greater number of quantitative than qualitative questions. The following section provides a detailed description of the methodology.

Participants

Participants consisted of students and teachers from the following three schools; Horton High, Park View Education Centre and Horton High. However, Avon View High teachers were trained, but due to time constraints the trials could not be completed. The observations around the training of the teachers have been included (Appendix J).

Approximately 44 students (25 Female and 16 male), grades 9 through 12 (see Appendix A for student demographics) and 6 teachers (3 female and 3 male) completed the requirements expected for participation. Information sessions were held with School Board members and teaching staff to explain the nature of the project. Both teachers and students acted as voluntary participants in the study.

Design

A qualitative approach was selected as the primary mode of inquiry for teachers, as this method would provide the greatest form of detailed responses from participants. A combination of qualitative and quantitative measures was selected for the impact on students and, of course, for analysis of the performance or more precisely, the accuracy of teachers' spoken text and for variables, such as Student Profiles (Appendix A).

Procedure

Teachers

A consent form (see Appendix B) was handed to teachers to read and sign during an information session to finalize project agreements. The consent form outlined teachers' participation including; completing all questionnaires and providing information for on-line notes. Subsequently, a pre-technology, paper and pencil based questionnaire (see

Appendix C) was administered to teachers, asking respondents to answer questions pertaining to class preparation and delivery and to address any concerns he or she may have in regards to integrating speech recognition technology into his or her classroom. The questionnaire consisted of both open ended (e.g., How will your class benefit from the use of this technology?) and closed ended questions.

Teachers engaged in opaque testing (no displayed text) for a minimum period of two weeks. When accuracy rates reached an acceptable level i.e., 80% and/or 15 000 words were trained in the SR system; teachers proceeded to “go live” with transparent testing. During this time, teachers provided displayed text to students. Teachers were free to select the lectures they would supply for research purposes. Upon completion of transparent testing, a post-technology, paper and pencil based questionnaire (see Appendix D) was administered to teachers, asking participants to provide feedback on their experiences with the technology.

Students

A consent form (see Appendix E), information sheet (see Appendix F) and pre-technology questionnaire (see appendix G) were administered to students. Students were informed, by a member of the LLP team, on the nature of the project. Students were asked to complete the questionnaire at home with his or her parent/guardian. A Parent/Guardian signature was required for students to participate in the project. Students were asked to provide demographic information and indicate any supports he/she uses in school. Students were asked to return the forms to his/her classroom teacher. Upon completion of the study, a post-technology, paper and pencil based questionnaire was administered (see appendix H). Focus groups were conducted with students during their lunch hour to obtain additional feedback. The session was audio recorded and students were free to discuss their experiences with the technology.

INFORMATION /STRATEGIC PLANNING SESSION

An information session was conducted with school officials and teachers to explain the nature of the project. Subsequently, a strategic planning meeting was conducted to provide an overview of the following issues; the implementation plan, discuss and build consensus pertaining to courses, training, timelines, posting of notes etc. and to ensure clarity on all issues. An agreement was reached that teachers would provide approximately 15,000 words to build their voice profile. Participants each selected one course for the study. Courses selected by teachers for the research include: English, Statistics, Biology, Chemistry and Geography. The following was noted of each school:

Horton High

Four teachers volunteered to participate in the study. Much interest was displayed by support staff (IT) and Administration. Although not part of the formal study, these

individuals attended the information and strategic planning sessions to become familiar with ViaScribe, in an attempt to encourage students to use the technology.

Teachers appeared knowledgeable regarding various forms of technology and eager to implement SR into their teaching method. One teacher in particular was interested in learning to edit the notes. A teacher with Distance Education students was excited about the possible benefits of the online notes, as the students were not present for the teacher's lecture. In addition, the information technology person agreed to assist the LLP team and teachers should any problems arise.

Park View Education Centre

Ten teachers showed for an initial information session and six teachers completed a pre-technology questionnaire. Numerous questions and concerns were raised by teachers. Unsure if the technology would be conducive for her class, one teacher indicated she would use the technology to collect anecdotal evidence. Two teachers had students with Attention Deficit Disorder who may benefit from the online notes. Several teachers shared with us that lecturing was not a commonly used teaching method in their specific courses.

At our initial meeting we learned that the school was in the process of replacing computers and that some of the existing computers would not be able to run Windows XP. In addition, some teachers were waiting for LCD monitors to be installed in their classrooms. There were also some students who did not have access to computers or high speed internet outside of school. Teachers mentioned the possibility of copying the online notes and passing them out in class.

The study was fortunate to have 16 students complete the post technology questionnaire and for 8 students to partake in a lengthy Focus Group discussions on how the technology worked and their views on the technology

Avon View High School

Eleven people were in attendance for the meeting at Avon View High School. The enthusiasm expressed by the teachers was very impressive. One teacher in particular had a strong knowledge of ViaVoice. He had researched IBM's website and appeared to be knowledgeable regarding the technology. In addition, an Industrial Arts teacher was excited about the possibilities this technology could afford him in his classroom. He felt it would help tremendously when he teaches his section on safety. The online notes would be a reminder of the safety precautions required by students while using the machines.

The online notes appeared to be of most interest to the teachers. Several teachers were solely interested in posting the online notes, rather than displaying text in the classroom. In addition, a number of teachers were interested in learning to edit their own notes to ensure students could access the notes in a timely fashion.

Training

An information/training session (see Appendix I) was conducted for teachers. Items discussed during the session included:

1. Defining the participation and training on ViaScribe (used to train voice profiles): Participation was voluntary and editing one's own files was discouraged; as it is time consuming. Displaying text to students was to be avoided during the data collection / voice profile training phase, edited transcripts would be returned during the "transparent" testing phase, etc.
2. Accuracy / Word Error Rates (see Appendix N): Teachers were to expect accuracy to start low (50%-70%) and gradually increase as more data was trained into their voice profile. Target accuracy threshold for live display is approximately 80%. Trainer and participant discussed examples of transcriptions at various levels of accuracy and strategies for "reading through" some types of errors, etc.
3. Strategies for attaining higher accuracy: articulation and rate of speech, microphone placement, identification of course terminology for voice profile training, selective recording (content vs. housekeeping)
4. Work flow: trainer and participant reviewed microphone setup and positioning, then referred to a workflow document ("cheat sheet") to practice the procedure for launching ViaScribe, recording a lecture, and shutting down (saving). If the instructor expressed interest in incorporating PowerPoint slides, a special PowerPoint workflow was reviewed.

Starter voice profiles were then created for each teacher on his or her classroom computer using IBM ViaVoice. These profiles would be trained further on classroom audio collected during the "opaque" testing phase using ViaScribe's voice profile development tools (see Appendix N for additional information on voice profile training and teachers word error rates)

Data Analysis

It should be noted that due to a relatively small sample size and our resolve to ensure confidentiality, a decision was made to combine the data from Park View and Horton High Schools, which shared many commonalities, not the least of which was geography.

An analysis was performed to determine the results of several questions including; if and how often students watched the displayed text and accessed the online notes. The analysis of qualitative data provided us with insight as to why students selected the answers they chose. Due to the substantial variation in the sample and the low sample size we felt the collected data did not lend itself particularly well to determining statistical significance. For example, 11 students were not exposed to the displayed text and one student was not present during the transparent testing. In addition, 33 students (75%) did not access the online notes.

Two categories were applied to the data to answer the core research questions.

Attitude: Students' responses towards the displayed text and online notes were categorized under "Favourable", "Unfavourable", "Indifferent" and "Conditional". The data is based on a combination of qualitative and quantitative answers from questionnaires. Careful analysis of data enabled students to be categorized into the appropriate category. The "Favourable" and "Unfavourable" responses were selected based on a large number of positive or negative statements and a consistency of these statements throughout the questionnaire. "Conditional" responses were based on views in which students felt changes to the technology were required prior to being useful in the classroom. Responses were categorized as "Indifferent" when students' expressed neither positive nor negative views.

Interaction: Students were asked how often they watched the digitized text during class and the how often they accessed the online notes. Students were categorized under "Frequent", "Intermittent", "Infrequent" and "No Interaction".

Research Outcomes

The following outcomes were obtained over five months of research at two high schools in Nova Scotia. In total, the responses and views of eight teachers and 44 students were included in the study. The research was performed in two stages. Firstly, demographic information was obtained from teachers and students to better understand the participants and dynamics of the classroom. Secondly, teachers and students provided feedback on their experiences with SR. Table 1 provides the percentage of time teachers spend in various forms of class delivery.

Table 1

Percentage of time spent in various forms of class delivery

	Lecturing	Class Discussion	Group Work
Teacher 01	30-50%	30-50%	less than 10%
Teacher 02	10-30%	30-50%	10-30%
Teacher 03	50% or more	10-30%	10-30%
Teacher 04	30-50%	less than 10%	10-30%
Teacher 07	10-30%	10-30%	30-50%
Teacher 08	30-50%	10-30%	10-30%

As teachers did not have previous experience with SR a number of concerns were raised including; integrating other methods (i.e., Windows Journal or calculations) while displaying text, finding time to lecture and having access to the hardware.

All teacher participants agreed the technology would be beneficial in their classroom. Table 2 presents a summary of the potential benefits addressed by teachers.

Table 2
Potential benefits of the technology

1. Students will engage more senses (visual and auditory)
2. Online notes can be used as reference and study tool
3. Absent and Distance Education students can obtain online notes at a later date
4. Students with disabilities will benefit most from the technology
5. Students can focus on lesson rather than trying to write notes

Students were asked to indicate if they have a disability and specify the types of supports they use in school. Table 3 includes both the categories and number of students with disabilities.

Table 3
Categories and number of students with disabilities

	Frequency	%
Learning Disability	2	4.5
Low Vision	4	9.1
Total	6	

A small number of students reported using supports in school. Table 4 contains the supports used by students and their level of satisfaction with each support. It should be noted that one student expressed satisfactory levels with their peer tutor, whereas the other student was not satisfied.

Table 4

Supports used by students and level of satisfaction with support			
	Level of satisfaction	# of students	%
Peer tutor	satisfied/unsatisfied	2	.04
Note-taker	somewhat satisfied	1	.02
Resource	satisfied	1	.02
Assistive technology	satisfied	1	.02

The majority of students held an optimistic outlook prior to exposure to the technology. Table 5 summarizes students' responses (see Appendix J for students' pre-technology responses).

Table 5

Summary of students' responses prior to exposure to the technology
1. Will enable all students an equal opportunity to access and understand class material
2. Provide students with an additional study tool to prepare for tests and exams
3. Beneficial as the technology will provide both visual and auditory stimulus
4. Will assist students in note-taking
5. Useful when students miss class- as they can access the online notes
6. Some students did not feel the technology would benefit their studies

Teachers Post-technology Reponses: Teachers were asked to identify any concerns they have with SR. The following comments are included in Table 6.

Table 6

Teachers concerns with SR

1. A number of teachers found it difficult to find time to lecture in class
 2. Lack of time to implement and use the technology
 3. Lack of equipment (i.e., LCD and screen)
 4. Displayed text a distraction to students
-

When asked how students responded to the technology, two teachers reported the screen as the students' main focus. Teachers noted the following:

Students tend to focus more on the screen, particularly in the first class or so. No comments on font or screen size [Teacher 01]

Since we only did this twice-Still a novelty so a lot of attention paid to screen. Second class less attention paid so I would assume this trend would continue. We had no screen and put text on the wall...hard to read [Teacher 07]

A teacher found the technology to be a distraction to the students and expressed the following comment:

Students were distracted by the text on screen. I had to cover it because students were scanning for humorous interpretations instead of reading or listening to gather content. It's a good online resource but a distracting classroom presence [Teacher 02]

Two teachers did not display text in the classroom. One teacher noted the following:

Never went to transparent phase. Needed to start this program earlier in the year so that there was adequate time to complete the training and implement the transparent phase. I did not feel invested in this initiative due to the short length of time [Teacher 08]

Five of the six teacher participants held optimistic views towards SR. Teachers reported the online notes as being the major benefit of this technology

I think the intent of the research is excellent. Unfortunately, the time of the year prevented us from fully taking part in everything that we should have done. We would welcome the chance to participate again next year if at all possible. Thanks for everything that you did and hopefully we can take part again next year...much earlier in the year. [Teacher]

In addition, a teacher would like to continue working with SR. The following comment was provided from Teacher 03:

I would enjoy working with it a bit more next fall if you want to try an additional testing. I wonder if I had submitted a list of key geographical terms that I frequently use, to Heather, if it might have made a difference. Heather said it might help but I'm afraid I never got the list completed. Thank you for the opportunity to try this. I believe it has significant potential [Teacher 03]

All teachers experienced some form of technical difficulties; however, only one teacher indicated the response time to identify and correct the problem was too long. Teachers described the quality and quantity of training/guidance they received as “excellent, “very thorough”, “very good”, “good” and “adequate”. One teacher did indicate she would have liked training on editing audio and text.

Students Post-technology Responses: Of the 44 student participants, 31 students (70.5%) indicated watching the digitized screen and 13 students (29.5%) reported not watching the screen. Table 7 presents a summary of students' responses towards the displayed text in the.

Table 7

Summary of students' responses towards the digitized text

1. Students watch the screen to compensate for missed information
 2. The screen is viewed to see how words are transcribed
 3. Students watch the screen to laugh at the errors
 4. Easier to understand material with both visual and auditory stimuli
 5. Technology doesn't work well
 6. It is not needed for the particular unit of study
 7. Students have a better understanding of class material
 8. Mistakes in the displayed text are a distraction to students
 9. Classes run smoother and more quickly
 10. Causes teachers to slow down their rate of speech
 11. Teachers are unnatural in their lesson delivery
 12. Certain teachers are more inclined to stay on topic
-

Favourable responses: Thirteen students expressed favourable views towards the digitized text and many utilized the digitized text to compensate for information they missed while their teacher was lecturing. The following was noted by two students:

It still has mistakes but some words that I missed will be shown on the screen [Student 02]

It causes him to slow down so the microphone can catch his voice, so I can get what I need from it [Student 07]

Table 8 provides the number of students who reported obtaining a better understanding of lectures and improved note-taking by using the technology. It should be noted that 11 students were not exposed to the digitized text, as their teachers were not prepared to begin transparent testing and one student was not present during the transparent testing phase.

Table 8

Number of students who reported a better understanding of lectures improved note-taking

	Better understanding of lecture (# of students)	%	Improved Note-Taking (# of students)	%
Yes	12	27.3	07	15.9
No	32	72.7	37	84.1
Total	44	100.0	44	100.0

Some students felt they could obtain a better understanding of the material when using SR as a reference. For example:

You can re-read what has been discussed to get a better understanding [Student 11]

A grade 11 student noted the following:

At first we couldn't stop laughing...but it keeps our attention more. We could read and hear it...which was nice [Student 17]

Unfavourable responses: A number of students in the sample were categorized as having unfavourable views towards the text. Poor levels of accuracy, difficulty understanding the digitized text and a distraction were primarily the sources of students’ responses. The number of students having difficulty understanding text when serious errors appear on the screen can be seen in Table 9.

