CENTER FOR Children & Technology

Distance Learning Evaluation: Final Report 1994-1995 New York City, New York

Executive Summary

The New York City Public Schools implemented a distance learning program beginning in the fall of 1992. The project, called NYClassnet, was organized in an extensive collaboration between the high school division of the New York City Board of Education, the Borough of Manhattan Community College, the Lincoln Center Institute, and four public high schools in Manhattan and Brooklyn. The purpose was to create two way video/audio links among high schools, and with other educational institutions. Such joint classes were designed to expand the educational offerings available to students and their cultural horizons. The NYClassnet project explored some novel distance learning designs, linking high schools with a community college and with Lincoln Center. Each participating institution was linked by a NYNEX fiber optics cable. NYNEX provided the technological backbone, classroom technologies, and technical support for the project. Each participating school has one distance learning classroom, which connects them to a network providing two-way video and audio interaction with the other schools and the Lincoln Center Institute. During the study year thirteen NYClassnet classes were offered, 489 students enrolled, and 19 teachers participated.

The Center for Children and Technology of the Education Development Center has conducted a research and evaluation study of NYClassnet. During the 1993-94 school year, we created and tested measurement instruments and collected background data about the project. Full data collection took place throughout the 1994-95 school year. Our findings from these data are summarized in this report. Detailed information about each of the instruments and measurement tools is available in the Appendix.

We summarize here the highlights of the studies:

1. Distance learning was seen as an important innovation by administrators, teachers and students alike. Its purpose was seen by administrators and teachers to be primarily meeting the diverse learning needs of students and to bring people together across distances, exposing students to other cultures. Many teachers saw emotional rewards for students whose feelings of being "special" and "worthy" were enhanced because they were given access to advanced equipment.

    Most administrators and teachers also consider distance learning to be an important part of the future of education, as do a number of students, and were optimistic about the future of the New York City network. This interest in the future supports perseverance in solving

some difficult problems of implementation and coordination across institutions.

2. The distance learning project has been successful overall in relation to the central goals of administrators and teachers: a range of classes have been conducted, and new course content has been added. Basic logistics have been worked out, although chronic problems of scheduling across schools and planning remain a challenge. The need for continuing resolution, attention, and coordination at a system-wide level somewhat contradicts a current trend in education to devolve decision-making to individual schools. A continuing commitment to partnership across institutions is needed for success within the public education system, and even more so if outside institutions are involved (e.g. colleges, museums, cultural institutions). The partnership must have a structure to support patient and flexible resolution of institutional and cultural issues that may cause conflicts, including scheduling, performance expectations, supervision of teachers, grading and credit.

3. Though there was improvement after the first year of implementation, the technology was perceived as a continuing problem by most teachers. Our classroom observational data provided objective support that technical problems occurred with some frequency in the observed classes. While the technical glitches did not last long, they were observed to occur in approximately one-third of all class sessions. When asked about desired improvements, in addition to an improved audio system, teachers and students also frequently wanted improvements in visual acuity (e.g. larger, sharper monitors). This may be related to the desire for improved relationships across sites (see below). The document camera was overwhelmingly the most frequently used technology in the room; teachers want more training to better incorporate the other media and communications technologies. Many students want more responsibility for operating the various technologies.

4. The pedagogy in the distance learning classes was not notably different from that of traditional high school classes, though teachers frequently reported that more planning time was required for distance instruction. The similarity of pedagogical styles in most of the distance learning classes to traditional high school classes was reported by teachers and students and confirmed by observational analyses. Classes were dominated by teachers' lectures or exposition, and exercises and assignments were similar. The NYClassnet implementation was therefore not being used overall to explore or change the nature of teaching or pedagogy. Relatively few teachers

thought that the classes were too lecture-oriented, and few wanted pedagogical changes such as longer class periods, or more or off-camera discussions.

