

Back to the Future: The Practicality of Using
Microsoft NetMeeting for Effective Distance Tutoring

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Introduction

Though not readily documented, it can be assumed that higher education institutions (college, university, trade or technical schools, etc.) provide the most recent and up-to-date technology to its students in their computer labs with quality computers and other accouterments such as WiFi wireless connections (if for no other reason to attract quality students), while conversely, primary and secondary schools lag behind their higher education counterparts in technology. In my experience in eastern Pennsylvania, many primary and secondary schools provide its students with out-of-date computers and other archaic technology (such as dial up modems, slow processors, and even computers that were discarded by businesses in the community).

The idea for this distance tutoring project was conceived: (a) to provide a new experience mentoring children for university students pursuing a teaching certificate, (b) for university students to utilize technology in pedagogy, (c) as an outreach to elementary school students in need of academic assistance who may not otherwise have access to such assistance (for instance, students in poorer urban or rural school districts who do not have tutors), (d) to eliminate off campus travel for university students to take part in a mentoring

opportunity, and (e) to utilize existing technology and keep project costs to a minimum.

Before a full-scale distance tutoring project could occur, I decided to conduct this pilot study in the spring 2007 semester, with four education majors tutoring four elementary students attending one parochial elementary school in the diocese. If this distance tutoring project would be successful, full implementation would then be planned for fall 2007 on a larger scale with education majors at the university who were scheduled to complete my junior-level Computers and Assistive Technology course, serving as distance tutors for several public or parochial elementary school students.

I began the project by completing a short inventory of the existing technology being utilized at both the university and parochial school, with strong emphasis upon what might be utilized at little or no cost. The thought was that although popular distance communication programs such as Yahoo Messenger, Windows (MSN) Messenger, and Skype could be easily downloaded, Microsoft NetMeeting is already part of the Windows 95, 98, 2000, and XP operating systems, which most of the poorer schools utilize on their computers, and no installation would be required¹.

The Technical Side

I met with my four tutors on January 19, 2007, to discuss the project and allow them to test NetMeeting. This test, which included two-way audio (headsets with microphones), text chat, and whiteboard, was successful on campus because all computers were running from the same network. One week later, the director of instructional technology and I tested the connection from campus to the parochial school and discovered that we could not make a connection, neither by connecting from campus to the parochial school nor connecting from the parochial school to campus. We theorized that a firewall at one or both ends was prohibiting the connection. I requested that the connection problem be investigated by the university information technology (IT) department. We then attempted to connect from campus to a convenient remote off-campus location the following week, which was successful in one direction -- campus to off-campus -- but unsuccessful connecting from the off-campus site to campus. The IT department confirmed that campus could initiate and connect to off-campus sites, but off campus connections could not be initiated to campus under the current configuration.

I then tried to again connect between campus and the parochial school and rediscovered the possibility of a firewall at the parochial school, which was confirmed by its IT provider. The provider stated that the parochial school firewall protected

it from outsiders "surfing for open ports" trying to damage infrastructure (for example, sending viruses). Interestingly, as was the case with campus, the parochial school was also able to initiate connectivity to outside sites, but it was not possible to link to the parochial school by initiating connectivity from the outside in. As a result, the situation was that both the campus and the parochial school could initiate connectivity, but neither could accept it from the outside.

One proposed solution from the parochial school IT provider was to take advantage of a Virtual Private Network (VPN), and determine whether or not the campus IT department would allow VPN capability on its border (last device), last public IP, and give five static internal IP addresses. This option was not utilized.

Ted Fiedler, campus technical support analyst, provided the following explanation on a second option which was utilized that allowed NetMeeting traffic from the parochial school into the campus network. (Refer to Appendix A, *Technical Terms and Abbreviations*, for assistance with relevant terminology.):

Microsoft NetMeeting requires that the following protocol/ports combinations be opened to allow for two way communication between NetMeeting clients: TCP ports: 389, 522, 1503 1720, 1731, and 1 dynamic port which is decided and agreed upon by the client software. This dynamic port will be in the range of 1024-65535. UDP ports: 1 dynamic port which again is decided and agreed upon by the client software and in the 1024-65535 range. In the simplest scenario the source and destination IP addresses would be

known, for I will refer to them as A and B. When the two IP addresses are known we would then allow all traffic coming from IP address A to be forwarded to IP address B. In this scenario NetMeeting clients coming from IP address A can achieve two way communications with B as long as A is calling B. The two way communication works only if all outbound traffic from A is not restricted, specifically on the above mention protocol/port combinations. This is the simplest and most insecure method. To tighten security, only traffic from IP address A on the above protocol/port combinations would be allowed to be forwarded to IP address B. The issues that arise are the two dynamic ports that must be opened by the client software on B. The solution is to only allow H323 traffic to open up ports for already established sessions. To simplify the explanation: A calls B - A now has an established session (or state) on B. We need to now allow only traffic from A which has state on B to come back in on dynamically assigned ports. (T. Fiedler, personal communication, February 27, 2007)

For a still unresolved reason, each of the 20 computers in the parochial school computer room had the same IP address and could only allow one student at a time connect from the parochial school to campus as a result. This meant that the four tutors and four elementary students could only conduct sessions once a week -- and never more than one tutor/student at a time. Also, because of other protective configurations at the parochial school, the elementary students had to be logged into the computers as "administrator" instead of "student" by the principal prior to the start of each distance tutoring session.