Table 9
Number of students having difficulty understanding errors on screen

	# of students	%
Yes	19	43.2
No	25	56.8
Total	44	100.0

In one case, the technology was viewed as an incentive not to attend class. A grade 11 student commented:

No, because if the notes are available no one would come to class [Student 35)

Conditional responses: Two students conditioned their responses indicating the technology may be better suited in another class or more useful with better accuracy rates.

One student from a grade 11 class expressed the following view:

Because of some silly errors the students in the class are distracted. This may change when using the technology in a different unit. It is not needed for the particular unit we are working on [Student 04)

Indifferent responses: Fifteen students were best categorized as having “indifferent” responses towards the digitized text. They expressed neither strong positive or negative views towards the displayed text. These students were not interested in using the screen as a reference for note taking.

Online notes: Of the 44 student participants, 33 students did not access the online notes. Table 10 provides a summary of reasons students did not access the notes (see Appendix K for all responses). A number of students indicated they did not have sufficient time to access the notes; however, they would have obtained the notes had they been accessible at an earlier date. As these students observed:

They were placed online at the last minute; however, I feel they would have been useful for me if I had more time [Student 33]

Haven't got around to it yet, there is still a month of school left [Student 42]

A number of students did not access the online notes because they were satisfied with the lecture materials and notes provided by the teacher and did not feel it necessary to supplement this material. For example:

Well I understood everything in class so I did not need them [Student 03]

There were enough notes on the teacher's site...that I didn't think I needed them [Student 40]

Table 10

Summary of students' responses for not accessing the online notes

1. Students did not feel the notes would benefit their studies
 2. The notes did not contain the important lecture details
 3. Students accessed teachers website for additional notes
 4. Students did not have sufficient time to access the notes
 5. Students unsure how to access the notes
-

Eleven students reported accessing the online notes. One student indicated frequently obtaining the notes; four students reported intermittently using the notes and five students accessed the online notes infrequently.

Focus Groups: The final portion of research consisted of conducting focus groups with student participants and lunches were provided. Two focus groups were held to obtain additional feedback from students. The sessions were audio recorded and were comprised of open ended questions (see Appendix L and Appendix M). Seventeen students in total were present (9 students in Group 1 and 8 students in Group II). Group one's comments are summarized as follows, proceeded by students' comments from Group II.

Focus Group I:

- Online notes were not accessed by students
- Students were studying poetry and did not feel the online notes would be of benefit to their studies. They liked the idea of SR but not for an English class
- Students felt that the technology would be most beneficial to the hearing impaired and ESL students
- Students found mistakes in the text very distracting
- Many students have dial-up connection, resulting in long wait periods while downloading material. Students felt it was time consuming to access the notes.

Focus Group II:

- Students were unaware of how to access the on-line notes until June 12, 2007. They would like the notes to be more easily accessible.
- Students felt the success of SR depended on the classroom environment and the personality of the teacher.
- They felt obtaining the online notes would be beneficial because they would provide students with more detailed notes.
- Students felt that the technology would work well in a Social Studies class or a lecture type class.
- Students will be using the notes for their upcoming final exams
- Some students thought the technology might be good for “translating” – for students where English wasn't their first language
- Definitely thought that the success of the technology depended on the “personality” of the teacher

Limitations

1. Timelines

Several teachers had commitments and or personal obligations that required their absence from school which resulted in delays. In addition, Project staff and planning did not fully appreciate High School operational activities, such as; snow days, early dismissals, March Break, in-services and extracurricular activities. Two teachers were unable to record lectures for several weeks because student teachers were instructing the class. One teacher needed to complete the study prematurely due to standardized literacy

assessments in mid May. Teachers at Avon View were trained in early May. Although initially eager to participate in the study, teachers expressed concern that there was not enough time to complete the project with the school year coming to a close and subsequently suspended their participation.

Teachers were required to share microphones due to the large number of interested participants. Teachers were informed of this during training sessions. When the time came to record lectures, sharing equipment proved to be an inconvenience and time consuming task for some teachers.

2. Teaching Style

A number of teachers felt SR did not compliment their teaching style. One teacher expressed interest in the study and subsequently was trained; however, due to the nature of the class, i.e., Art, withdrew from the study as the technology was not suited to the classroom environment. Upon the completion of training, another teacher felt lecturing would not be a beneficial teaching method for the specific group of students being taught. Subsequently, three teachers withdrew, as they too felt the technology was not well suited to their teaching methods.

Several teachers expressed concern regarding the applicability of the technology in their classrooms a number of times. It was reiterated to teachers that their participation was completely voluntary and they were free to withdraw from the study without any penalty.

3. Installation

Installation at one school was problematic. The school used Novell NetWare as its network operating system, and while ViaScribe has been successfully deployed under Novell before, in this case the two-step installation process created delays. First, the IT contact made ViaScribe available for distribution in the “application launcher”. He then instructed teachers to install the program locally from the application launcher the next time they logged in to the network. Most teachers had not completed this step at the time of training, so a portion of the allotted hour was spent installing software or troubleshooting with the school’s IT support. One of the target computers was not configured like the other machines at the school, and the training session had to be postponed so that the computer could be re-imaged.

Following training, when it appeared that all installations had finally been completed successfully, teachers began reporting a “missing .msi file” dialog on Windows start up. This is known to occur with ViaScribe if a Speaker Independent Profile has been deleted from the “C:\Program Files\IBM\ViaScribe\Users” folder or if that folder was otherwise tampered with. The technical support person at Saint Mary’s University asked the teachers to describe the contents of the \Users folder, and nothing was reported that is known to cause this error. The only effective remedy to the problem is reinstallation, which Saint Mary’s instructed the school to do; however, after repeated inquiries, Saint Mary’s could not confirm whether the reinstallation was ever completed. Although the

problem is not “fatal” because all programs--including ViaScribe--will function normally despite the error, it forces users to “OK-out” of a series of error messages on system start up, which is an unacceptable nuisance. The “missing .msi file” bug only appeared at one school.

4. Engine Failure / Audio Corruption

ViaScribe’s speech engine sometimes failed mid-lecture, resulting in corrupt audio files that ended abruptly at the point where the failure occurred. Software was found to restore as much of the audio as was saved to a playable state, but potentially valuable information was lost. This problem could occur silently, so that teachers might be unaware that anything was wrong with their files until Saint Mary’s staff opened the files hours or days later. Although Saint Mary’s staff had encountered this bug before, it was not considered a potential obstacle to the high school study because the problem was thought to be very rare. However, it affected more teachers than expected: one at Horton and two at Park View. This bug has no known cause, and since it originates at the engine level, ViaScribe’s developers, who treat the engine as a black box, are not able to offer a solution at this time.

5. Miscellaneous problems

Some teachers reported problems that Saint Mary’s staff had never seen before. One recording session for a teacher at Park View consisted of only the word “blah” repeated many times. When a Saint Mary’s staff person visited the teacher in her classroom to troubleshoot, the problem could not be reproduced: both software and hardware responded normally. Nevertheless, the teacher was reluctant to try to use the software again.

Another teacher found that ViaScribe became unresponsive a few minutes into her lecture and had to repeatedly shut the program down and re-start. Based on her description of the problem, it is difficult to determine whether or not this was the “engine failure” bug cited above or an entirely new issue.

Discussion on Findings:

Despite some important differences between university and high school environments which are listed below, the overall reactions to LLT were not entirely dissimilar. In just about every case students and teachers participating in the Gift Project saw great potential in the use of this technology especially for students with disabilities or for ESL students. Students, for example, recognized how the displayed text could allow one to catch words which may have been missed by just listening as well as being able to concentrate more on what the teacher was saying without the worry of trying to take notes. Many students also reported that displayed text even with errors could help them concentrate and one student felt that teachers using the technology were more focussed. When it came to appreciating online notes there was a broader agreement on the benefit of having a text of the lecture particularly if it were an edited lecture. The fact that the online notes included

the capacity for a multi media production of audio, text, power point and a note finder⁶ function was highly praised by students and lauded by teachers.

Now for a brief discussion of some points gleaned from our attempts to transfer the liberated learning concept into High Schools. The reader is asked to appreciate that observations should not be generalized across the board, particularly in light of the previously described limitations of the study and the small and non homogenous nature of the sample.

1. The SR technology, which is at the center of this study, continues to evolve and continues to present a range of problems for persons using the technology (see Limitations, items 3, 4 & 5, pgs 18 & 19).
2. The large consolidated high schools in Nova Scotia have fairly sophisticated IT facilities and typically principals and teachers have embraced new technologies as an integral part of teaching, learning and of attaining a high school education.
3. Transferring Liberated Learning speech recognition technology to high schools is time consuming and requires substantial resources both financial and human.
4. To state the obvious, the structure and functioning of high schools is in many respects profoundly different than universities. For instance, one major difference is that teachers describe their teaching as much more interactive than faculty in university particularly at the undergraduate level. In other words teachers report and students describe the typical high school class as predominately interactive between teacher and students. Teachers consistently tell us that a small percentage of their time is spent on lecturing. Typically they move around the class helping students individually and are constantly engaging students in discussion.
5. There are members of the Consortium working on a client centered system but it was not entirely ready for this study. For most of the life of the Project it has been understood that SR is better suited to the didactic format of one speaker, a Professor and an audience of many, that is, the students.
6. In part, because High School Classrooms function as an ongoing dialogue between teacher and students, exams may not be as closely linked to specific content emanating from teachers' lectures as they are in a university undergraduate classroom. This is important because it also means that high school students may be less dependent on classroom lecture notes than university undergraduate students when preparing for exams.
7. The age and maturity of students can shape the reactions of some students to the errors in the displayed text or to a teacher who has difficulties using the technology. More than one teacher was affected by the students' giddiness when

⁶ Please access the Liberated Learning web site for a full explanation of the note finder feature

- peculiar errors occurred in the displayed text. Another teacher reported losing control of the class the minute there was a humorous or embarrassing error in the displayed text.
8. Obtaining permission to test and conduct tests on LL technology in high school classrooms requires considerable time. The following represent some of the steps necessary prior to conducting research in a high school environment.
 - a. Obtaining approval from your University Research Ethics Review Board.
 - b. Obtaining approval from the School Board(s).
 - c. Obtaining support of the Principal(s) in which you intend to conduct the research.
 - d. Ensuring the principals are supportive of the research.
 - e. Finding teachers willing to participate in the study.
 - f. Obtaining permission of the parents of the students in the class in which you hope to do the testing,
 - g. Hiring a person preferably a teacher to liaise with the teachers and principals on a regular basis.
 - h. Distribution of Student Participant Permission slips and waiting for their return.
 - i. Finding the time for training teachers on the technology.
 9. Developing a deep appreciation of the differences in the operational structures between higher education and secondary schools is essential. For example, in a university setting, in-classroom teaching commitments might range from approximately 6 to 9 hours for the week and for high school teachers it could be 5 hours a day. High school teachers have less autonomy with respect to classroom activities than University faculty who have considerable latitude regarding how they can conduct the class and how they use technology in the classroom.
 10. Lastly and important for this study is that there appears to be a possible decline in the numbers of persons with physical disabilities in secondary schools in Nova Scotia. It is becoming rarer to have deaf, blind or mobility impaired students in the class. At this point we are uncertain whether the absence of significant numbers of students with disabilities was unique to the schools we selected or to Nova Scotia in general. Indeed the Principal researcher has questions about an overall decline in the numbers of students with physical disabilities in schools across Canada. There are however reportedly large numbers of students with learning disabilities in our schools but our limited experience leads us to believe that they are not always identified.

The above points need considerable more examination and as previously discussed do not diminish in the least the overwhelming belief held by students and teachers that this technology will one day change forever the way that students access classroom content and the way teachers teach.

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APPENDICES

Appendix A

DEMOGRAPHIC CHARACTERISTICS OF LLI RESEARCH PARTICIPANTS

N=44

GENDER

	Frequency	%
Female	25	56.8
Male	16	36.4
Undisclosed	3	6.8
Total	44	100.0

AGE

	Frequency	%
15 years	07	15.9
16 years	19	43.2
17 years	14	31.8
18 years	01	2.3
Not disclosed	03	6.8
Total	44	100.0

GRADE

	Frequency	%
Grade 9	05	11.4
Grade 10	03	6.8
Grade 11	29	65.9
Grade 12	04	9.1
Not disclosed	03	6.8
Total	44	100.0

PLANS AFTER HIGH SCHOOL

	Frequency	%
University	36	81.9
Community College	03	6.8
Work	02	4.5
Other	02	4.5
Not disclosed	01	2.3
Total	44	100.0

Appendix B

CONSENT FORM

FOR TEACHERS PARTICIPATING IN THE RESEARCH ASSOCIATED WITH THE LIBERATED LEARNING HIGH SCHOOL PILOT PROJECT (LLHSPP)

The Liberated Learning High School Pilot Project is a research endeavour that will examine the efficacy and feasibility of using speech recognition technology in the high school classroom environment.

Your response to this innovation represents a valuable component of this project. A significant part of this research entails teachers completing questionnaires and providing information for on-line notes.

I agree to complete all necessary questionnaires for this project and understand that results from questionnaires may appear in published work. I acknowledge that the nature of my voluntary participation in this project does not guarantee my anonymity, but that all measures will be taken to ensure the confidentiality of any data generated by my participation in the research.

I have been informed that audio and/or video clips, and text transcripts of lectures may be used by researchers and I understand that these materials will not be viewed by or distributed to any person other than those appointed to conduct research on this project. I have been informed that I can choose which clips of my lecture I wish to submit for analysis. I also understand that researchers have signed an agreement not to distribute any audio/video samples of lectures or text transcripts.

I have agreed to provide information for on-line notes and understand that access to this information will be managed by authorized persons employed by the Annapolis Valley Regional School Board and/or the LLHSPP.

I understand that all audio/video clips of lectures, text transcripts of lectures, questionnaires, data appearing on-line, and all other data collected throughout the life of this project will be shared only by researchers appointed to the project and will be destroyed within a year of publication of project results.

My participation in this project is voluntary and I understand that I may withdraw at any time during the research.