Because the NYClassnet featured classes designed and delivered by outside organizations such as Lincoln Center Institute and the Borough of Manhattan Community College, we also observed non-traditional pedagogical styles presented to high school students. We were not able to compare these classes with similar classes taught in the college or by LCI, since there are no similar classes. We can report that there were indicators of success in both types of classes.

5. Students' achievements in distance learning classes were not consistently or substantially better or worse when students' numerical grades in each distance learning class were compared with students' cumulative averages, or compared to a traditional comparison class. In some classes students did notably better, in some worse, and in some their performance was comparable to their average performance. There was no overall trend toward better or worse performance across distance learning classes when examined for the effect of the technology alone. Likewise, students' performances in Advanced Placement distance learning classes could be compared to state and national norms for three classes. Students' AP scores were substantially better for one course, comparable for a second, and substantially worse for a third. In one special education math class, the students performed significantly better than their grade point averages, and in a special education biology class, they performed significantly worse. In one class that had a novel format — The Lincoln Center Institute Theme and Variation Class — students performed as well as or significantly better than their grade point averages.

   In eight of the twenty-one classrooms student attendance was substantially worse than their attendance rates recorded in home room. In six of the distance learning classes, there was no difference in attendance. In the non-distance learning comparison class, attendance was substantially worse.

6. We were interested in how distance learning classes compare with traditional classes in terms of amount and type of interaction. Systematic observational analyses from four focal classes indicate that participation by both teachers and students (talking, lecturing, asking and answering questions) is very similar for distance learning and traditional classes, with the exception that there is a trend toward shorter turns for students in distance learning compared with non-

distance learning classes. Many teachers point to the paradox of distance learning bringing people together and, at the same time, *not* bringing them together. In a distance learning classroom, individuals in physically separate locations can see and speak with one another; they can interact, but only to a point. The distance and the technological medium erect a barrier to substantive personal contact. However, the patterns of interactions in classes appeared to be determined more by subject matter and teachers' habits than to be primarily determined by the distance technology. Very little off-task activity was observed in any of the classes, and some students indicated that they felt "left-out" when they were not on camera.

However, a particular striking finding from the interaction analysis is how little students actively participate in either the distance learning or traditional high school classes.

7. We discovered that in distance learning classes, in-class interaction is only a part of the overall category of *relationship*, which is very important to both teachers and students. Expansion of the social world of students was a prominent goal for the project. Adults and students were not notably concerned about the character of in-class interaction; in distance learning classes, it reflected what they were used to in school. However, they were concerned about the difficulties of establishing real personal relationships, and feeling like "one class". It appears that relationship gets established in part by the things that go on outside of class as much as by those in class — encountering each other in the halls and lunch room, informal exchanges in the borders around class periods, being in each others' physical company. Many of the suggested improvements in distance learning by both teachers and students concern the establishment of relationships cross distances.

8. For the most part, administrators reported that teachers volunteer for distance learning classes, though the administrators admitted that they often had particular individuals in mind to teach certain courses, within the constraints of the course needs defined by the project. Teachers are given basic training on the system, but both teachers and administrators want and need more advanced professional development — technical training and pedagogical strategies — and on-going support.

9. Though many students reported that they were not fully aware that they had enrolled in an interactive, on-line class at first, they also reported that they quickly grew accustomed to the technology in the classroom and felt comfortable with it. They reported that they

recommend the classes to their friends and would take distance learning classes again. Over half of the students reported that they took distance learning in order to take a course that was not otherwise offered. Students commonly reported being pleased with personal benefits derived from participation in the distance learning classes, overcoming shyness, and meeting new students.

Summary of Recommendations

It takes a long time to develop, implement, refine and stabilize an innovation in education. Research over the last decade suggests that 3 to 5 years is generally required for substantial technology-enhanced innovation. It is essential to continue to monitor and refine the implementation of this project as the technology, the education goals and social context change. Distance learning in New York City is still young.

Based on research, we recommend that the following issues be considered as the project is refined. These recommendations are discussed at greater length at the end of this report.

