

## **QUALITY CONNECTION: GOING THE DISTANCE**

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### **ABSTRACT**

Virginia Beach City Public Schools launched a new initiative in February 1999 – distance learning videoconferencing. The program was initially designed to offer additional curricular choices to students and expanded training opportunities for staff in real time, but the program has grown exponentially. Not only has DL created expanded opportunities, the technology has liberated students and staff from the confines of budget and schedules. In fact, the DL program – Quality Connection: Going the Distance – has revolutionized the way the division does business.

Though modest in its beginnings, with the installation of DL labs at only three of the district's high schools and with only one course offering in discrete mathematics, the DL program expanded rapidly. DL capabilities have continued to expand. Currently, all 11 Beach high schools originate and receive over 20 courses. Most recently, five middle schools have come on line.

In addition to the discrete mathematics offering, other DL courses available to our students include AP Statistics and Pre-IB Algebra II/Trig. Videoconferencing technology supports the various pedagogical strategies promoted by standards-based mathematics educators. The document camera is the heart of most instruction. Technology such as the graphing calculator, algebra tiles, and PC applications are effectively employed. The current emphasis on student learning through communication of mathematics is complemented utilizing site-to-site communications enabled by DL. A demonstration can be arranged provided there is comparable videoconferencing technology at the conference.

The division's motto is "Ahead of the Curve." As far as we are concerned, that is where we are collectively, all 85 schools and 10,200 employees. And, that is where we intend to stay.

## **Introduction**

The use of technology for technology's sake is not a choice that can be made in a field where budgets are tight and the stakes are high. One need only look to recent events in the news regarding technology, whether it be stocks, technology companies, IPOs, or the like, to realize how fluid and pervasive the technology market really is. That being said, it is also true that the effect technology has had in education can be compared to the effect the printing press had on the dissemination of knowledge in the Renaissance. This unprecedented access to knowledge and the potential for providing equity in education as well as enhancement of curricula have never been greater.

For Virginia Beach City Public Schools (VBCPS), technology – specifically, Distance Learning (DL)--has changed the way the division does business. Although the process has not been easy, we have progressed from offering one DL class to 20 students in two high schools to our present offering of 22 content-rich classes to 422 students spread across the division (Appendix A).

VBCPS launched a new initiative in February 1999 – distance learning videoconferencing. The program was initially designed to offer additional curricular choices to students and expanded training opportunities for staff. The program has grown exponentially from its nascent beginnings and fast outstripped its original purpose. Not only has DL created the above-mentioned expanded opportunities, the technology has also liberated students and staff alike from the confines of budget and schedules. In conjunction with training and courses, DL serves the Human Resources (HR) Department in its teacher recruitment effort. Staff employs the DL lab to interview prospective teachers at college campuses far afield. Students, also, use DL to virtually “visit” college and university campuses and discuss the admissions process and other issues.

## **Course Selection**

In preparation for the creation of our first class, we knew we had several critical components to consider: what class would be taught and which teacher would teach it. Three schools were targeted to pilot the DL labs and the mission was to have one school originate a class and the other two receive it by second semester of the 1998-1999 school year. Discrete Mathematics was selected as our premiere class and had a collective enrollment of 20 students. This videoconferencing medium premiered February 2, 1999, with Princess Anne High School’s Discrete Mathematics offering sent to Bayside and Ocean Lakes high schools. By the following school year, another high school shared AP Statistics with two neighboring schools. Currently, Pre-IB Algebra II/Trig is being shared from one of our high schools to our magnet middle school. We have been pleased with the vast majority of the experiences provided for both our teachers and students. The DL experiences tended to provide motivation for those students who were previously unmotivated or unprepared and created additional academic opportunities for gifted and highly motivated students.

## **Teacher Selection**

We made a conscious decision to be inclusive of all who were interested in providing distance learning instruction. This has proven to be a wise choice. The three mathematics classes offered have worked very well through the technology, largely due to the exceptional instruction of the teachers. In

our three-year tenure with this program, excellent instruction by excellent teachers has been our greatest gain and the most important feature of a successful program. We have learned that most important to a distance learning program's success is teacher quality, and that exceptional teachers make effective instruction happen, regardless of the facilities. Whether they are excellent communicators and/or performers, unabashed risk-takers, or reticent traditionalists who have built a powerhouse of a program, DL teachers all begin at the same level. Once the teachers are committed to using the distance learning venue, they must be convinced to stay the course. Because most are not technologically savvy, validating the fear that accompanies the lack of experience is important. During training, it is vital to put teachers in front of the cameras and microphones early and have them utilize the document camera and control keypad immediately. The phobias will only persist and grow if the lack of hands-on experience continues.