Participant _____ (please print)
Signature _____
Date _____
Researcher(s) _____
Research Site _____
Date _____

Appendix C

Liberated Learning High School Pilot Project Questionnaire for Teachers - Pre-technology

Test site: _____

Date: _____

1. The purpose of this questionnaire is to understand how the use of speech recognition technology will affect class preparation and lecture delivery.	
Time invested in class/lecture preparation A) 1-2 hours B) 2-3 hours C) 3-4 hours D) 4-5 hours	Teaching methods you use include A) the use of overheads B) the use of power point C) audio-visual materials D) other (please specify)
Time spent lecturing in class A) Less than 10% B) 10-30% C) 30-50% D) 50% or more	Time spent in class discussion with students A) less than 10% B) 10-30% C) 30-50% D) 50% or more
Students time spent in group work A) less than 10% B) 10-30% C) 30-50% D) 50% or more	
2. Have you used or observed speech recognition technology prior to the information session you have attended today? Yes/No	
If yes: In what situation(s)?	
3. Do you have any concerns with integrating speech recognition technology into your class preparation? Yes/No	
If yes: What concerns do you have?	
4. Do you think using this technology in your classroom will have any benefits? Y/N	
If yes: How will your class benefit from the use of this technology?	

5. Do you currently post lecture notes online?

If no:

What are your views about posting lecture notes in the online lecture notes system?

Appendix D

Liberated Learning High School Pilot Project Questionnaire for Teachers - Post- technology

Test site: _____

Date: _____

1. To begin with, we are interested in how using SR has had an impact on your class preparation. What kinds of changes has the technology introduced to your method of lecture preparation?

- Time invested
- Content and format (length of lecture)

2. To what extent are you conscious of the technology?

3. Have you experienced many technical difficulties? Yes/No

If yes: How long has it typically taken to identify and correct the problem?

4. Have technical difficulties ever been serious enough to require technical support beyond what you were capable of? Yes/No

If yes: How was the problem resolved?

5. How do you think SR has affected the pace and continuity of your lecture?

6. What observations have you made about your accuracy and readability?

7. How would you rate the use of this technology?

- a. Difficult
- b. Somewhat difficult
- c. Somewhat easy
- d. Easy

8. How would you describe the quality and quantity of training/guidance you have received in this initiative?

9. Have you identified any new concerns?

10. Can you describe how this technology has been advantageous for you

11. How have students been responding?

- Do you notice if students tend to focus on you, or the screen?
- Have they provided any feedback to you such as requests for larger fonts, recommendations about the size of the screen?

Appendix E

Informed Consent – Students
Liberated Learning High School Pilot Project
Dr. David Leitch
Atlantic Centre of Support for Students with Disabilities
Saint Mary’s University
Halifax, NS B3H 3C3
420-5449 FAX 496-8222 email: david.leitch@smu.ca

I am Director of the Atlantic Centre of Support for Students with Disabilities at Saint Mary’s University. I am inviting you to participate in my study. The purpose of the study is to explore the merits of speech recognition for improving access to teaching content within the high school classroom.

This study involves the real time display of text of classroom lectures. This technology will also produce online notes that the student can access as a text file on a computer or as an audio file which can be downloaded as a MP3 file. This study will take place in your school during the second semester and requires that you complete two questionnaires and/or take part in a focus group. This research activity will take place during your lunch hour and/or free period.

Similar studies at Saint Mary’s University (2001-2003) indicate that improved access to teaching material had a definite positive impact for students facing disability and second language barriers. There are no known risks in this study. **Your participation is completely voluntary. You may withdraw from this study at any time without penalty.**

All information obtained in this study will be kept strictly **confidential and anonymous**. No personal data will be collected. Numbers will be assigned to all students with all information kept in secure filing systems. Raw data will be destroyed at the end of the project. Please do not put any identifying information on any of the forms. To further protect individual identities, this consent form will be sealed in an envelope and stored separately. Furthermore, the results of this study will be presented as a group and no individual participants will be identified.

If you have any questions, please contact the project coordinator, Erica McGill at 491-8611 or erica.mcgill@smu.ca.

This research has been reviewed and approved by the Saint Mary’s University Research Ethics Board. If you have any questions or concerns about the study, you may contact Dr. John Young, Chair, Research Ethics Board at ethics@smu.ca.

By signing this consent form, you are indicating that you fully understand the above information and agree to participate in this study.

Participant’s Signature: _____ **Date:** _____

Parent or Guardian Signature: _____

Appendix F

Dear Student,

I am writing to request your participation in the Liberated Learning High School Pilot Project. A number of your teachers are about to begin to use a speech recognition system in the classroom. This will allow you read as well as hear what your teacher is saying as the teachers words are translated into text that is projected onto a screen in the classroom in real time. This text can be combined with PowerPoint or video clips. This text, along with PowerPoint and video is saved on the high school computer network allowing for later access by the student from a computer at a remote site (virtually anywhere you can access the high school website). The voice files can be downloaded as MP3 files.

Your views about the speech recognition technology are extremely important. In particular, your responses will help researchers understand whether or not speech recognition technology improves access to high school teaching for students facing a disability and language barriers.

This research will require you to complete questionnaires and/or to participate in focus groups in which you will be asked some basic questions about:

- 1. Support systems you've used in high school**
- 2. How you feel about the speech recognition technology being used in your Liberated Learning class, as well as the online notes that are made available after class**

The focus groups will be audio-recorded and transcribed, and you may review your transcript if you wish. The information you provide is strictly confidential and your identity will not be revealed.

Attached you will find a general question and answer sheet about the nature of this research and your participation in this research.

If you have any further questions, please contact your teacher or, I welcome you to contact me directly at erica.mcgill@smu.ca.

Sincerely,

Erica McGill

Appendix G

*Liberated Learning High School Pilot Project
Questionnaire for Students- Pre-technology*

Test site: _____
Date: _____

<i>SECTION A: BACKGROUND INFORMATION</i>						
<i>1. Age</i>	<i>2. Male Female</i>	<i>3. Grade</i>				
<i>4. Plans after high school</i>						
<ul style="list-style-type: none"> <i>1- University</i> <i>2- Community College</i> <i>3- Work</i> <i>4- Other (please specify)</i> 						
<ul style="list-style-type: none"> <i>5. a) Is English your first language? Yes/No</i> <i>b) What is your first language?</i> <i>c) How long have you used English in school?</i> 						
<i>6. Students with disability (check all that apply)</i>						
<i>Deaf</i>	<i>Hard of Hearing</i>	<i>Learning Disability</i>	<i>Blind</i>	<i>Low Vision</i>	<i>Mobility Impaired</i>	<i>Other (including ADD)</i>
<i>SECTION B: MAIN SUPPORTS USED BY STUDENT</i>						
<i>If you do not make use of supports in school proceed to Section C</i>						
<i>7. Circle: The support(s) you use in school and your level of satisfaction with each support.</i>						
SUPPORT		LEVEL OF SATISFACTION				
Peer Tutor		<ul style="list-style-type: none"> 1- Very Satisfied 2- Satisfied 3- Somewhat Satisfied 4- Not Satisfied 				
SUPPORT		LEVEL OF SATISFACTION				
Sign Language Interpreter		<ul style="list-style-type: none"> 1- Very Satisfied 2- Satisfied 3- Somewhat Satisfied 4- Not Satisfied 				

SUPPORT	LEVEL OF SATISFACTION
Educational Assistant	1- Very Satisfied 2- Satisfied 3- Somewhat Satisfied 4- Not Satisfied
SUPPORT	LEVEL OF SATISFACTION
Note-Taker	1- Very Satisfied 2- Satisfied 3- Somewhat Satisfied 4- Not Satisfied
SUPPORT	LEVEL OF SATISFACTION
Test Accommodation	1- Very Satisfied 2- Satisfied 3- Somewhat Satisfied 4- Not Satisfied
SUPPORT	LEVEL OF SATISFACTION
Resource	1- Very Satisfied 2- Satisfied 3- Somewhat Satisfied 4- Not Satisfied
SUPPORT	LEVEL OF SATISFACTION
Assistive Technology (including FM System)	1- Very Satisfied 2- Satisfied 3- Somewhat Satisfied 4- Not Satisfied
SUPPORT	LEVEL OF SATISFACTION
Other (Specify Below)	1- Very Satisfied 2- Satisfied 3- Somewhat Satisfied 4- Not Satisfied

SECTION C: Speech Recognition Technology

8. Have you used or observed speech recognition technology?
9. If yes, in what situation(s)?
10. How useful do you feel the Liberated Learning course will be in helping with your specific learning needs?

Appendix H

Liberated Learning High School Pilot Project Questionnaire for Students – Post-technology

Test site: _____

Date: _____

SECTION A: DISPLAYED TEXT
1. We would like to know a little bit about the displayed screen in your classroom. Do you watch the digitized screen during class? Yes/No
If Yes: How often would you say you watch the screen during a typical class? 1- Always 2- Most of the time 3- Sometimes 4- Rarely What are the main reasons why you watch the screen?
If No: Why do you choose not to watch the screen?
2. When you're not watching the screen, what do you usually focus your attention on? <input type="checkbox"/> Instructor <input type="checkbox"/> Overheads/Power Point <input type="checkbox"/> Whiteboard/chalkboard <input type="checkbox"/> Other
3. Do you take your own notes in class? Yes/No
If yes: → Do you compare your notes to the screen? Yes/No → How often do you compare your notes in a typical class? 1- Always 2- Most of the time 3- Sometimes 4- Rarely → Do you feel your notes have improved by using this technology? Yes/No
4. Has the digitized text helped you understand the lecture better? Yes/No
If yes: Can you tell us how?
5. Do you ever have difficulty understanding the text when serious errors appear on the screen? Yes/No

How often does this happen in a typical lecture? 1- Always 2- Most of the time 3- Sometimes 4- Rarely
6. How does this technology affect your classroom environment?
7. How does the technology affect the way your teacher delivers the lectures?
SECTION B: ONLINE NOTES
8. Do you use the online notes? Yes/No
If yes: How often do you use the online notes? 1- Always 2- Most of the time 3- Sometimes 4- Rarely
<i>If you have not used the online notes:</i> Can you tell us why you have chosen not to use the online notes for this class?
9. Have the online notes been useful for you in your studies? Yes/No
10. Have you experienced difficulties in obtaining the online notes? Yes/No
If yes: Can you tell us how?

Appendix I

TRAINING OBSERVATIONS

Teacher 01:

- The audio on the classroom computer was not working properly; therefore, LLI laptop was used.
- Teacher appeared comfortable and relaxed during the training.
- Chose to use a lapel microphone
- Trainer created a shortcut to Via Voice on his desktop.
- Some difficulty accessing Via Voice software- took some time to do so and had to extend the training time
- Provided teacher with the opaque testing checklist and contact information for LLI staff
- IT was called to help correct the audio problems
- Saved files were defaulted to the C drive when they should be saved to the P drive-IT to look into this.
- Trial run for speaking went well – noticed the pace of speech.

Teacher 02:

- Training with Teacher delayed due to technical problems in previous session
- Due to personal commitments, teacher would be absent from school for one week
- Teacher was comfortable using technology and was relaxed during the voice training.
- Trainer created a shortcut to Via Voice on the desktop
- There was good audio quality in classroom.
- Chose to use a lapel microphone.
- Was given an opaque testing reference checklist
- Teacher was provided with LLI staff contact information

Teacher 03:

- Due to personal commitments, would not be returning to school until February 15 2007
- Chose to use headset...felt somewhat silly but was more concerned with voice clarity
- Has used FM systems in the past – hearing impaired students in his class
- Trainer demonstrates how to use the transmitter (volume dial, 3 settings, ensure wire is hanging down)
- Demonstrates how to wear headset and stresses the importance of having microphone a thumbs width from mouth. Teacher pus on headset...trainer adjusts the microphone
- Teacher informed about battery usage
- Creates Voice Profile:

Teacher puts on headset. While standing Teacher begins to read the excerpt on the computer. Trainer realizes the transmitter is not turned on and teacher needs to begin again. Teacher stands and appears relaxed and calm while reading 10 minute excerpt. Teacher indicates that he feels funny projecting voice towards white board. The computer is set up in the direction facing the wall, rather than towards the class. When mistake was made...Teacher fumbles but recovers quickly

- Trainer sets up voice profile and creates folder to save text to his computer
- Provides Teacher with reference sheet for opaque testing
- Trainer explains that when ViaScribe is opened, a black screen appears. It is imperative that the black screen is minimized and not closed. If closed, ViaScribe will close as well. A demonstration of the opaque testing steps is performed.
- Teacher goes through trial run of opaque testing...putting on headset, turning on transmitter, opening ViaScribe, testing and providing several lines of text...laughing at himself when text displayed. Trainer said not to worry.
- Asked to send vocabulary terms to create his voice profile
- Configuration – tweaked pause structure
- Provided mock lecture – very relaxed
- Played back – sounded good
- Will be using PowerPoint at times

Teacher 04:

- Teacher has a cold today
- Training delayed due to previous training session
- Teacher chose to wear headset – Trainer demonstrates how to wear headset and stresses the importance of having microphone a thumbs width from mouth.
- Demonstration of how to use transmitter (volume dial, lights , 3 settings, ensure wire is hanging down)
- Performed audio check
- Created voice profile, began with reading excerpt from the laptop. Antennas were not hooked up - had to start again
- Teacher appeared to be relaxed
- During 10 minute reading Teacher was relaxed and composed when a mistake was made
- Teacher spoke somewhat fast
- Teacher uses a laptop in the classroom
- Rarely uses PowerPoint
- Uses graphing calculator screen and drawings
- Pleased that text can be positioned below chosen application
- Teacher was unsure of what microphone is suppose to be turned off between lectures- keep computer one on
- Longer audio cable is required for Teacher
- Trainer talked Teacher through the steps for opaque testing
- Was asked to provide a mock lecture, so playback could be heard. She appeared somewhat nervous

- Audio in the classroom is played through projector but was coming through her laptop (was distorted) – is okay now
- Volume was red – Trainer left it at that
- Voice recording sounds okay...she spoke fast

Teacher 07

- Demonstration of how to properly position microphone and set up receiver
- Teacher says she is “ technically challenged”...proceeds to laugh
- Teacher has worn headset in the past for a hearing impaired student
- Teacher appeared very relaxed and comfortable
- Trainer demonstrates transmitter and headset once again – ensure thumbs width from lips
- Teacher puts on headset – correctly done
- Reads excerpt in classroom voice – sounds good
- Skips reading of 10 minute excerpt due to time constraints
- Her computer is thawed out – any changes made will stay
- Trainer uses flash drive to copy new profile from laptop to classroom computer
- Teacher jokes around...very at ease
- Trainer explains how to open ViaScribe; minimize the black box, and turn microphone button on, say “testing, testing” to ensure everything is in working order
- Trainer checks to ensure audio is working properly
- Teacher giggles – is amazed and excited to see the text on the screen
- Teacher launches ViaScribe
- First words recorded should be “testing testing” to ensure software is working properly
- Teacher minimizes window – ViaScribe still recording
- Teacher laughs – is very excited for the opportunity to experiment with the technology
- Trainer reminds Teacher that words said casually will not save accurately
- Trainer explains that lectures will be edited at SMU and will be returned quickly during transparent testing
- Teacher says she will begin opaque testing on Monday, April 23. Trainer explains we are looking for subject matter
- Trainer asks if teacher will provide her with a list of words commonly used in her class. This is done to assist with training her voice profile
- Teacher will be sharing microphone with another teacher