1. Special attention needs to be paid to the problems that appear to be chronic, such as scheduling and planning distance learning classes — a problem across the participating schools. Review of project structure is likely to be needed as this project moves from an implementation phase to a stabilization phase.

2. Establishing relationships across distances is of primary concern to teachers and students. This interest needs to be addressed through a combination of strategies for getting classes together face-to-face and new experiments with the technology.

3. Experiments in innovative format and pedagogy need to be encouraged, especially those linked to other desired changes in teaching and learning (e.g. portfolio assessment), or expand what this means.

4. Consider the relatively high level of student interaction in the innovative distance learning classes, especially when compared with the non-distance learning class, and continue to focus on emphasizing the type and quality of interaction that is best supported in these media.

5. Experimentation with innovative mixed media course design drew student and teacher praise and should be encouraged.

6. Teachers would like more opportunities for professional development in technical skills and in pedagogical strategies for distance learning classes.

7. Experiment with technical refinements such as flexible cameras, larger monitors, better sound. Also, students would like larger roles in the operation of the classes and network, a change that may be used to advantage to improve the overall flexibility of the system.

Introduction

NYClassnet is a distance learning project implemented in the fall of 1992 by the New York City Public Schools. It was developed through extensive collaboration between the high school division of the New York City Board of Education, the Borough of Manhattan Community College, the Lincoln Center Institute, and four public high schools in Manhattan and Brooklyn. NYNEX provided the fiber optics backbone, classroom technologies, and technical support for the project linking each participating institution. A distance learning classroom within in each school connects them to a network providing two-way video and audio interaction. During the study year thirteen NYClassnet classes were offered, 489 students enrolled, and 19 teachers participated. Below is a table that presents each class, the semester offered, number and name of school "classrooms" connected, number of students enrolled in each site, and the number of teachers:

Table 1
NYClassnet Classes 1994-1995

Class	Semester	# of Classes DL Sites	Schools (Students Enrolled)	# of teachers
AP Psychology	Fall	2	Hum (28), SJH (5)	1
Core Concepts in Math	Fall	4	SJH (13), WI (14), TT (12), Hum (13)	4
Critical Thinking	Fall	4	SJH (16), WI (16), TT (15), BMCC (18)	4
Pre-Calculus	Fall	3	Hum (15), SJH (11), TT (6)	1
Spanish 1	Fall	2	WI (15), TT (10)	1
Theme and Variation	Fall	2	Hum (13), SJH (20)	2 + LCI Staff
Core Concepts in Science	Spring	4	Hum (10), SJH (14), WI (11), TT (14)	4
Critical Thinking	Spring	3	Hum (13), SJH (17), BMCC (18)	3
Economics	Spring	3	Hum (35), WI (21), TT (20)	3
Pre-Calculus	Spring	3	Hum (9), SJH (1), TT (6)	1
Spanish 2	Spring	2	WI (12), TT (9)	1
Theme And Variation	Spring	3	Hum (12), SJH (19), WI (17)	3 + LCI
AP American History	Full Year	3	SJH (12) , WI (17), TT (10)	1

School Names: Hum = Humanities, SJH = Sarah J. Hale, WI = Washington Irving, TT=Transit Tech, BMCC=the Borough of Manhattan Community College, LCI = Lincoln Center Institute. If more than one teacher is listed, that indicates that the class was co-taught by the given number.

NYClassnet, a distance learning initiative that is, by design, innovative and complex, was "intended to bridge the social and psychological distances that often isolate minority inner city youth from their counterparts within the same geographical community."[1] Part of the innovative nature of the project derives from the definition of "distance" used in the NYClassnet project. As used by project staff, the word refers primarily to psychological and social isolation rather than substantial geographical separation, and the innovation supported by the introduction of new technology to the classroom and school is that of reducing the peculiarly urban phenomenon of personal isolation in a crowded environment. Viewed in this light, as it is in this evaluation, the project is seen to be at the center of much of the contemporary discussion of school restructuring and improving learning conditions and contexts for urban youth. In changing the physical boundaries of the school classroom to extend out electronically into remote schools and classrooms, the project begins to redefine what "school" and "learning" can mean. The consequences of this redefinition have economic, social, philosophical, aesthetic, cultural, and pedagogical implications. Those who commit to such complex innovations deserve credit simply for having the courage to take on such a task.