What was learned. The following was necessary to facilitate the pedagogical part of this distance tutoring project:

1. An adult was required to be present to connect the elementary student with the college tutor prior to

- each session, and then remain either in or near the room in case there were technological difficulties (even for plugging in the headsets/microphone).
2. Telephone access must also be available. This is necessary to ensure that the student and tutor are present and that the connecting technology is in working order.
 3. Communication in the morning of the distance tutoring session (or earlier) is necessary. Is school in session today? Is the student in school? Is this testing week? Is school closed for holiday or weather emergency?
 4. The video component of NetMeeting was not utilized as it was deemed unnecessary. Whiteboard, chat, and audio were utilized.
 5. Headsets with microphones are an essential purchase. For this project, each unit cost \$4.95.

The Pedagogical Side

Four university tutors met with four elementary students one day each week from February 19, 2007, to April 30, 2007. Kelly, a sophomore elementary education major, tutored one 1st grade student in reading and spelling for eight sessions; Lauren, a sophomore English secondary education major, tutored one 4th grade student in reading and spelling for ten sessions;

and Marta, a sophomore Spanish secondary education major, tutored one 4th grade student in reading and spelling for six sessions. One additional university undergraduate was initially scheduled to tutor a 10th grade student in geometry (they did complete one session), and then was switched to tutor a 7th grade student in algebra (they completed two sessions), but there was not enough data to include in this study.

Pedagogical and Technological Successes. All three tutors seemed to have success using NetMeeting as a distance learning tool.

Kelly was able to have her 1st grade student talk about stories that were previously read in class, read stories aloud in their entirety, summarize concepts after reading, and continue on to introduce and predict the plot of the next day's story by looking at pictures. Each time they met online, Kelly's student practiced spelling her vocabulary words and composing complete sentences utilizing each word. Kelly commented, "When we went over spelling she had a little trouble, but continued to type the words until [my student] got them right", which was evidenced by two perfect 100% scores on two spelling tests. On at least one occasion, Kelly's student practiced phonics such as *long-o sound, y vowel sound, plural es, and sh and ch sounds.* The student used the whiteboard to type out spelling words while Kelly recited them aloud. Kelly further commented, "It was so

nice to get to actually talk to [my student] for the first time today... I like using the white board and chat as much as possible because I think it makes things a little more fun for her."

Lauren was able to accomplish a great deal with her 4th grade student. They reviewed stories that were read in class earlier that day (with the student reading her favorite part of the story aloud); discussed how the stories ended and other details to ensure comprehension; reviewed any items that were incorrect on exams and ensured that she understood why they were incorrect; introduced her to upcoming stories along with relevant new vocabulary (and read some contextual sentences to try to determine meanings of words that she did not know); discussed how all of the stories in a unit were connected, the ones she liked best, and what she learned from each; and predicted the plot of upcoming stories by examining pictures. Lauren noted that her student's reading improved and she became much better at pausing for punctuation and sounding out difficult words (such as *interview*, *journal*, and *conversations*). Lauren drew on the whiteboard at one point to help her student understand that some antique automobiles needed a crank to start them and showed a "plot chart" to visualize the rise and fall of events. Lauren commented near the end of the tutoring sessions, "[My student] got 100% on a reading test, and since I've been

working with her I haven't heard her say she's gotten 100% on a test for reading. So that was great to hear!" Lauren's student became much better at comprehending her reading rather than just trying to get the words correct, and also asked questions while she read which indicated that she was interested and confident enough to ask. Lauren further commented, "[My student] has improved wonderfully just in the past two weeks, because she is working on taking a breath at the end of her sentences... [My student] and I also have a very good time talking - she is much more comfortable with me, asks lots of questions, and really has a great sense of humor."

Marta also had many successes with her 4th grade student. Marta gave her student examples of the steps that she herself would take to determine a word's meaning using context clues and guided him to make his own definitions from these clues. Marta's student read the story that was going to be covered in the next class and she helped him with pronunciation and defining new words. They reviewed vocabulary and the student composed sentences and typed the definitions using the text chat and whiteboard function, and was quizzed orally on vocabulary and comprehension. The text chat feature was used to type sentences with vocabulary and was able to be e-mailed (copy and paste) at the end. They used text chat as a comprehension quiz-like strategy. Marta stated, "[My student] had no problem

understanding how to use the whiteboard [and] I helped him sound out words and test his comprehension every few paragraphs. He could repeat syllables or words just as effectively as in person." They reviewed after each page or two about what happened in the stories and identified any new vocabulary words. The internet was also utilized, searching for more information about planets that her student was interested in. Marta's student improved 10 points on his last test. Marta further commented, "Being a distance tutor turned out to be very effective. [My student's] reading comprehension improved, and I did not feel constricted as a tutor. I had the internet at my fingertips, and we even researched about related topics out of his intrinsic interest. My only wish is that we could have had more sessions together."