Teacher 08:

- Teacher states that she uses a lot of equations during class – would this be a problem?
- Trainer demonstration of how to properly position microphone and set up receiver
- Teacher asks about battery usage – let us know when needed
- Shows headset – boom should be a thumbs width from mouth

- Teacher jokes around – said she was tired today
- Adjusts audio setting – forgot to turn microphone on first time
- Creates voice profile
- Student comes in to watch and asks a couple of questions
- Trainer copies Teacher’s profile to classroom computer
- Teacher explains to student that they can download lecture and listen to it at home
- Trainer adjusts settings on classroom computer
- A number of students entered classroom to ask for help for an assignment
- Teacher learned very quickly how to navigate through ViaScribe
- Teacher did not have any questions
- Trainer reminds teacher that the system will attempt to transcribe anything she utters
- Heather reboots computer to ensure settings stick

Teacher 15

- Extension cables required
- Email copy of best practices
- Chose to wear lapel microphone
- Trainer demonstrated set up of transmitter, receiver and microphone
- Read excerpt to adjust volume levels
- Read 10 minute excerpt
- Teacher appeared very comfortable and knowledgeable
- Teacher navigated through the software, as Trainer explained
- Network used to save files – S drive
- Asked technical questions
- If microphone turned off...program still recording
- If technical problems arise- shut off and do not worry about it
- Microphone button in “off” position to save recording
- Teacher will act as main contact for other teachers. He will check the ‘S’ drive
- Thinking of other teachers and ideas of how to help cut down on blank recorded spaces
- Did not have speakers – Trainer listened to recording through microphone-sounded good
- Recited small lecture...caught himself looking at screen, said “shoot” and laughs
- Listens to playback through headphones
- Appears comfortable and confident
- Trainer demonstrates PowerPoint features (go to slide show and set up show)
- Teacher navigates easily through the software

Teacher 12

- Very hot in classroom. Somewhat uncomfortable.
- Teacher indicated she was a fast talker
- Laughs when reading accuracy paragraphs
- Will be using lapel microphone

- Trainer demonstrates set up of transmitter, receiver and microphone...laughs...thought transmitter was boom
- Reads excerpt to adjust quality levels
- Trainer stresses the importance of annunciating word endings
- Teacher appeared somewhat distracted. Had to write something down on hand to remember to do later
- Reads 10 minute excerpt...spoke fairly quickly
- Did not have C drive on computer...assistance of IT person was required
- Needed to troubleshoot (i.e. re-image computer) – took approximately 25 minute
- Teacher appeared preoccupied with other things during the training
- Did trial run of opaque testing...appeared comfortable with the software
- Did laugh several times and read errors – said “I know, but it is funny”
- Teacher took notes on how to adjust volume setting
- Teacher indicated she would ask one of the other teachers if any questions arose

Teacher 14

- Teacher asked if it was possible to use two classes for the study
- Indicated she was a fast talker
- Very friendly and chatty...lots of laughing
- Recently changed teaching style in an attempt to interest the students
- Will use headset...demonstration of set up of receiver, transmitter and microphone
- Teacher jokes around
- Spoke slowly during reading of excerpt. Teacher appeared to be making a concentrated effort to speak slowly. Had a number of errors during the 10 minute excerpt
- Asked if error could be repeated if not pronounced correctly the first time
- Trainer copies flash-drive to classroom computer
- Indicated a problem with sinuses in which voice becomes raspy
- Kept wanting to look at screen when lecturing – turned head away from monitor
- Playback of lecture was sounded static
- Teacher did not think her voice sounded good...laughs about it
- Indicated she may forget the process
- Went through opaque testing steps 3 or 4 times

Teacher 16

- Teacher is familiar with ViaVoice
- Very familiar with best practices
- Indicated to Trainer it may be helpful to know what class the excerpts come from
- Has done ViaVoice presentations in the past...indicated he does not say many ‘ums’ and ‘ahs’
- Very relaxed...familiar with terminology and practices
- Would prefer to wear a lapel microphone but will wear a headset
- Does not have any questions

- Trainer demonstrated set up microphone, transmitter and receiver
- During quality volume rating- used projected classroom voice
- While reading excerpt, spoke slowly and enunciated all words
- Trainer converted flash drive over to classroom computer
- Teacher gives short lecture to test out software
- Spoke clearly and slowly...was conscious of enunciating words

Teacher 11

- Teacher has used Dragon Dictate in the past
- Asked if more reading will increase accuracy
- Good attitude...laughing and joking
- A couple of students were present in lab working on computers
- Teacher wanted a copy of best practices sent to email
- Teacher indicated he does not like reading out loud, however, teacher did a great job
- Demonstration of setting up of microphone, transmitter and receiver
- More jokes
- Reading of excerpt...sounds good...system likes his voice
- Wants to make safety video using this technology

Appendix J

Students Pre-technology Questionnaire Responses

Have you used or observed speech recognition technology? If yes, in what situation(s)?

1. Home, just for fun [Student 07]
2. When someone had hearing problems [Student 11]
3. On the computers at school [Student 12,]
4. My father has it for taking medical notes [Student 18,]
5. Someone who had a hearing problem [Student 35,]
6. In stats class [Student 45,]
7. Math class last year [Student 47,]
8. Watched teacher use it [Student 48,]
9. Windows vista on my brother's computer [Student 50]
10. Biology class [Student 51]
11. Studying [Student 54]

How useful do you feel the Liberated Learning course will be in helping with your specific learning needs?

1. Well, if I am a visual learner it would help significantly in my learning [Student 01]
2. I think it will help my study tools [Student 02]
3. Pretty useful...though I am doing okay now, having more options to help my learning is always good [Student 03]
4. I think it will be helpful in the way that I learn better when I see and here things [Student 04]
5. Not sure [Student 05]
6. I'm not really sure [Student 06)
7. Not that useful unless I miss class [Student 07]
8. It will help me take notes [Student 08]
9. Yes. I think it would help me to understand class deeply [Student 09]

10. I think it will be very effective being able to hear and see what the teacher is saying [Student 10]
11. Very helpful; as it can allow everyone an equal chance of getting the information [Student 11]
12. I don't have any specific learning needs, so I don't think it will make much of a difference [Student 12]
13. I will be able to see what he is saying [Student 13]
14. I think it should be really useful [Student 15]
15. I think it will make learning easier because it will be accessible more easily [Student 16]
16. It will help me study better and prepare for my tests and exams [Student 17]
17. I don't think it will make a huge difference in my case, but it would be nice to have the audio version of notes available. [Student 18]
18. I believe it will create excellent new methods for me for studying [Student 19]
19. Very useful. Being able to get some notes when you missed the class or seeing what you missed on the board because you were running late for some reason [Student 21]
20. Not sure [Student 28]
21. It will help learning English [Student 29]
22. I think it will be useful by giving us a better way to review things we did in class. [Student 31]
23. It will be good for students who are better at reading than listening. [Student 32]
24. I think it would be very useful to students who miss class, forget what the teacher said or students who have trouble learning straight from a teacher. [Student 33]
25. Very, as it can give everyone an equal chance at getting the information [Student 35]
26. It could help me with studying, note taking, etc. [Student 36]
27. It will be good if I miss class [Student 37]
28. Very useful because I travel a lot, so I miss school sometimes. [Student 38]
29. A little helpful [Student 40]
30. I think it will help a lot [Student 41]

31. Should be cool [Student 44]
32. It will be nice to be able to see the notes afterwards on the computer/internet [Student 45]
33. It will be easier to get notes and information taken in class. [Student 46]
34. You can hear better [Student 47]
35. Not a lot it's just a change [Student 48]
36. It will help because I will be more focused on what my teacher is saying instead of taking notes and therefore not really paying attention. [Student 50]
37. Well, it depends on how well the notes are taken. I think it will help. [Student 51]
38. Rather than writing notes, I can listen more attentively to the teacher and can take notes later [Student 52]
39. It will become easier to review notes at home. [Student 53]
40. Very [Student 54]
41. I can pay attention while teacher explains notes [Student 55]

Appendix K

Students' Post-technology Responses

We would like to know a little bit about the display screen in your classroom.

Do you watch the digitized screen during class? Yes/No

If yes: What are the main reasons you watch the screen?

1. If I didn't catch something the teacher said, I can check to see [Student 01]
2. If you miss something the teacher says, it helps [Student 05]
3. Blank [Student 17]
4. Blank [Student 02]
5. To see how the words turn out [Student 19]
6. To catch what I missed [Student 07]
7. To see the funny mess-ups [Student 15]
8. Get something I missed [Student 03]
9. Blank [Student 16]
10. Helps me remember what was said [Student 18]
11. For notes [Student 04]
12. For fun [Student 09]
13. See what it would make words out to be [Student 10]
14. If I zoned out...to catch up on topic and conversation [Student 06]
15. It's something to look at [Student 11]
16. Because it is funny [Student 28]
17. To see the errors [Student 30]
18. To see what it picks up [Student 31]
19. Blank [Student 32]
- 33-37 [text not displayed]
20. If I missed a word, definitions and long questions to copy [Student 46]
21. It's new and if I missed something I could read it over [Student 47]
22. Notes [Student 49]
23. Easier to understand and learn with both visual and vocal [Student 50]
24. Was not present [Student 51]

25. Take notes [Student 53]
26. Because it's right in front of me [Student 54]
27. For information [Student 55]

If no: Why do you choose not to watch the screen?

1. It is not needed for the particular unit we are working on [Student 04]
2. It doesn't work very well [Student 12]
3. Yes/no – it's not always there [Student 48]
4. Daze off [Student 50]
5. Because it's new [Student 52]

Has the digitized text helped you understand the lecture better?

If yes: Can you tell us how?

1. If I was writing a note and I missed something the instructor said...I could get it from the screen [Student 17]
2. If still has mistakes but some words that I missed will be shown on the screen [Student 02]
3. Because I catch what I missed during class [Student 07]
4. Because I could see it in writing [Student 14]
5. Easier to listen and read along [Student 16]
6. Because not always do I understand exactly...when he says stuff...but reading a little later is better [Student 18]
7. You can re-read what has been discussed to get a better understanding [Student 11]
8. Yes, it helps if you missed something and helps to explain things out [Student 46,]
9. It's just more information to visually see and hear [Student 50]
10. Yes, because I could listen to teacher [Student 52]
11. Yes, because I can see the notes twice [Student 55]

How does the technology affect your classroom environment?

1. Most of the time attention is on screen [Student 01]
2. Most of our attention is on the screen...mistakes (on the screen)...disrupt the class a bit [Student 05]
3. At first we couldn't stop laughing...but it keeps our attention more. We could read and hear it...which was nice. [Student 17]
4. Not too much [Student 02]
5. People like to watch the screen during a lecture to see what happens [Student 19]
6. It helps people pay attention and get their notes [Student 07]
7. More giggles [Student 15]
8. Sometimes a distraction when funny words come up instead of what is said [Student 03]
9. I like it [Student 16]
10. Makes us more alive in class [Student 18]
11. Because of some silly errors the students in the class are distracted. This may change when using the technology in a different unit [Student 04]
12. I think it takes the attention off the teacher because of "funny" errors [Student 09]
13. People are paying more attention to the screen rather than the lecture [Student 10]
14. Extra...un-needed thing [Student 12]
15. Everybody laughs at what the screen is messing up [Student 21]
16. Not a big difference, except can't see notes on board used for previous class [Student 06]
17. It is definitely a positive tool. Further development of this program could be very beneficial. Students like to watch the ViaScribe [Student 11]
18. When it's showing, we laugh at what it thinks he's saying, so he turns it off. I think in order for this thing to work you need a better recognition system [Student 28h]
19. It makes us happy because it is funny [Student 29]
20. We laugh at the errors [Student 30]
21. It makes us laugh [Student 31]
22. It makes it easier [Student 32]

23. Everyone is actually listening or reading the information [Student 46]
24. We laugh at what comes up on the screen and we have to be quiet [Student 47]
25. It doesn't [Student 48]
26. We laugh at errors [Student 49]
27. Helps us learn better [Student 50]
28. It's a lot easier to focus if you don't need to take notes [Student 51]
29. Paid more attention [Student 52]
30. Things run smoother and quicker [Student 53]
31. It's half distracting because it always messes up so we always end up laughing at the mess up. [Student 54]
32. More relaxed because we can get notes from internet. [Student 55]

How does the technology affect the way your teacher delivers the lectures?

1. Not anyway really...has to speak a little slower...repeat questions we ask [Student 01]
2. Has to talk slower...has to repeat what we say so it shows on the screen [Student 05]
3. It didn't really affect anything [Student 17]
4. It helps me somewhat [Student 02]
5. It has to be correct and proper [Student 19]
6. It causes him to slow down so the microphone can catch his voice, so I can get what I need from it. [Student 07]
7. He speaks louder, clearer, slower and doesn't babble as much [Student 15]
8. Not very much...he may write more things down [Student 03]
9. Easier to follow along with the teacher talking as well [Student 16]
10. Nope, does them exactly same as before [Student 18]
11. He speaks more clearly [Student 04]
12. Hasn't [Student 09]
13. He talks slower sometimes and tries to keep on subject. [Student 10]
14. He talks slower [Student 12]
15. They are the same [Student 21]

16. He tends to speak slower and enunciate more clearly, which brings away from the discussion because it isn't natural [Student 06]
17. He had to speak a lot louder and clearer because of you spoke too low then a word might be spelt differently than pronounced. [Student 11]
18. It doesn't [Student 28]
19. It doesn't [Student 29]
20. No different [Student 30]
21. It doesn't [Student 31]
22. Makes us laugh [Student 32]
23. She speaks more clearly and makes sure the screen gets all the information [Student 46]
24. Stays on topic but mostly stays the same [Student 47]
25. It doesn't [Student 48]
26. Don't know [Student 49]
27. It doesn't [Student 50]
28. It doesn't [Student 51]
29. Doesn't have to stop and wait for class to catch up with writing [Student 52]
30. Faster [Student 53]
31. She presents great lectures so it's good to have a copy of them [Student 54]
32. Not very much [Student 55]

If you have not used the online notes: Can you tell us why you have chosen not to use the online notes for this class?