The portrait we present of the NYClassnet project illustrates the difficulties of innovation, the process of exploring many paths on the way to finding one sure route, and many of the rewards of effort. Our examination of the introduction and impact of distance learning into the schools of New York City concentrates on the ways administrators, teachers, and students view this new approach to teaching and learning, their views of how a full range of student needs and abilities are accommodated in the distance learning classes, the characteristics of distance learning classes compared with traditional schooling in terms of design and interaction, and measures of student attendance and achievement. The views of various participants often overlap. But at times, we will offer distinct interpretations from the perspectives of different participants; such a range of opinion is to be expected in the evaluation of a phenomenon as complex as a new distance learning system.

Is the NYClassnet project "new," and "newness" or "difference" are defining characteristics of both "change" and "innovation?" But, are they enough? In 1994, only 6% of US public schools reported having two-way video with two-way audio; an additional 10% reported having one-way video with two-way audio capacity. Either of these two telecommunications configurations would be considered new or different to most schools in this country. They are certainly new to the schools of New York City, and having access to these technologies is at least the

beginning of change and innovation. Putting them to good use, however, is the final measure. For many schools, technological innovation has had more to do with simply installing equipment.

Terry Deal[2] describes his own experience visiting a high school and observing a group of students working at computer terminals:

> "A revolution in the way we teach,' noted the math chairman. Then my eyes moved to an overhead projector atop a cabinet at the rear of the room. I noticed a television set sitting unused on a nearby table. I vaguely remembered forecasts of similar revolutions in teaching. Many of the prophesies were mine; most materialized about as much as those regarding classroom television and overhead projectors. As my tour continued, I looked for other familiar innovations: the language lab, team teaching, open-space classrooms, or school-within-a-school. All of these have been replaced with new forms strange to me. In some ways, the school periphery was different. But the differences seemed superficial. The school was almost the same. What was happening inside the classroom was almost exactly the same."[2]

In our evaluation of the NYClassnet project, we were investigating whether behavior changed in the classroom and identifying the impact of any changes on the learning and teaching that took place.

Other researchers such as Cassidy and Lane[3] attribute successful adoption of educational technologies to the confluence of three primary concepts: "...equitable and universal access, student construction of knowledge, and facilitative teaching." Linda Roberts of the Office of Educational Technology, U. S. Department of Education, identifies "...planning, adequate budgets, equipment that is widely available to all students and teachers in the classroom, professional development, technical and administrative support, and well-produced programming that seamlessly integrates technology into the flow of learning and teaching."[4] We examined the extent to which these characteristics are found in the NYClassnet project as a measure of the ways that the initiative is built on established principles and as a check of the validity of these principles.

Keeping our collective eyes on the kinds of innovation or change that distance learning represented for the high schools in New York City, we examined in both breadth and depth how teachers, students and administrators experienced the network, and how this related to their experience of "regular" school. We did independent, systematic and regular observations of a sample of distance learning classes and a comparison non-distance learning class to document the nature of

interaction and type of pedagogy that took place throughout the school year. Student achievement and attendance data were analyzed with respect to the cumulative performance of each distance learning participant, and where appropriate, AP scores were compared to statewide and national norms.

The findings detailed in this report provide a new guide to successful efforts to implement technological innovation in public school, as well as a new map of some of the pitfalls to be expected.

New York City distance learning administrators indicated in interviews that they saw "new" opportunities for students as a major factor influencing their decisions about the beginnings of the project. One Board of Education administrator says he hoped that distance learning would be a way to "bridge socio-economic barriers between students" and to "provide them a window on the world."