## **Equipment**

In Virginia Beach all DL rooms are similarly equipped and can be either origination or receiving sites. The equipment is permanently fixed and cannot be moved from room to room. At each site a primary camera (Illustration A) is focused on the teacher who uses a touch pad to manipulate the camera (Illustration B). The instructor also manipulates a document camera (Illustration E) and the cameras at the remote sites, and can select the video sources seen by the students (Illustration C). A monitor allows the teacher to preview each image before it is broadcast. Each classroom has four television monitors, two at the front of the room, two farther back (Illustration D). Each shows images of the teacher's choosing, such as his/her computer screen, document camera image, an instructional video, or the shot from another camera. At the receiving site, a student who wants to ask a question presses the button on a microphone on the table (Illustration F). When the remote site camera zooms in on that student, the microphone allows the question to be heard by the teacher and students at the other sites. If a student wants to show the teacher her work (Illustration G), she uses the document camera in her room.

## **Special Considerations**

It must be noted, however, that instructing through the DL medium is neither for every teacher nor every student. While we determined that student need was a main factor in course and teacher selection, we recognized that there were several other crucial determiners as well. Some might consider these determiners to be self-serving, but the end result was the establishment of a firm foundation for distance learning across the division. We were able to "sell" distance learning to some principals and teachers simply because they had differing agendas. For example, some were avoiding involuntary transfers due to low enrollment, or generating interest in fledgling programs that needed a jumpstart, while some were saving dangerously low enrollment elective courses that were close to being dropped from the master schedule.

## DL and Teaching Standards

The question of whether Distance Learning is an effective or an appropriate medium for the teaching and learning of mathematics is a critical one. Best practices espoused in the *Handbook of Research on Improving Student Achievement*, (ERS, 1995), and promoted by the Virginia Beach City Public School System, are addressed by Distance Learning in many ways. For example, the "Opportunity to Learn" is provided to those students who might otherwise not have access to a particular mathematics course due to unavailability of staff or insufficient student enrollment. From another viewpoint, this "Opportunity to Learn" may be more of an equity issue. The National Council of Teachers of Mathematics in its *Principles and Standards for School Mathematics* (NCTM, 2001) paints a vision for school mathematics that demands "high-quality, engaging mathematics instruction" for all students. Its first principle, that of educational equity, "is a core element of this vision." With the growing national shortage of qualified mathematics teachers, the concepts of equity and opportunity to learn will certainly become more critical issues, for which distance learning can provide an answer.

"Openness to Student Solution Methods and Student Interaction" is uniquely enhanced through the use of the document camera. Students can share work directly from their notebooks with their distant peers. The possibility of this occurring can serve as motivation for more consistently organized work. Although a few students exhibit camera shyness, others frequently are eager to experience the new technology and often do so with an elevated air of professionalism. Our teachers report that younger (middle school) students seem particularly willing to "ring in" to ask questions and contribute to class discussion. The opportunity for "Small Group Learning" is not impeded, but does require special consideration in terms of space and accessibility to microphones and camera. "Whole class discussion" takes on a different flavor. It is imperative that participants from each site contribute to the learning process, and herein lies the challenge. The necessity for the camera to focus on the speaker before other sites can hear him/her is for some, a "moment of fame" while others experience an unfortunate rise in anxiety. An impatient few find the moment it takes for the camera to train on the speaker agonizingly slow. They want to voice their input immediately and spontaneously.

The intrinsic motivators of curiosity and ambiguity (Child, 1986) and the brain's innate drive to seek patterns and meaning (Caine & Caine, 1994) can be tapped through the use of concrete materials and calculators. Both tools can be employed in a visually pleasing and effective manner through the use of the document camera. One of the most important themes espoused by the *Principles and Standards for School Mathematics* (NCTM, 2001) is that of connections. Through the use of a graphing calculator and the employment of multiple representations, graphical, algebraic and numeric, connections not previously possible can be discovered. The document camera enables any calculator to be utilized and viewed easily by all students without extra cables or a specialized view screen. The student can display his/her own calculator while justifying individual thinking or posing a particular question. Caine & Caine (1994) speak of a teacher's need to "orchestrate the immersion of the learner in complex, interactive experiences that are both rich and real." The distance learning lab enables an internet linked computer to be experienced by all participants at all sites simultaneously, providing real world, even real time, data and global access with ease.