1. I haven't had use for them [Student 01]
2. I haven't needed them yet [Student 05]
3. I didn't have a chance [Student 02]
4. I understand better from word of mouth [Student 19]
5. I don't need them [Student 15]
6. Well I understood everything in class so I did not need them [Student 03]
7. No real reason [Student 18]

8. They are not needed. We aren't being tested on these particular notes [Student 04]
9. Because I have good notes [Student 09]
10. Don't see the point [Student 10]
11. They don't contain the important details [Student 12]
12. I don't need them [Student 21]
13. Because I pay attention and rarely miss classes [Student 06]
14. I take notes in class mostly [Student 11]
15. I understand them the first time [Student 28]
16. I don't need to [Student 29]
17. I understand everything so I don't have to look it up [Student 30]
18. Don't need to [Student 31]
19. They were placed online at the last minute, however, I feel they would have been useful for me if I had more time. [Student 33]
20. I didn't think I needed them [Student 34]
21. They were just made available a week ago [Student 35]
22. They were only made available at very short notice. [Student 36]
23. There was enough notes on the teacher's site that I didn't think I needed them. [Student 40]
24. Haven't got around to it yet – there's still a month of school left [Student 42]
25. She already has her notes online anyway [Student 44]
26. Well the online notes were not accessible for most of the time [Student 46]
27. I do not need to [Student 48]
28. Haven't had access [Student 49]
29. Haven't had time to [Student 50]
30. I will be but we just got access to them – you only just gave us access [Student 51]
31. I never knew how to get on the website to see them [Student 54]
32. Because they weren't posted early enough [Student 55]

Have you experienced difficulties in obtaining the online notes? If yes, can you tell us how?

1. Don't know where they are [Student 09]
2. Haven't tried [Student 28]
3. They weren't loaded online yet [Student 46]
4. Took awhile to get the site up so we could use the notes – too late [Student 47]
5. You didn't give us access to them! [Student 50]
6. Too many links and options [Student 53]
7. I can't get to them [Student 54]
8. No proper link [Student 55]

Would you recommend an LLI class to other students? Why or why not?

1. Yes, especially if you have trouble following what the teacher says [Student 01]
2. Yes, it helps in a lot of ways [Student 05]
3. Yes I would. It's a good learning tool [Student 17]
4. 02 Blank
5. Yes some students learn well that way [Student 19]
6. Yes, it is good if you miss a class [Student 07]
7. Yes, it's helpful if you missed a class [Student 14]
8. Yes, our class didn't use it much for poetry, but for classes with actual lectures it would be very helpful to see and hear the notes. [Student 15]
9. Depends on the student...some it does not affect at all but it can help if you miss a day of school. [Student 03]
10. Yes, I think it's better for the learning experience [Student 16]
11. Yes, it's a great chance to do better in all your classes [Student 18]
12. If the notes would be useful [Student 04]
13. Yes, if they take bad notes or miss a class [Student 09]
14. No, too distracting. Kids laugh at errors. [Student 10]
15. No, because it's unnecessary [Student 12]
16. Yes, for people who have difficulty learning [Student 21]
17. Maybe to students who have trouble listening in class [Student 06]

18. Sure! It's very interesting. Everyone should learn what it is. [Student 11]
19. No. From my point of view it's worthless unless the text version is better. If it were it might be helpful to non English students, exchange students, etc. [Student 28]
20. Yes, it makes me laugh [Student 29]
21. Yes, because if you miss a day you can look it up after they fix the errors [Student 30]
22. Sure [Student 31]
23. Yes [Student 32]
24. Yes, I feel it's a very effective way for students to get the notes they missed or just simply missed something he said that day [Student 33]
25. If it was used regularly, it could be useful if you missed a class [Student 34]
26. No, because if the notes are available no one would come to class [Student 35]
27. No, I never had an opportunity to use the notes [Student 36]
28. Sure, it seems like a good program [Student 37]
29. Yes, it enables your class to move along faster [Student 40]
30. It would be more useful in an English class. With math I found notes to be useful enough. [Student 41]
31. It is useful but I suppose it would be even more useful in a class that didn't rely so heavily on visual with the audio [Student 42]
32. Yes, because if you missed something in the class or a day you can just go look over the notes [Student 43]
33. Probably for more subjective courses, math doesn't really require this as it is more writing than talking [Student 44]
34. Yes, I would because if you missed a day of school, or even a couple days you can still access the lesson and independent study,. Plus, if there was something in class you didn't understand you can go back and read over the notes. [Student 45]
35. Yes, it was helpful during class time if you are not good at taking your own notes. [Student 46]
36. Yes, but if it started at the beginning of the semester and didn't get the site the last week of classes. [Student 47]

37. Depends on who learns better using visual tools [Student 48]
38. Yes, if we could get access to it [Student 49]
39. Yes, easy way to save the notes and review while having a visual aid. [Student 50]
40. Yes, you can actually pay attention instead of taking constant notes, but only if we could get access to it! [Student 51]
41. Yes, it helps learn more [Student 52]
42. Yes, because you don't have to write [Student 53]
43. Sure – in the future it could work very well. [Student 54]
44. Yes (if it works) because it ensures that you can get notes. [Student 55]

Appendix L

Liberated Learning High School Project Focus Group

Interviewees: Nine Grade 11 English Students

Name of interviewers: Erica McGill and Laura Gillis

Date of interview: May 16, 2007

The focus group session was audio recorded and students were asked to respond to open ended questions regarding the displayed text and online notes. The following is a transcription of the informal conversation held with students.

EM: We want as much honesty and as much feedback as possible. We just want to know what you thought about the whole thing...from start to finish.

EM: Um...so does anyone have any comments or thoughts about ...what happened?

EM: I know you filled out the questionnaires...

Student: I didn't like it

EM: You didn't like it

Student: We only used it once or twice

EM: So, you only used it...the displayed text... when your teacher was talking...you said once or twice?

Student: yeah

EM: Did anyone access the notes that were online?

Student: I couldn't find them (laugh)...

LG: Ok

EM: Interesting...so no one saw the notes...because they would be exactly what your teacher was saying

EM: Did anyone listen to the audio?

Student: I tried but it didn't work (laugh)

Student: The only time I saw the notes was when our teacher showed the class. I saw some mistakes when I saw it.

Student: We were doing it for poetry and did not really need notes for it...what we were using it for was not the best.

LG: So when...so...before everything happened what was your general understanding about what was going on? Did you guys have an idea about the technology and that?

Student: Yeah...my Dad uses it

LG: Oh really?

Student: Yeah...he dictates medical notes

LG: Oh...ok

Student: So...he always has something like it

LG: Ok

Student: I like the general idea but not for an English class...just because much of it...I know it will never be perfect and stuff but so much of an English class is listening and stuff...and taking notes. I know some kids find it difficult but I don't think this technology works for English.

EM: At this stage, can you tell me if you feel the displayed text in the classroom has been useful to you as students?

Student: Well...with it up on the screen, you are not really paying attention to what he is saying.

Student: Yeah exactly...I know when we were watching it...people were watching for mistakes...laughing and not paying attention

Student: Yeah

EM: So, the mistakes are distracting?

Student: Yup

EM: Yeah...rarely at this stage...it's going to be 100% accurate...accuracy rate...I guess it's more...just if you can read along and sort of still understand what's being said on the screen...even with the mistakes...but if it's distracting...then that's not going to be a good thing.

Student: It might be useful for like posting notes for homework...

Student: Yeah

Student: Or for history class

Student: You kind of get off track too...so if you are reading the notes in class...you're going to be so confused...because some teachers tell little anecdotes within class and so you will be reading it and not really know

Student: And you won't hear the questions asked by other students...so if he's answering questions...

LG: Ok

Student: ...we're not going to know what the question was

Student: He usually repeated the question

Student: Sometimes he did but sometimes he didn't

Student: And it doesn't do names well (laugh)

Student: No

EM: Part of that is you have to train the software, so if maybe in the future...if the teacher has a list of the class names...then that might be helpful...for the names that aren't always as common.

Student: Or if they are totally different

Student: The first comment I saw...it spelled my name wrong

EM: Oh ok

Student: Usually the system will pick out...uh...others words for names that sound just like them

LG: Yeah

EM: I mean we are definitely in the early stages of this...but we just need to know it's something that's going to be helpful for students.

Student: I just have one question

EM: Sure

Student: For ViaScribe...will there...like I've seen voice recognition ...will this change it...like is it different? What is the big difference?

EM: What other ones are you talking about?

Students: Other ones you can use on computers...because I knew our computers here have them

EM: Like Dragon Speak or something?

Student: Yeah

EM: Um...that's a different type of technology...Dragon Speak trains the users voice for it...it can be used for dictation...it can be for writing...so you'll actually be just dictating what you want. That's a little bit different than this because this is meant for bigger ...classroom situations...so...and Dragon Speak and or maybe Kurzweil...you have here too...No...it's not going to change anything that way...

LG: What about...when there was the displayed text in the classroom. How often would you guys probably look at the screen? Or was that distracting to you while you teacher...

Student: I found it distracting

Student: I found if I listened to him and if I like then dazed off...if I just started thinking of something else...I could catch up to what we were talking about

Student: I think the most distracting part was people laughing

Student: Yeah...you could tell people were watching it ...but watching it to laugh

Student: We did only use it once or twice...so I think if it had been up more often we would have just grown immune to it...so...

LG: Ok

Student: I think if it came into effect it wouldn't be something that the kids would really have a problem with

EM: Ok...so being more use to the flaws...so no one was able to access the notes online?...which is kind of disappointing...because like what you said...if you miss a class...you'd have the whole lecture...you know...accessible

Student: You could access them from your computer

Student: My computer...I have dial-up and to access stuff online you need high speed to get anything to work...because it's really slow...

EM: So no one actually saw the notes?

Student: No...

Student: We knew where they were on the site

Student: Our teacher could access them from his computer but I'm sure most of us didn't need the notes because we already answered the questions and written them down.

Student: In all honesty, even if I needed the notes...I don't think I would have done on the computer to get them...that's just me.

Student: I think I would have...like we went to New York for a week...if we had still used ViaScribe...I think I would have.

Student: No...if I can't understand the class I might check but at the time most students understand the class...so...don't need the notes.

LG: If you had tried to access notes, could you have done it on school property?

Student: Oh yeah

Student: Probably

EM: How easy is that to do? You guys don't have frees now.

Student: We can do it at lunch and there is usually one or two computer labs open

LG: Do you have to pay for printing?

Student: Yeah...

EM: That kind of stumps us (laugh). The other component other than just seeing it was how useful are notes?

EM: So, can you see any benefits for a specific type of learner?

Student: Yeah...the hearing impaired...

EM: Sure...and that's originally what it was developed for

Student: Actually it's pretty good for me because as an ESL student...sometimes I can't understand some words but like when...um...he say some difficult word or some hard vocabulary that he pronounced very correctly...and it caught it...I can copy it and that is actually quite helpful.

LG: So, you were able to take something from that?

Student: Yeah...when he showed text...I was able to catch some words from it...I think it's quite helpful for that.

EM: Would you have accessed the notes online or is that not something you would need?

Student: If I couldn't understand the class...probably I'm going to access it and check it...this English course...not disadvantaged students in class...so...like...they mostly understand the class and don't feel like they need the notes...I think...

EM: Ok

Student: If also depends like how you learn...because sometimes just seeing the words you understand the concepts and remember stuff...and sometimes you learn better listening to a voice...but...

Student: Yeah

Student: If you're like a visual learner than the opaque...what do you call it

LG: Transparent

EM: I get those mixed up too

LG: So, are there any other classes besides history you guys said that might work?

Student: Lecture classes

Student: Anything that has long lectures where people just sit like...some science classes...take long periods of notes and would be good using ViaScribe

Student: I like math

Student: I think it would depend on teacher's teaching style and whether they normally lecture...whether they just answer questions...

Student: Yeah

Student: It also depends on the teacher themselves because I know of one teacher that totally gets ff topic (laugh)

Student: I even realized that with our teacher...he tried to stick to one subject as much as possible and like...

Student: Cause then you end up with a lot of stuff you have to sift through

EM: Um...we did do it with math and there are other issues with that...Mrs. F.... is quite good with posting her own notes?

Student: Yeah...she posts her own like religiously (laugh)

EM: And we do try to request teachers using it...use more lecture than...

LG: How do you think the technology affected the classroom environment and the flow of the class? Would the students get disruptive when there were errors on the screen?

Student: Yeah...laugh a lot

Student: Sometimes he sounded unnatural too...the way he was speaking

Student: Probably the only distraction was when the words were not really right for what he was talking about...it just gave a random word...that was distracting...but the rest of the errors you understand that it's the system having trouble picking up the word...but...

LG: The longer that someone uses it...the better that it's eventually going to be...so...

EM: And it's also something we want to know for the research because I know it seemed like a long time since we started...or it has for us...but if you were to have a longer

chance to have a look at the displayed text...we also wanted the notes attached to some kind of assessment...say...if you were having a test or something to see if more students would access the notes to prepare for tests...but if that's not how the class is set up or it's poetry and you're not really having a test...then like you said...you're not going to access them.

Student: I just found the majority of this class is spend talking notes...the whole class today we were taking these notes...and I know especially with vocabulary... I have printed off all the vocabulary we get everyday and now I don't even pay attention to the vocab at the beginning of the day...and if all of these notes were available online and people knew they could just print them off...I really don't think they would get the full benefit of the class...

Student: They would just sit there and do absolutely nothing

Student: Yeah...they wouldn't pay attention and they would be unclear and that might make more work for teachers having students coming in and asking questions that were.....

EM: Is there anything else you want to add...all this is really helpful

Student: It works but it's just not for high school setting

Student: Because I don't think many high school students could be bothered with...

Student: Yeah...it might work better with younger grades

Student: If somebody listens to it...and spends the whole class listening to it...processing and not writing it down and then...um...accessing the notes after would be a good idea

EM: We do use it at St. Mary's in sciences and sociology...and it has been successful but it's very small portion of classes that have it offered...anything else?...thank you

Appendix M

Liberated Learning High School Project Focus Group

Interviewees: Eight Grade 11 Biology Students

Name of interviewers: Erica McGill and Laura Gillis

Date of interview: June 14, 2007

The focus group session was audio recorded and students were asked to respond to open ended questions regarding the displayed text and online notes. The following is a transcription of the informal conversation held with students.

EM: Let's begin. What did you think of the technology?

Student: I think it's a pretty good idea in concept...but the fact we didn't get it until late...

Student: Yeah

Student: Like we only had...like the notes were just posted yesterday

Student: Yeah, we just got access to them yesterday. We've had them since April but would only access them since yesterday

Student: The only time we had it was when we were laughing because the text was pretty much ridiculous at the very beginning...that's pretty much all we got to see...like we didn't really get to the full notes until like yesterday.

EM: So they might be useful studying for exams?

Student: Oh yeah!

Student: Cause it's easier to listen to what she's saying instead of having to concentrate on writing notes and then missing a lot of it.

Student: Yeah

EM: Did anyone listen to the lecture? There was audio too...

Student: I was doing that when I read and it made it a lot easier.

EM: Mmm...interesting...you guys are the first group that listened to the audio....

LG: After school did you access the online notes?