Many New York City administrators commented that they view interactive technology as the "wave of the future." They felt excited about the potential of distance learning for their schools. They believe that it holds great possibilities for increasing the variety of curriculum available to students, for exposing students to a larger world than just the peer group within their own school, and for developing teachers professionally. They have also learned a great deal from their experiences thus far about the problems that may arise in implementing such a program, and how they can be addressed.

While most administrators feel that as currently implemented, distance learning is just barely "scratching the surface" of what it can offer students, they hold firm to their enthusiasm for distance learning's potential. The conviction that distance learning is good for students both academically and socially is driving much of the enthusiasm about distance learning, and administrators are beginning to see some of the promise realized. Administrators believe that distance learning is enabling some innovative work, providing high schools access to AP and other courses that would otherwise be unavailable.

Developing less teacher-centered and lecture-centered classroom environments was seen as being highly beneficial to students, and innovative approaches to these kinds of classrooms were tried and refined as part of NYClassnet. Obviously, this requires teachers who are willing to play with and explore the technology, who are committed to experimentation as part of the project.

For the most part, the teachers who have participated in distance learning network feel it has been generally successful; they are optimistic about its future. They feel they have been part of an exciting experiment that is one of the likely directions for the future of education. Distance learning has challenged them to adapt their teaching styles. Distance learning also makes it more difficult to get to know their students — one of their biggest concerns. But many see significant benefit for their students. The perceived opportunities for their students make them most willing to spend the extra time and effort necessary to master the technology, to adapt their teaching, and for some, even to relinquish some classroom control.

The distance learning classroom, in most schools, is regarded as a special place by many students, and consequently, being a student in that room can make kids feel "important." Students are exposed not only to new subject matter, but also to new students, new teachers, and other adults — professionals and artists — they wouldn't otherwise "meet." Students reported that other teachers and professionals paid attention to them and cared about their opinions more so in the distance learning class than they usual experience in a traditional class. This sense of being valued by adults may serve as an important component of inquiry-based learning, where students' questions and ideas are included in the process of learning.

This report is divided into five general sections. First, in order to help readers understand how we worked, (1) the methods we used to collect information are briefly described. We then combine our findings and interpretations of the information gathered by all these instruments in two large sections, each with sub-themes: (2) Teaching and the integration of distance learning into the education system; and, (3) Students and learning. To explore in greater depth some innovative aspects of the program, (4) a case study of one of the more innovative courses is summarized. We conclude with (5) a set of recommendations that arises from these data. Details of the study are included in an extensive Appendix. Where appropriate, the research instruments themselves are attached.

I. Methods for Gathering Data

In order to understand and evaluate the distance learning implementation in New York City, we collected two overall strands of data. All procedures were developed and tested in the pilot phase of the project which was the 1993-94 school year. Each instrument and procedure was tested and refined in the pilot phase so that we were assured of its adequacy, reliability and practicality for the full scale 1994-95 study.

First, particular data were collected for *all* distance learning classes and participants in New York City for the 1994-95 school year. The data include teacher and student questionnaire responses, and student achievement and attendance data. We also conducted in-depth interviews with a group of administrators selected to represent a range of views for the county-wide program.

Second, to develop an in-depth view of the distance learning experience, we complemented these large-scale procedures with an in-depth study of a sample of classes. Three distance learning classes were selected to be representative of the range of offerings; one non-distance learning class that was taught by one of the focal distance learning teachers was selected as a comparison class. The teachers in each of these classes were interviewed in-depth, some repeatedly. Samples of students in each class were also interviewed, and we attempted to collect work-portfolios for these sample students throughout the year. Each of these classes was also systematically sampled and observed throughout the year by an observer who electronically recorded the kind and frequency of interactions that occurred in real time in the class, as well as the use of various technologies and other materials. The observer also recorded field notes according to an observational protocol to document the content of each observed class and its pedagogical features. The majority of these classes were videotaped.