The mathematics teacher plays an important role in enabling students to construct understanding by providing a variety of rich experiences. Since the lens of the camera magnifies everything from flaw to

forte, the distance learning teacher must embody NCTM's Teaching Principle. The teacher must not only possess profound content knowledge, but he/she must be well versed in multiple representations of an idea, able to connect concepts, and possess an expertise in a wide array of pedagogical strategies. Perhaps more importantly, the teacher must be capable of creating an environment that is supportive and conducive to students participating actively in their own learning process. The combination of techno phobia and math anxiety could be a deadly combination. The use of games, simulations, and multimedia presentations has proven to be effective in distance learning. A spirit of camaraderie can be developed through the encouragement of cooperation and competition, which are both valid motivators (Child, 1986). The ability to set an onscreen timer for such activities assists with time management, both from the teacher's perspective and that of the students'.

## **Feedback**

We asked teachers and students how the distance learning technology affected instruction. Teachers were candid in their responses, looking for the positive, and suggesting methods that may improve a continually changing medium. When asked, students provided refreshing, objective candor.

Many of the suggestions offered by the first instructor were excellent building blocks for the program. A stipend for the distance learning teacher, a fax machine located in the classroom, a teacher assistant hired to not only support the receiving classes but the sending classes as well—all are now regular fare in our distance learning program. Two subsequent mathematics teachers had more specific reflections regarding instruction using the distance learning venue. Both agreed that instruction changed dramatically as they utilized videoconferencing equipment. They also found that interactivity decreased and there was a dire need for creative thinking on how to accommodate this feature in a math class. In addition, they discovered that enticing student response using microphones and cameras easily shut down the participation of the most volunteer-phobic student. For those students, the tendency to participate was minimal in a traditional class, but having to use the technology coupled with a the lack of interactivity made it like pulling proverbial teeth in order to get a response.

Teachers found the greatest gains of lesson-planning-for-TV included the following: increased interactivity in instruction; employment of state-of-the-art technology especially the document camera; enhancement of instruction in non-distance learning classes, specifically, better organization, frequent use of power point; and a brisk instructional pace. Overwhelmingly, the mathematics instructors found great value in enriching student academics by providing courses, especially at the upper level, that would not otherwise be available.

Probably the greatest interference to mathematics instruction was the teacher's inability to see the students as they worked and what they could do. In addition, because the interdepartmental mail between 85 schools takes days to deliver, teachers also found that lack of immediate feedback in grading homework and tests/quizzes hampered effectiveness in keeping students current and on task. Lastly, all teachers found the effectiveness of the teacher assistants at the receiving sites vital to student success.

## Lessons Learned

The one constant of our DL program throughout the three years of its existence has been the continual and successful marrying of mathematics courses with videoconferencing. However, most students will tell you, and we concede the point, that nothing will ever take the place of excellent, live instruction. DL, despite its advantages, will always remain a strong second.

The lessons we have learned are many. This medium is not for every teacher nor is it a venue for every student. The abstract nature of mathematics can create an unbreachable chasm for many. Distance learning can compound the psychological barrier experienced by some learners of mathematics. Therefore, teacher selection will dictate the success of any program since it is the teacher that must bridge the divide. Those professionals who understand that interactivity in instruction connotes success, who demonstrate mastery of their content, and who illustrate effective communication and delivery styles, will thrive using distance learning. Because of the critical nature of these essential skills, found in master teachers, it is not recommended that an inexperienced instructor should ever be directed to teach via DL.

In three years we have learned the many facets of a successful distance learning program. We continue enthusiastically on the journey through a program whose only constant is the fact that it will never remain so.

### REFERENCES

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**Illustrations  
of VBCPS  
DL**



(A)



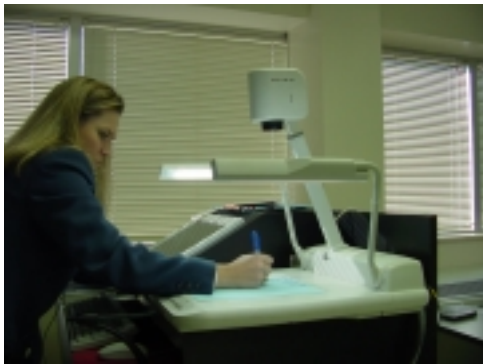
(B)