Student: I haven't gotten a chance to do that ...I would have...

EM: Was your teacher the one who showed you how to access the notes?

Student: She went through all steps to show us how to get there

LG: Ok...only yesterday you saw the lecture? What did you think?

EM: Because it's not edited, there's going to be some errors...what did you think?

Student: Well...um...we just kept reading. If we read the sentence and something ridiculous popped up...we kind of already knew what it was

Student: yeah

Student: At the very beginning it was kind of...we had no clue what she was talking about but it really came a long way...because she didn't even really use it that much...she used it a bit...but -

LG: What about your class environment? How did it affect it...besides laughing?

Student: Mostly we were just laughing

Student: We got smarter... (laugh)

Student: We had to be a lot quieter because we didn't know if it would pick up on the notes or something. So, she always told us to keep really quiet...it kept the classroom quieter

LG: Did your teacher's teaching style change?

Student: She talked a bit more slowly but her teaching didn't change

Student: She's really good...the notes that we have are better now because we are getting all the information that she's saying instead of having her explain it...now were getting it all now

Student: Now we're getting little random facts about...

Student: Yeah...cause she's good at lectures in the first place so it's good to have what she's saying because if we always had to write down what she was saying...it would take really long

Student: Yeah...she breaks it down into layman's terms for us to understand

Student: Yeah...and she usually only breaks little pieces but when she explains it like over...

Student: In detail

Student: Yeah

EM: What other benefits can you see?

Student: It would be good for people who can't really listen and write at the same time

Student: I'm one of those people. I have a hard time writing and listening at the same time...it's really helpful for me

Student: Or people who have a hard time seeing the board

Student: And people who are slow at writing...I'm not slow at writing but I know some people are and you always have to wait for them to get it all written down and then we just sit and wait

Student: Would you recommend this for other classes?

Student: Oh yeah!

Student: If you get it to work...it will work pretty well

EM: That's kind of where we're at...at this stage

Student: I think the only thing that can be really distracting is in the beginning when it's making errors

Student: And you're laughing at it...

Student: If at the beginning of the semester we take notes and we lose them and then for exam time we can see all the notes

Student: The one thing that may discourage might be you can just read up at home

Student: If you missed class you don't have to worry about getting notes from someone else

Student: Or...you could just say...if you didn't feel like going to class...you could just skip and get the notes later...so that way it's kind of...

EM: Do you think there are any specific classes/subjects that this might work better in?

Student: Math, history, bio

Student: It would be horrible in math

Student: Math would be really hard wouldn't it?

Student: Anything with a lot of lectures

Student: Yeah

Student: Bio is really good too because bio is basically memorizing, so it would be brutal for physics or chemistry

Student: Do you think you'll use the online notes for your upcoming exams?

Student: Oh yeah...

Student: sure

Student: It will be good when she's reviewing with us too...so then we have all those notes that we know are going to be on our exam

LG: good

EM: Anything you can see you could recommend?

Student: Easier accessibility of the notes...which I'm sure you could easily do

LG: Do most of you guys have high speed at home?

Student: No

LG: You have print credits at school?

Student: Yeah

LG: Do you have to pay for that?

Student: When we run out we have to pay but we get so many every month

Student: It's like 20 sheets a month or something

LG: ok

EM: Anything else that happened or you want to add?

Student: I don't know what it would be like for other teachers because our teacher gets to the point really fast. Some teacher might babble on and on and on....

Student: Then you have a bunch of notes of stuff you really don't need to know

Student: Yeah...

Student: I can name one teacher...

Student: Cause like (our teacher) was really good person to use it for cause she's really good at lectures but some teachers just go on about stuff that doesn't even matter...so I don't know if that would mess up people or something...looking at those things

Student: Yeah...cause you'd still have to go through and take out the stuff you don't need

Student: Yeah

Student: Cause I know some teachers just lecture through the whole class and half the stuff it doesn't even matter

Student: What if the teachers went in and edited stuff? ... and then they could take out what we didn't need

EM: That's a possibility. I mean we do that at SMU so it's not that much trouble for teachers but...yeah...that's a possibility....so she would take out the attendance or housekeeping stuff

Student: And it also depends on how comfortable the teacher might be with it too...cause (our teacher's)...like personality...she doesn't like care...but some teachers might like freak out or something cause I know Mr.X might sweat to death (laughs)

Student: She also like turns it off for stuff that's not important

Student: She'll like talk and then turn it off and turn it back on

Student: Teachers just have to remember to turn it off and on

LG: Did you have a chance to fill out the post-technology questionnaire?

Student: yeah

EM: So nothing else?

LG: Thanks very much

Appendix N

Voice Profile Training and Transcription Accuracy Analysis

Voice Profile Training vs. User Training

Speech recognition programs tailor recognition to individual speakers by means of “voice profiles”. A voice profile is a folder of acoustic and vocabulary data describing the speech patterns of a single user. Voice profile training is the process of adding data to this folder. A distinction should be made between voice profile training, which involves teaching the speech recognition system to better recognize a user’s speech, and *user training*, which involves teaching instructors how to operate ViaScribe, modify their speech habits for speech recognition, care for their wireless microphone sets, etc.

User training occurred during the ½ hour group information session and for about 45 minutes of the 1-hour individual training sessions. Voice profile training began, in most cases, in the remaining 15 minutes of the 1-hour individual session and continued for several weeks thereafter.

If the 1-hour individual sessions included voice profile training, it consisted of a “ViaVoice enrolment”. IBM ViaVoice is a commercial dictation package that creates voice profiles compatible with IBM ViaScribe. The ViaVoice enrolment process involves reading out loud from a series of set texts. ViaVoice does not output the number of words trained following an enrolment as ViaScribe does, so profiles trained only on ViaVoice are marked “ViaVoice” in the data tables below.

Opaque Testing

The greater part of voice profile training occurred in the weeks following the group and individual training sessions, using ViaScribe classroom recordings as inputs. During this data collection phase, teachers recorded “opaquely” (hiding the ViaScribe display from students). IT contacts at each high school periodically collected and transferred opaque recordings to Saint Mary’s staff via FTP. Saint Mary’s staff then prepared edited verbatim transcripts from the raw speech recognized text and audio and ran these through

ViaScribe’s voice profile development tools: a vocabulary builder, a pronunciation adjuster, and an acoustic model enhancer.

Word Error Rates

The standard measure of “accuracy” within the Liberated Learning Consortium is the Word Error Rate (WER), which is the inverse of accuracy. That is, 80% accuracy is equivalent to a 20% WER.

We compute WERs with and without “insertions”. An insertion is an “extra” word in the speech recognized text that has no equivalent in the edited verbatim transcript. For example:

Spoken:	good morning ... how are you today
Transcribed:	good morning ... how are of you today

Here, the WER including insertions is 16.67%, but the WER excluding the extra “of” is 0%. Insertions can happen if the speech recognizer mistakes one longer word for two shorter ones or if extraneous noise is picked up by the microphone and “transcribed”. In the charts below, the WER excluding insertions is labelled as “WER w/out ins”.

Although Word Error Rate scores are a useful shorthand for describing a recording’s overall accuracy, they are not the whole story. For instance, some errors are easier than others to “read through”, so two texts with the same WER might differ widely in comprehensibility, which is more difficult to measure. It is also worth noting that the WER is an average score for the entire lecture and as such may not represent the level of accuracy students were seeing at any particular moment. Students would have experienced some minutes of the lecture as above, and some as below, the average WER level indicated.

Implementation

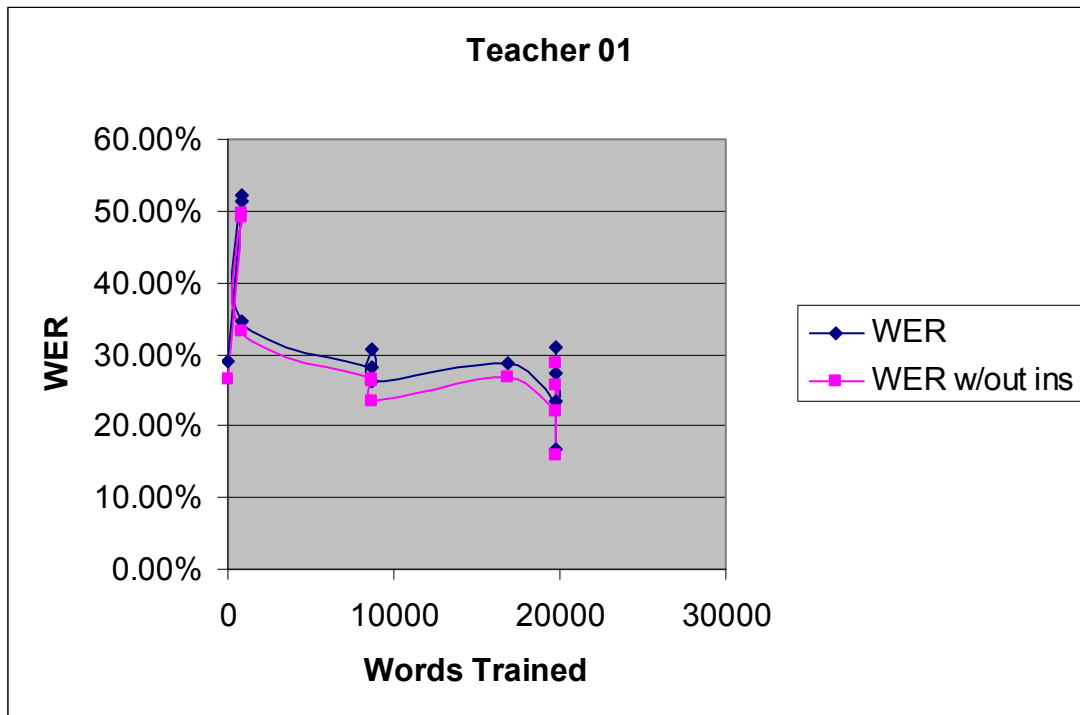
The relationship between voice profile development measured in words trained and WER is represented by a smooth curve in the charts below, but the reader is advised to note the

location of plot points. Despite the best efforts of high school IT personnel and Saint Mary's, there were delays in submitting recordings to Saint Mary's for processing, returning updated profiles from Saint Mary's, and replacing outdated profiles on the classroom computers. Consequently, rather than a smooth progression of training in even increments, there is a cluster of recordings around one level of training, followed by a long gap and another cluster of recordings at a much higher level of training.

A second complication was the audio corruption bug mentioned in the "Limitations" section. The number of recordings affected by this problem follows the WER chart for each instructor.

Teacher 01

Recording	Words Trained	WER	WER w/out ins	Comments
sip_2007_02_21_1	0	29.07%	26.56%	
2007_02_22_1	810	51.34%	49.25%	
2007_02_26_1	810	52.14%	49.80%	
2007_03_07_1	810	34.61%	33.31%	
2007_03_19_2	8681	28.05%	26.50%	
2007_03_19_3	8681	30.65%	26.26%	
2007_03_20_1	8681	26.34%	23.56%	
2007_03_30_1	16,857	28.61%	26.78%	
2007_04_17_2	19705	23.53%	21.96%	Transparent
2007_04_24_2	19705	27.34%	25.79%	Transparent
2007_04_24_1	19705	16.63%	15.80%	Transparent
2007_05_02_1	19705	30.90%	28.79%	Transparent



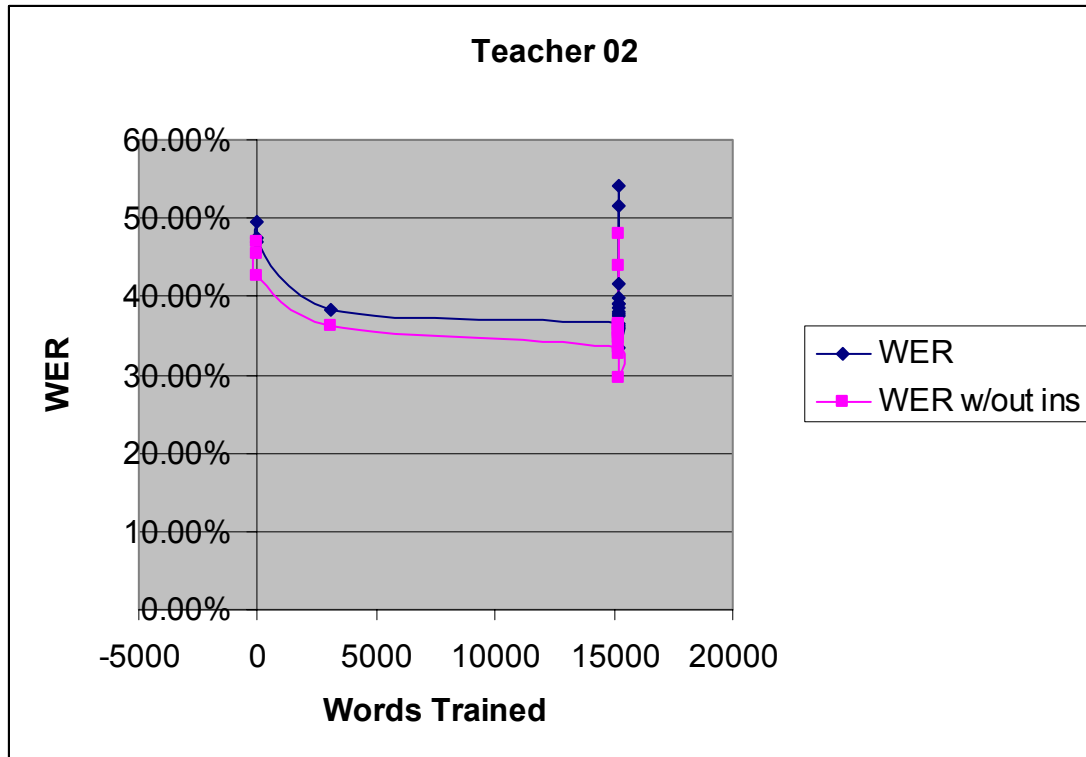
Corrupted Recordings: 0

Teacher 01's first lecture, although recorded using a profile with no training whatsoever, was quite accurate at 29.07% WER because he was speaking very clearly and deliberately throughout. The lecture with the highest WER post training (30.90%) was spoken with far less care than the first lecture, yet is nearly as accurate. The most

accurate lecture of all at 16.63% featured good articulation on par with the first lecture, yet shows about a 40% improvement.