A. Participants' perceptions and experiences: Interviews and questionnaires

To understand how the various stakeholders experienced the distance learning implementation, we conducted interviews with individual administrators, teachers, and students at various points in the 1993-94 school year. This provided us with in-depth data from different perspectives, and helped us to design questionnaires to be completed by all participants. These data were collected during the pilot phase, and drafts of the questionnaires were tested and refined to ready them for the 1994-95 study. Refined questionnaires were constructed and distributed to all teachers and students who participated in distance learning classes during the 1994-95 school year. The teacher questionnaire was quite lengthy and detailed, and it was completed during their free time; the student instrument was shorter and was completed during the class sessions.

We also conducted in-depth interviews with the various participants during the 1994-95 study, based on refined interview protocols that were developed and tested in the pilot phase.

1. Administrators. We conducted eleven qualitative interviews with school administrators in New York City in the 1994-95 school year; 4 of these individuals were interviewed repeatedly. The administrators were selected

to represent a range of schools and roles including: all distance learning coordinators; Board of Education coordinators, and Lincoln Center and Borough of Manhattan Community College program staff.

2. Teachers. We interviewed eight distance learning teachers and one paraprofessional. These teachers represent various disciplines — English, literature, critical thinking, history, arts, and dance. The teachers in our in-depth sample of distance learning and non-distance learning classes were interviewed repeatedly.

The lengthy teacher questionnaire (see appendix A) was distributed to all nineteen distance learning teachers. They were asked to respond to a variety of questions, from basic demographics to more subjective reactions to distance learning . The latter questions were designed as statements in which teachers were asked to select a score on a scale of 1 to 6. The score of a 1 represents least agreement with the statement, scaling up to a 6 which represents strong agreement with the statement. We coded teachers' responses in three categories: 5 or 6 denotes strong agreement with the statement; 3 or 4 is moderate response; 1 or 2 denotes strong disagreement.

Nine of the nineteen teachers responded to the distance learning questionnaire, representing the pool of distance learning teachers for the 1994-95 year. Four were men, four were women, and one did not respond to the gender question. The mean age of the distance learning teachers is 47.6 years, which is slightly older than the national average. More than half of the teachers are very experienced (5), having taught for more than 15 years. Two have taught between 11 and 15 years, and two are relatively new.

Four of the teachers teach 12th grade; 7 teach 11th grade; 3 teach 10th grade; 1 teaches 9th grade.

These teachers are relatively experienced with respect to technology: 6 report using computers in their personal lives (5 for more than 7 years), and 6 in their teaching (3 for more than 7 years). Likewise, most (7) report using video in their teaching, probably reflecting their participation in distance learning , and in their personal lives. Three of the teachers report experience with telecommunications, both at school and at home.

3. Students. Group interviews were conducted with students in each of the 4 high schools and in the community college; 7 such in-depth interviews were conducted. Students were selected to represent a range of schools, classes, and levels. Most of the interviews were conducted in the spring of

1995. Some of the students had multiple experiences with distance learning, as both home and remote students in the classes.

We received 286 completed questionnaires from New York City distance learning students, which represents 59% of all New York City distance learning students for the year (489 students total). Tables presented in the report and Appendix note the total number of students (N) who responded to a particular question, and the text simply notes the percentage of those students who responded to a question. For some of types of questions, i.e., goals and ideas, advantages, problems and barriers, and improvements, students were asked to rank their responses on a scale of 1 through 6 (1 representing the lowest influential factor to 6 the highest influential factor). We then combined categories in groups of two, (1 and 2, 3 and 4, 5 and 6) to develop a three point scale; not an influence, moderate, and, an important influence.

B. Classroom observation procedures

1. Interaction analysis. In order to understand how the classes were conducted, the frequency, type and duration of interactions by teachers and students, and the use of and problems with the technologies and other materials, we developed an observation system that allowed us to record these categories of information in real time. *Observer* is a computer-based classroom observation tool for recording these data (see Appendix). An observer visited each focal class approximately once every week to two weeks throughout the semester or school year (depending on the length of the class). She used *Observer* to record these key categories of classroom activity throughout the entire period. Home and remote sites were sampled. These data were compiled for each class over time.