(C)



(D)

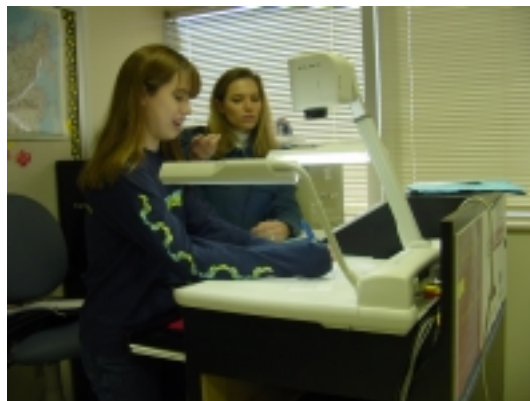


(E)

(F)



(G)



## MIDDLE SCHOOL DISTANCE LEARNING BELL SCHEDULE

	1 <sup>st</sup> Bell	2 <sup>nd</sup> Bell	3 <sup>rd</sup> Bell	4 <sup>th</sup> Bell	5 <sup>th</sup> Bell	6 <sup>th</sup> Bell	7 <sup>th</sup> Bell
Landstown						<b>Creative Writing (20)</b>	<b>Creative Writing (16)</b>
Princess Anne						<i>Creative Writing (5)</i>	<i>Creative Writing (12)</i>

## HIGH SCHOOL DISTANCE LEARNING BLOCK SCHEDULE 2001-2002

SCHOOL	BLOCK 1A	BLOCK 1B	BLOCK 2A	BLOCK 2B	BLOCK 3A	BLOCK 3B	BLOCK 4A	BLOCK 4B
COX	<i>Japanese I (7)</i>		<b>AP Comp Gov (6)</b>	<i>Japanese II (2)</i>		<i>Anatomy/Sports Injury (2)</i>	<i>Japanese I (2)</i>	<i>Russian II (1)</i>
BAYSIDE		<i>Japanese I (7)</i>	<i>AP Comp Gov (1)</i>		<i>Japanese I (8)</i>	<b>Latin IV (2)</b>	<b>Latin III (5)</b>	
FIRST COLONIAL		<b>Japanese I (15)</b>	<i>Japanese II (2)</i>	<i>Russian I (3)</i>	<i>International Relations (8)</i>		<i>Russian II (1)</i>	<b>AP Art History (9)</b>
GREEN RUN				<i>Russian I (3)</i>		<i>Latin IV (2)</i>	<i>Japanese I (13)</i>	<i>AP Art History (2)</i>
KELLAM	<b>Russian I (9)</b>	<i>Japanese I (6)</i>		<b>Russian I (8)</b>	<i>Japanese I (6)</i>		<b>Russian II (7)</b>	<b>Russian II (3)</b>
KEMPSVILLE	<b>French V (4)</b>			<i>Japanese II (2)</i>			<i>Russian II (1)</i>	<i>Japanese I (12)</i>
LANSTOWN	<i>Russian I (4)</i>	<i>Japanese I (4)</i>	<i>Japanese II (4)</i>		<i>Japanese I (6)</i>			<i>Japanese I (6)</i>
OCEAN LAKES	<i>French V (1)</i>	<b>Japanese I (12)</b>		<b>Japanese II (5)</b>	<b>Japanese I (11)</b>	<b>Anatomy/Sports Injury (11)</b>	<b>Japanese I (12)</b>	<b>Japanese I (9)</b>
PRINCESS ANNE	<i>Japanese I (14)</i>		<b>Alg. II/ Trig. (PAHS-17)</b>	<i>Russian I (9)</i>	<i>International Relations (1)</i>	<i>Anatomy/Sports Injury (4)</i>	<b>Mus. Theory I &amp; II (18)</b>	<i>Russian II (1)</i>
SALEM	<b>Japanese I (10)</b>		<b>Japanese II (9)</b>	<i>Russian I (2)</i>	<i>IR (2)</i>		<i>Latin III (4)</i>	<i>Russian II (1)</i>
TALLWOOD	<i>Russian I (10)</i>		<i>Japanese II (2)</i>		<b>International Relations (7)</b>		<i>Mus. Theory I (2)</i> <i>Mus. Theory II (1)</i>	<i>AP Art History (6)</i>
KEMPS LANDING MAGNET			<i>Alg. II/Trig. (2)</i>					

#s indicate student enrollments

**Bold indicates sending classes**

*Italics indicates receiving classes*