Teacher 02

Recording	Words Trained	WER	WER w/out ins	Comments
		47.61		
2007_02_22_4	ViaVoice	%	45.54%	
		49.60		
2007_02_26_1	ViaVoice	%	46.87%	
		46.88		
2007_03_01_2	ViaVoice	%	42.57%	
		38.36		
2007_03_19_1	3078	%	36.28%	Transparent
		36.49		
2007_04_30_2	15178	%	33.55%	Transparent
		33.52		
2007_04_30_3	15178	%	29.53%	Transparent
		38.06		
2007_04_30_4	15178	%	34.72%	Transparent
		39.71		
2007_04_30_5	15178	%	35.83%	Transparent
		39.00		
2007_05_22_1	15178	%	36.51%	Transparent
		41.56		
2007_05_22_2	15178	%	36.24%	Transparent
		39.04		
2007_05_22_3	15178	%	36.30%	Transparent
		36.22		
2007_05_15_1	15178	%	32.80%	Transparent
		37.90		
2007_05_15_2	15178	%	35.59%	Transparent
		51.62		
2007_05_15_3	15178	%	47.97%	Transparent
		37.60		
2007_05_17_3	15178	%	35.17%	Transparent
		54.04		
2007_05_17_4	15178	%	43.94%	Transparent
		38.51		
2007_05_14_1	15178	%	34.79%	Transparent

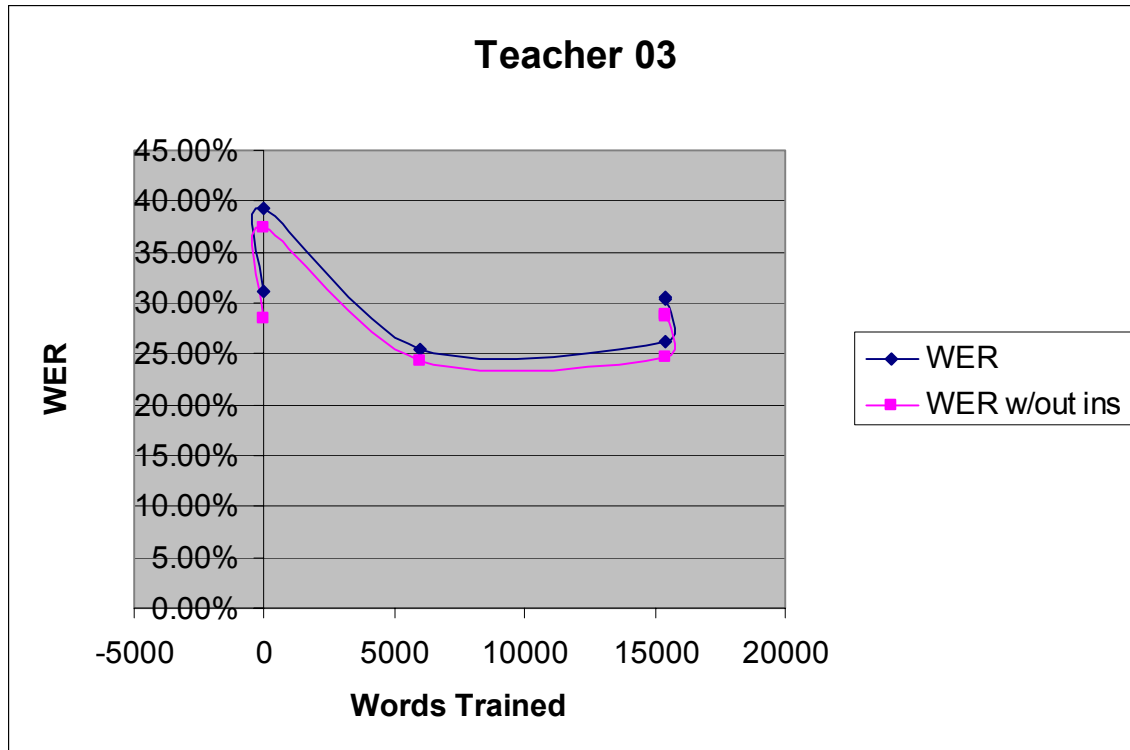


Corrupted Recordings: 0

With Teacher 02 (male), a change of any kind is difficult to discern: lectures at the highest level of training fall both above and below the WER at the 0 words trained marked. The lecture with the highest WER (54.04% including insertions) was only two minutes long and consisted of a recap and homework assignment conveyed very rapidly to beat the bell. The lecture with the lowest WER (33.52%, including insertions) was about 12 minutes long and delivered at a slower pace with clearer enunciation.

Teacher 03

Recording	Words Trained	WER	WER w/out ins	Comments
2007_02_27_2	0	31.06%	28.50%	
2007_03_01_1	0	39.23%	37.32%	
2007_03_20_1	5986	25.44%	24.26%	
2007_05_07_1	15390	26.14%	24.61%	Transparent
2007_05_09_1	15390	30.44%	28.82%	Transparent
2007_05_28_1	15390	30.50%	28.63%	Transparent

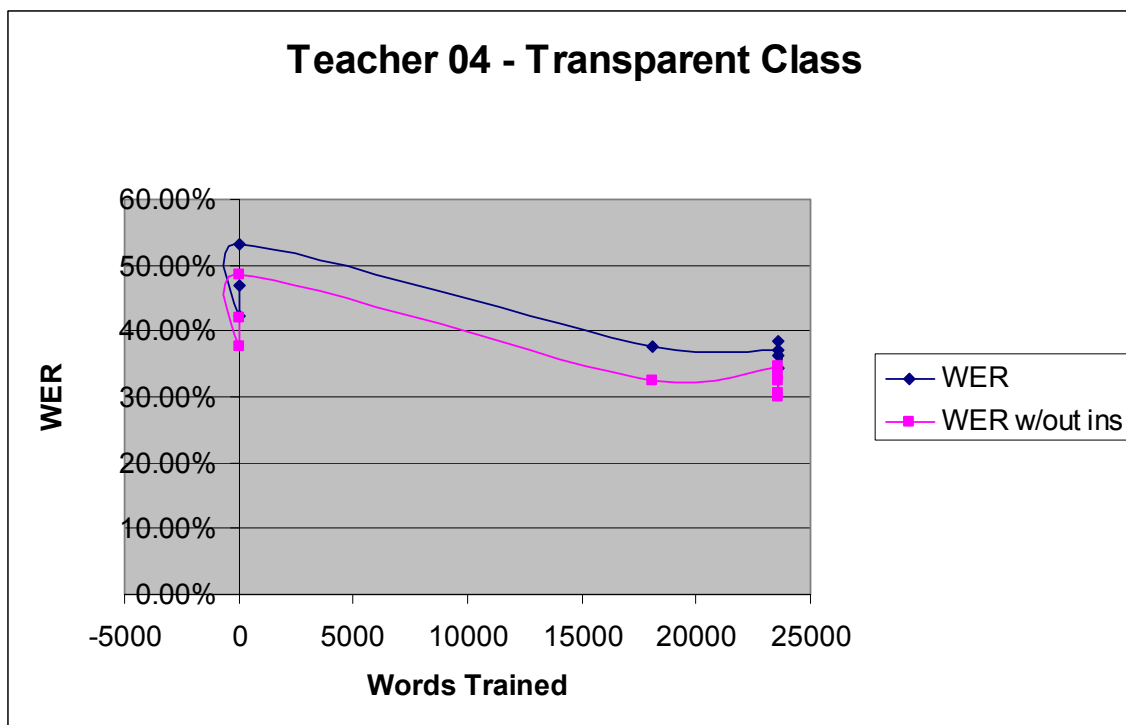


Corrupted Recordings: 0

While Teacher 03 (male) spoke consistently clearly in every lecture, a trend towards reduced WERs with training is not so apparent here. Possibly we would need more than the six recordings available to us to see a pattern emerge.

Teacher 04 – Transparent Class

Recording	Words Trained	WER	WER w/out ins	Comments
2007_02_20_4	ViaVoice	47.01%	42.06%	
2007_02_16_1	ViaVoice	42.40%	37.67%	
2007_02_21_1	ViaVoice	53.24%	48.54%	
2007_03_27_3	18096 (no VV)	37.63%	32.52%	
2007_04_19_1	23565	37.20%	34.64%	Corrupted audio, partly salvaged
2007_04_23_1	23565	34.48%	32.48%	Transparent (Text Displayed)
2007_04_24_1	23565	34.26%	30.52%	Transparent
2007_04_25_1	23565	36.34%	29.91%	Transparent
2007_04_26_2	23565	38.38%	33.38%	Transparent



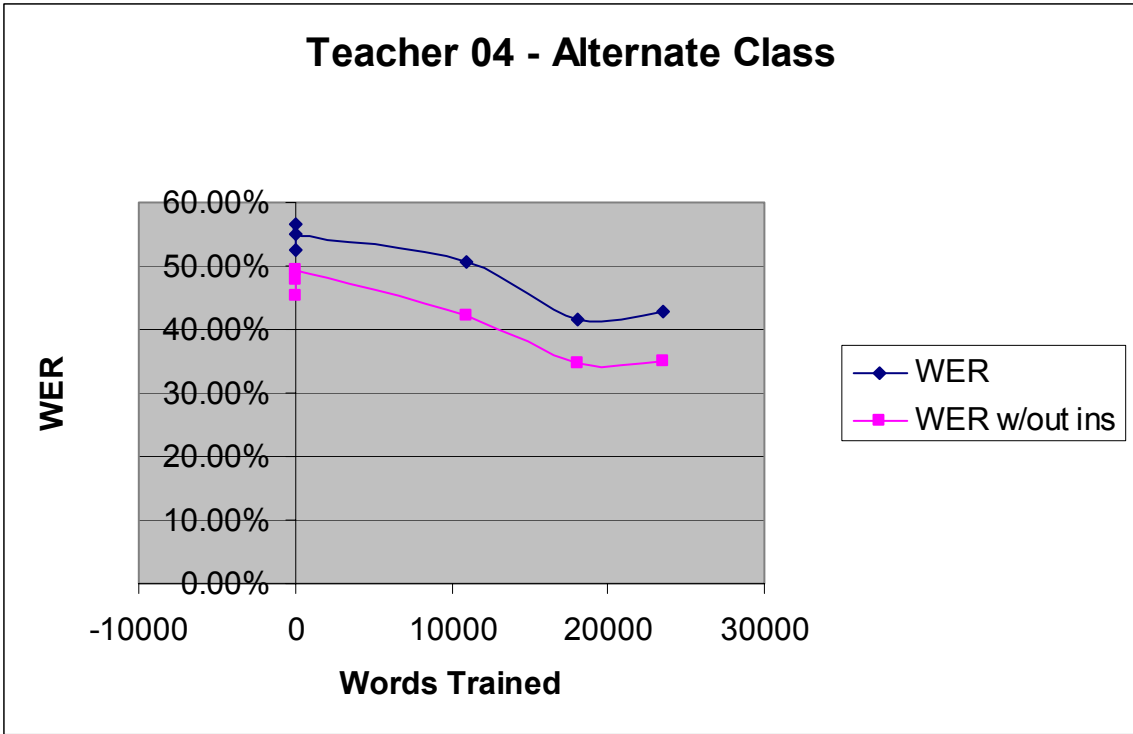
Corrupted Recordings: 9 (both classes together)

Teacher 04 (female) made recordings from two classes, but only displayed text in the one above. She noted that students in this class were older and more motivated than those of her other class, which suggests that she might not have had to devote as much speech to classroom management as compared with her other class. (Speech relating to classroom management or otherwise off topic is usually transcribed less accurately because the teacher's manner of delivery typically changes.)

The chart shows a decrease of roughly 20% between recordings made at the 0 words trained mark and the 23,500-words trained mark.

Teacher 04 – Alternate Class

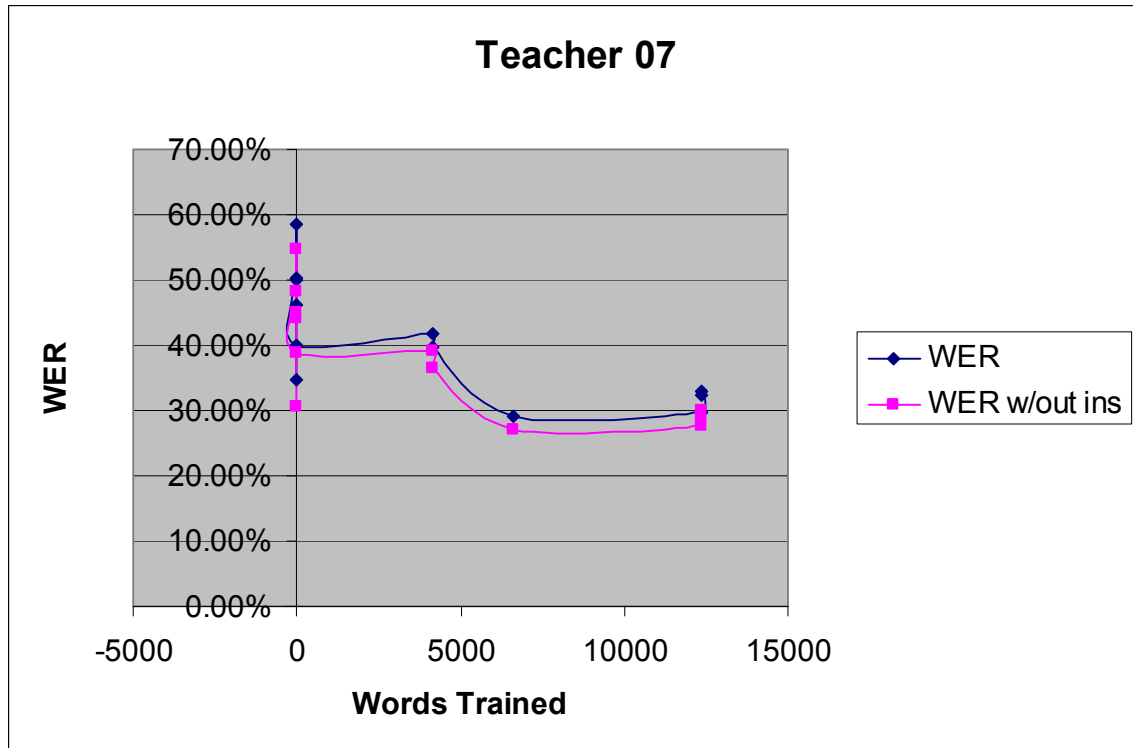
Lecture	Words Trained	WER	WER w/out ins	Comments
2007_02_13_1	ViaVoice	52.42%	45.35%	
2007_02_20_2	ViaVoice	56.51%	47.79%	
2007_02_12_3	ViaVoice	54.93%	49.38%	
2007_03_19_1	10983	50.53%	42.09%	
2007_03_28_1	18096	41.63%	34.56%	
2007_04_30_1	23565	42.72%	35.12%	Corrupted audio, partly salvaged



Here the error rates are higher (possibly due to a more rambunctious class, as noted above), but the improvement with training more dramatic at roughly 30%.