2. Classroom observations: Field notes. In order to understand the content and substance of each class, the researcher recorded detailed structured field notes about each class session she observed. This was done immediately following the class session, according to a protocol developed by the research team. The design of the protocol was based on the pilot observational experiences in the previous school year. These field notes were then summarized within categories, and a summary of the content and pedagogical strategy of each class over time was written.

C. Learning measures

We collected four kinds of data about students' performances and achievements. First, students' grades for all distance learning classes and the comparison non-distance learning class were collected. These were all numerical scores based on the 0 to 100 scale. We also obtained the GPA for each of these students, likewise expressed numerically. This

information allowed us to compare each students' performance in distance learning with their overall high school performance.

Second, several of the distance learning classes were Advanced Placement courses. We obtained the AP scores of those students who took the corresponding AP exams. We also obtained the average national AP scores for that course, as well as the New York State averages. This allows us to compare performances in these distance learning Advanced Placement courses with performance norms.

Third, we collected attendance data for each student in these courses throughout the year, and compared this to each individual's overall attendance record in high school.

Finally, for the focal courses we attempted to collect samples of students' work as they progressed through the course. This procedure was problematic for three reasons: student work in most courses consisted of short homework assignments and tests rather than more substantial products; there were logistical barriers to full collection of student work portraits; some of the material consisted of videotaped presentations and there was some concern about confidentiality. These data are therefore incomplete, and only reported illustratively.

D. Summary of findings

In examining the data across these various instruments and measures, several prominent themes emerge concerning the experience and consequences of distance learning thus far in New York City. To provide maximum coherence for these complex data, we will discuss findings according to these themes, rather than by individual measure. We were concerned with how the innovation interacted with characteristics of schooling (its integration into the education system overall, and into teaching) and how it affected students and their performances. As noted above, the report of our analyses is thus divided into two overall sections: **Teaching and Integration into Education System**, and **Students and Learning.**

In considering the results thus far of this implementation, it is important to keep in mind that the program was large and ambitious, involving many individuals and schools. Typically, substantial technology-based innovations require at least three years to stabilize, and to begin to show effects. Some of our previous research suggests that up to five years is needed. We studied the distance learning innovation in its third year. In addition to assessing results at this point in its development, these data should thus also be considered as *formative*, pointing to particular refinements that would benefit the program as it continues.

II. Teaching and Integration into the Education System

The summary of our results with respect to the perception, design and impact of distance learning on the education system and teaching is organized into eight general themes:

A. Expectations and experiences of administrators and teachers

B. Format and pedagogy in classes

C. Relationships and interactions in classes

D. Technology

E. Selection and recruitment of teachers

F. Professional development

G. Parents

H. Future of distance learning

A. Expectations and experiences of administrators and teachers

The implementation of Classnet was complex. It involved public high schools that had not previously coordinated their activities, a community college, and a cultural institution. Each institution had somewhat different motivations and expectations for participation; but all wanted to offer enriched learning opportunities to New York City students. Reasons for interest in the project varied by perspective.

The school administrators were especially hopeful that distance learning would be a tool to better meet the diverse learning needs of students. Many associate distance learning with the idea of interactivity, and bringing people together across distances.

> "To this day, I will never forget the first day I talked to that television set and it talked back to me. I got all choked up and chills, and I still feel that way. I think it is the most thrilling medium imaginable, and we have not even touched its potential."

Responses to the survey indicated that the possibility of exposing students to other cultures was the highest rated goal for distance learning (89%); the second goal was offering courses not otherwise available (78%), followed by engaging at risk students (67%), and providing professional development (67%) (see Table 2).

> "For the students, I thought it would increase their possibilities for interacting with other students and would break down feelings of isolation. I was also focused on possibilities for staff development. I thought this would remove some of the obstacles facing traditional development programs like travel restrictions,

scheduling problems. I thought it could be a way to re-integrate professional development into the life of the school. It could also allow them to observe other colleagues in action and maybe offer a way to develop cooperative teaching skills."