Pedagogical and Technological Issues. Marta's student had problems with the printer at the parochial school throughout the experience, but she managed to get around this by e-mailing what the student should have printed. This is not because of NetMeeting, but rather a problem at the school's end. Lauren noted that her student frequently did not have her books and that sometimes the microphone would work intermittently. Technologically, Kelly had to reboot her computer on occasion for the connection between schools to work. Pedagogically, Kelly noted that her 1st grade student took a long time finding the

keys when reviewing spelling once - so much so that it was abandoned on that day. Also, midway through there was a change in books and Kelly did not have immediate access to them.

Recommendations and Conclusion

This distance tutoring project should next be implemented on a larger scale with many university tutors assisting elementary or secondary students at a number of schools. The project should be implemented over a longer period of time (perhaps one full year). It should also include elementary or secondary students from diverse ethnic and socioeconomic backgrounds, as well as varying geographic locations (urban, rural, and suburban). Each of the tutors in this pilot study lamented only being able to assist their student one day each week and recommended more time (perhaps two or three days each week). Also, mathematics or some other subject besides reading and spelling should be attempted.

There were many successes in implementing the distance tutoring project using NetMeeting as a viable means for communicating between schools. Poorer schools with limited budgets would be able to utilize NetMeeting to connect with colleges/universities in conducting similar programs to assist elementary and/or secondary students with their studies without needing to be in the same geographic area.

Notes

¹Microsoft NetMeeting is not part of the latest Windows Operating System, Windows Vista. According to *Josh's Windows Weblog*, Microsoft has quietly made available a version of NetMeeting that will run on Windows Vista which is not a public download. Interested parties should contact Microsoft support if they have a need for its downlevel collaboration capabilities. (http://windowsconnected.com/blogs/joshs_blog/archive/2007/02/16/windows-netmeeting-for-windows-vista.aspx)

Appendix A

Technical Terms and Abbreviations

(two pages)

H323 is a standard approved by the International Telecommunication Union to promote compatibility in videoconference transmissions over Internet Protocol (IP) networks. It addresses call control and management for both point-to-point and multipoint conferences as well as gateway administration of media traffic, bandwidth and user participation. *H323* describes how multimedia communications occur between terminals, network equipment and services. (http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci516602,00.html)

Internet Protocol (IP) is the method or protocol by which data is sent from one computer to another on the Internet. Each computer (known as a host) on the Internet has at least one *IP* address that uniquely identifies it from all other computers on the Internet. (http://searchvoip.techtarget.com/sDefinition/0,,sid66_gci214031,00.html)

Port Number is a way to identify a specific process to which an Internet or other network message is to be forwarded when it arrives at a server. It is a 16-bit integer that is passed logically between client and server transport layers and physically between the transport layer and the Internet Protocol layer and forwarded on. For example, a request from a client (perhaps on behalf of you at your PC) to a server on the Internet may request a file be served from that host's server. In order to pass your request to the remote server, your computer identifies the port number of 21 in the 16-bit port number integer that is appended to your request. At the server, the TCP layer will read the port number of 21 and forward your request to the appropriate program at the server. (The number 21 is an example of a conventionally assigned permanent port number, or "well-known port number".) (http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci212811,00.html)

Transmission Control Protocol (TCP) is a set of rules (protocol) used along with the Internet Protocol (IP) to send data in the form of message units between computers over the Internet. It is known as a connection-oriented protocol, which

means that a connection is established and maintained until such time as the message or messages to be exchanged by the application programs at each end have been exchanged.

(<http://searchnetworking.techtarget.com/dictionary/definition/what-is-TCP.html>)

User Datagram Protocol (UDP) is a communications protocol that offers a limited amount of service when messages are exchanged between computers in a network that uses the Internet Protocol. This means that the application program that uses *UDP* must be able to make sure that the entire message has arrived and is in the right order.

(http://searchwebservices.techtarget.com/sDefinition/0,,sid26_gci214157,00.html)

Virtual Private Network (VPN) is a network that uses a public telecommunication infrastructure, such as the Internet, to provide remote offices or individual users with secure access to their organization's network. A virtual private network can be contrasted with an expensive system of owned or leased lines that can only be used by one organization. The goal of a *VPN* is to provide the organization with the same capabilities, but at a much lower cost. It's basically like having a secure Intranet over the Internet.

(http://searchsecurity.techtarget.com/sDefinition/0,,sid14_gci213324,00.html)