Teacher 07

Recording ID	Words Trained	WER	WER w/out Commentary
2007_04_24_1	ViaVoice	34.81%	30.68%
2007_04_24_3	ViaVoice	49.91%	44.87%
2007_04_24_5	ViaVoice	46.03%	44.18%
2007_04_25_1	ViaVoice	58.39%	54.78%
2007_04_26_1	ViaVoice	50.38%	48.16%
2007_04_30_1	ViaVoice	40.10%	38.81%
2007_05_03_1	4124	41.70%	39.01%
2007_05_08_1	4124	39.57%	36.49%
2007_05_22_1	6598	29.09%	27.09%
2007_06_01_2	12339	29.57%	27.54%
2007_06_01_4	12339	32.85%	30.10%
2007_06_04_1	12339	32.40%	28.75%



Corrupted Recordings: 0

Due to file transfer delays, Teacher 07 (female) recorded 6 lectures with a profile trained only on the ViaVoice enrolment. These lectures vary widely in accuracy, from a 58.39% WER to 34.81%. The 34.81% recording was not a true classroom recording, but “staged” to provide an initial audio sample for training. Staged speech that is mostly read from a set text and delivered without an audience tends to be better articulated and consequently more accurately transcribed than spontaneous speech in front of a live audience. If we ignore this first lecture and focus on the “live” recordings delivered before training, an improvement of about 40% becomes apparent after training.

Appendix O

GIFT Atlantic Liberated Learning High School Pilot Project

*“PHASE II: Testing Speech Recognition Technology
at Halifax West High School, 2006”*

*Submitted by: David Leitch, Director
Atlantic Centre of Research,
Access and Support for Students with Disabilities*

Date: October 10, 2007

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INTRODUCTION

The Atlantic Centre of Research, Access and Support for Students with Disabilities at Saint Mary's University has been working on ways to improve accessibility in education for over 20 years. A pillar of the Centre's operation has been the exploration of how technology can enhance our commitment to inclusion. For example, in 1986 the Atlantic Centre was the first University Support Centre in Canada to purchase the Kurzweil Reader, which enabled visually impaired students to scan text. Most recently, since 1998 the Atlantic Centre has been researching how speech recognition technology (SRT) can improve access to classroom lectures. This work, under a project called Liberated Learning (LL), has specifically focussed on how SRT providing real-time display of spoken lectures and post-lecture online notes can help students with disabilities, non-disabled students and teachers. In 2005, the Grocery & Beverage Industry Foundation Together (GIFT) generously supported our ambition to determine if Liberated Learning Technology could be transferred to the high school environment. Halifax West High School was the first high school willing to allow us to test the SRT in a select number of classrooms. The LL research was also most fortunate to have the Halifax Regional School Board sanction Saint Mary's University's Atlantic Centre Liberated Learning Project at Halifax West High School.

BACKGROUND

Halifax West High School Pilot Project: March-June, 2006

Halifax West High School is the secondary school with the District 7 family of schools located in Halifax Mainland. As of September 2005, this school had a student population of 1,475. The school catchments area includes well established neighbourhoods such as Fairview and areas of Clayton Park. There are a number of high density areas that include a very diverse immigrant population. Because of this diversity and an established English as a Second Language (ESL) program, support for technology, and its size (highest secondary school population in Nova Scotia), Halifax West High School was chosen as a test site to develop the protocol for using speech recognition (SR) in the classroom.

Three teachers were identified through a school administrative process to be involved in the testing of SR in the classroom. All three taught classes at the grade 11 level

One test class was a Grade 11 ESL class of 16 students comprised of 10 males and 6 females. The ethnicity of the class was varied with students from Asia, Africa, Latin America and the Middle East; in all cases English was not their first language nor was it the language spoken at home. The Advanced Biology class had 28 students, 15 males and 13 females, two of these students were ESL students.

RESEARCH OBJECTIVES and CORE RESEARCH QUESTIONS

There are three objectives associated with this applied project.

First, we are interested in examining the benefits of real-time display of the text of lectures will have on those students who have difficulty hearing or comprehending the lecture and may rely on assistive technology. We will also focus on English as Second Language (ESL) students and how the display of text will assist them in the classroom setting. Ultimately, we are interested in how speech recognition technology is used by all students in accessing teaching content

A second objective is to understand how students utilize the online notes generated from their lecture and posted on the school website. The software automatically saves classroom files as text files, incorporating PowerPoint slides and audio files (WAV and MP3), thus the student can access lectures from a remote computer or download the audio files to a MP3 player.

The third objective is to examine the utility and barriers in the use of voice recognition in the classroom by teachers.

The core research questions addressed by this Project are;

1. How do students in a high school setting respond to and describe their experiences with speech recognition technology in the classroom?
2. How do students utilize the post class files of lecture notes?
3. How does speech recognition technology impact on the way teachers prepare and deliver course content?

METHODOLOGY

The research protocol was approved by Saint Mary's University Research Ethics Committee and the Halifax Regional School Board Research Committee. The school administration identified teachers they felt would be appropriate for the intended research. The teachers then developed their voice models. The teachers were then interviewed during the testing of SR in which they were recording their voice and further developing their voice model but not exposing students to SR in the classroom; this was the “*opaque*” phase of the research. Students were also interviewed during this phase.

Students were then exposed to SR in the classroom for up to three weeks. This was termed the “*Transparent Testing Phase*”.

After using SR in the classroom the teachers and students were once again interviewed; this was the post-technology phase.

There was an informal discussion with a group of students after the post-technology phase.

Minor adjustments in the methodology were made because one teacher was not able to participate in all phases of the Project, although they did develop a voice model and another instructor was "*on course*" for two weeks of the research period which limited the exposure of students to SR in their class.

FINDINGS

Pre-Technology

Teachers

The objective of the pre-technology interview was to determine teaching style before the introduction of SR into the classroom. This interview also focussed on the perceptions of the teacher with respect to the anticipated impact of Speech Recognition.

Both the ESL and Science teachers use the LCD projector and PowerPoint and both access the web in their teaching. They noted that their courses are student-centered with little time spent lecturing. The Science teacher observed that he does lecture and that much of the time is spent on problem solving and lab work. With respect to class preparation, both teachers felt that there would be few problems in adapting SR during class preparation.

In terms of potential benefits the Science teacher noted that *"having the exact lecture text available along with the compressed PowerPoint documentation ... would be useful"*. The ESL teacher noted that *"auditory and visual learning would be able to occur at the same time" ...it would help them to see what I am saying and help them to take notes"* which was identified as a real issue with ESL students.

In terms of limitations of integrating SR into the classroom, both teachers who participated had concerns about having to change teaching style to a predominantly lecture format. There were concerns expressed by both teachers about having to speak *"formally"* and therefore losing *"spontaneity"* in the classroom. This led one teacher to observe *"I don't know if I am the best candidate for this, I don't know if my teaching style matches this well"*. The other teacher noted *"I kind of feel like the technology interrupts the flow of the class because I think the kids don't want to ask questions because they don't want to interrupt, they realize that it is being recorded so they wait until the technology is shut off and then ask their question after, but not during class"*. The Science teacher was concerned that the technology might cause students to be less engaged because they would believe that they did not have to pay attention *"making the kids less engaged because they might feel like they can doze off"*.

Students

The 11 students who completed the Pre-Technology Interview (see TABLE I) ranged in age from 15 (one student) to 18 (three students) with an average age of 17. Six students were male and 5 were female.

All but four students used support resources offered by the school. All of the ESL students used the resource room for tutoring or for test preparation; all of these students use the ESL instructor for further help. These students indicated they had difficulty with

the sciences (4 of 6) and history (2 of 6). Of the ESL students, only one indicated exposure to SR and that was as a student in Columbia where it was used in learning English. For ESL students, English was not the language spoken at home.

For the students in the advanced Biology class, only one used any school support and it was for Math tutoring. Two of the five students identified English as their most difficult subject with Math, Chemistry and Physics also cited as being difficult. Three of the five students have observed SR at home where it was used by their parents in each case.

In all cases where the student used the academic support system of the school they were satisfied with the support.

TABLE I

Students 1 – 6 were ESL students and students 7 – 12 were biology students

#	Gender	Age	Disability/ Learning Difficulty	Supports	Exposed to SR	Language spoken at home
1	Male	17	ESL	Resource Room	No	Arabic
2	Male	17	ESL	Only ESL teacher	No	Turkish/ Russian
3	Female	18	ESL	YMCA Room	Yes-in Columbia	Spanish
4	Female	18	ESL	YMCA Room	No	Persian
5	Male	18	ESL	Resource Room	No	Spanish
6	Female	17	ESL	Resource Room	No	Korean
7	Male	15	None	None	Yes-father uses at work	English
8	Female	16	ESL	Resource Room	Yes	Bosnian
9	Female	17	No	No	No	English
10	Female	16	No	No	No	English
11	Male	16	No	No	Yes-father uses in writing	Urdu

POST-TECHNOLOGY

Teachers

The ESL teacher used SR primarily in reading assigned reading so that the student could both hear and see what she was reading - she found this to be the most effective use of the technology given the short period to integrate SR into the classroom. The Science teacher indicated that because he did not lecture he did not use SR often in the classroom. He felt in terms of presentation that when he used SR "*he had to speak formally, textbook style*" and that it was difficult to refer to things outside of class such as a school dance or a television show because this would be "*stale*" by the time the students referred back to online notes. He felt that "*he had to be careful about what he said*"; which in turn "*makes it dull for students*"

Neither teacher found any issues with post-class processing of the lecture notes.

In terms of SR technology impact in teaching and on the class, both teachers noted that they were "*constantly aware of the technology*". They were constantly aware of pronunciation and the Science teacher noted this awareness in turn "*slowed down the lecture*".

Technically there were a few problems; in one instance the screen saver came on over the SR projection and a student fixed the problem. A more important issue was the problem that the software did not recognize the voice immediately and in those few seconds you could lose student attention at a critical moment. The ESL instructor used the errors generated by the software, particularly at the beginning of class, to engage the students and therefore did not perceive student frustration. The Science teacher felt the inaccuracy of displayed text was a real impediment to teaching.

Both teachers found it easy to implement SR in classroom, but the ESL teacher noted that it would take longer than a month for the use of SR to become routine; her observation was that SR "*was not difficult but remained new*". The Science teacher observed that using SR was like "*talking into an answering machine*".

Both instructors felt the quality and quantity of instruction and support provided by the Atlantic Centre to be very adequate, but the ESL teacher noted that to incorporate SR further into pedagogy that in-service training should be used. She felt "*that there should be a small group of 2/3 teachers using SR for a year to understand the dynamics and limitations of SR*"; this would also help in identifying which situations SR would be most useful. It was felt that being able to incorporate web material into SR would be very useful and it would then become an effective "*learning tool*".

The ESL teacher was quite positive in the use of SR, particularly in terms of her specialization; she recommended a year long pilot study using different courses. She also indicated that there should be an open process for selecting teachers. The Science teacher noted that SR would be useful with students with a disability or ESL students, but felt for

him and his pedagogy the use of SR would be very limited.

The ESL instructor noted that students had accessed the online notes before being given instructions on how to access these notes - she felt this was an indication of their interest.

Students

Because SR was not used extensively in the Science classroom, only two students were interviewed and there was an informal discussion with three students who had been exposed to the technology.

From the student perspective the use of SR is generally positive (see TABLE II). It was noted by students that they were “*more engaged*”. It was observed by the majority of ESL students that “*hearing and seeing makes comprehension easier*”. SR was important for understanding proper pronunciation and sentence structure. It was also noted that the online notes which were accessed by two students were useful for review of material. The impact on class environment was that the class was quieter and the students paid greater attention to what is being said. The students noted that the ESL instructor spoke “*louder and more slowly*”.

The ESL students were quite enthusiastic about the use of SR in the classroom. They felt it helped in comprehension and would like to see it used in history and science courses.

The Science students did not share the same enthusiasm as the ESL students in no small measure because as they did not have the same length of exposure to SR and the exposure they did have was very near the end of the semester. Because the instructor places all his PowerPoint slides on his course website, the SR online notes were found to be “*distracting*” for one student. It was felt that the class became more formalized with the use of SR thus taking away from normal class flow of material.

TABLE II**Students**

#	Watch Screen?	Why watch or not watch screen?	Use of SR in addressing learning	Access online notes	Why?
1	Yes	Watching the screen was an active process	If errors reduced and used in lectures SR would be beneficial in learning language and grammar	No	Reading from book was adequate
2	Yes	Helpful to hear and see, keeps one on task	Helpful in learning how to correctly write spoken English in full sentences	Yes	Useful in reviewing for tests
4	Yes-about half the time	Hearing and seeing makes understanding come easier	Being able to see and hear was of benefit-otherwise SR was not a lot of help	Twice	To re-listen to the teacher
5	Yes	Active process keeps him alert	Useful in translation and language comprehension	No	Student did not know how to obtain the notes
6	No	Some words are incorrect	When working properly SR was most useful in grammar comprehension	No	Book was adequate
9	Yes-only about half the time	Problems with accuracy	Not really useful-somewhat distracting	No	Teacher had adequate notes online
10	Yes-teacher did not really use it enough	Accuracy distracting	Useful in lecture for checking notes	No	Teacher put all his PowerPoint and notes online

DISCUSSION

This research is indebted to the Principal of Halifax West High School, the teachers and students and to the Halifax Regional School Board, for their willingness to help us explore the transfer of SRT from a University environment to the High School. We knew from the outset that transferring the technology would be challenging, but felt that it could be a useful tool for enhancing access to classroom material and hopefully worth the attempt.

Testing the technology at Halifax West was particularly important because, of course, it was the first time ever anywhere in the world that Liberated Learning technology was tried at the high school level. Consequently, we appreciated that Halifax West provided an opportunity to gain insight into measures which would help us with subsequent testing in high schools.

The following are some of the critical lessons we learned, thanks to Halifax West:

Firstly, if one is to run any project in the high school setting, it is crucial to fully understand the time-activity structure of the school. For instance, one must be very aware and respectful of not interfering with exams or the period of time when teachers are preparing the students for exams.

Secondly, research projects which require staff time for tasks such as training, must realize the extraordinary busy schedule maintained by most teachers. If teachers are teaching five hours a day, then there is little time to devote to a new project.

Thirdly, it is important to engage at least five or six teachers on a project such as ours which is testing new technology. This number is essential if the Project is serious about providing a support group for teachers, who are putting themselves 'on the line' with trying a new technology in the classroom.

Fourthly, the technology is better suited to some classes than others. The technology by its very design is more appropriate for classes in the Humanities, Social Sciences and ESL classes. At the time of the tests, there were numerous unsolved challenges relative to using SRT in a Mathematics or Science class. For example, formulae either spoken or written would not be properly captioned.

Last, and most appreciated by the Researchers is the generosity of the Teachers and Students to speak very positively about the potential of the technology, even though they experienced technical problems with the SR application being tested and had minimal time to perfect developing a voice profile or for practicing before 'going live'.