"I see the network as a way for students to interact with the rest of the world, people from other cultures, even if it's just to get to know other students in Brooklyn, that foreign country over the river. It's a wonderful opportunity, and I'm pleased Humanities was chosen to participate."

Table 2
Teachers' Initial Goals about Distance Learning

	N=	Important goal (%)	Indifferent (%)	Not a goal (%)
Possibility of exposing students to other school cultures	9	89	11	0
Possibility of offering courses to students that would not otherwise be offered	9	78	11	11
Possibility of engaging at risk students	9	67	0	33
Possibility of advancing teachers' own professional knowledge and skills	9	67	33	0

Several thought that the technologies would make students feel special and "worthy". Some administrators and teachers think the exposure to technology is a very positive aspect of the program for their students — both in terms of the practical benefits of learning to use technology comfortably, but also for the emotional and psychic rewards of feeling "special" and "worthy" because they have been given access to expensive and advanced equipment.

Relatively few of the teachers thought that distance learning was a way to deal with financial limits of today's schools (33%).

The community college viewed itself as being at the forefront in their use of these learning technologies. Experimentation with the technologies combined with a commitment to work with public high school students as their constituency motivated their participation. Many of the public school staff thought that the relationships between high schools were easier to

manage than the relationships with the college, and with Lincoln Center. The different motivations and institutional cultures required more effort on the part of participants to resolve.

> "What is our unique position in this environment with at-risk students? What can we do about the dropout rate? What can we do about higher test scores? What can we do for our population that we deal with in the inner city? Pedagogically, what can be developed to give these kids an advantage? What can kids in the heart of the South Bronx be given with this technology? What can they access with it? Those were the things that we were trying to set out to do".

Administrators perceived that the particular schools were chosen largely because of their proximity to the fiber cable; this solved technical problems, but introduced challenges in terms of school "culture," schedules, and enhancing each others' curriculum offerings.

Overall, most of the administrators were optimistic about the future of the network, despite a number of difficulties encountered in the implementation. On balance, they are positive about their experiences, and put the weight of their comments on the potential for the future. They believe that the network has been and will continue to be an asset for students, and a learning tool for the larger New York Community.

However, no innovation is easy, and the size and complexity of public education in New York City leads to some especially high hurdles. There have thus been a number of challenges to the distance learning innovation, some made more intense by the recent budget cuts for education: logistical and scheduling difficulties; technical problems; faculty and turf squabbles; and differences in institutional cultures and traditions. Each school's individual culture, established traditions, and curriculum limitations had to be factored into the planning:

> "People, from parents to students to administrators, have a very fixed notion of what a school is. When it comes to making changes, few people want to. This led, in extreme cases, to fighting over minuscule scheduling differences."

1. Institutional cultures: needs and purposes

Scheduling was the difficulty most frequently discussed by administrators. Trying to coordinate the high school and college schedules was a particular problem, as were slightly out-of-sync bell schedules across the high schools. In addition, schedule adaptation for the needs of the

network was perceived by some as giving up control and independence by the schools. There was also resistance on the part of some to changing the entire school's schedules for a small number of classes.

Moreover, the issue of scheduling involves more than synchronizing bell schedules; it is a matter of each school's trying to recognize the others' strengths and to complement them in terms of which classes are offered. For example, on high school had most often hosted advanced placement (AP) classes, so they have benefited less from the expanded curriculum. The principal at that particular school also felt that participating in the distance learning network "somewhat hindered" the mission of his school: a focus on humanities and college preparation, not on technology. He noted that he had had to work to persuade faculty members of the value of distance learning.

The decisions about which classes to offer was also be a point of tension. To make these decisions, the different institutions had to recognize each others' strengths, and to perceive how they would benefit from others' course offerings.

Distance learning coordinators were identified in each school. Administrators all agreed that the role of the coordinators is crucial, but many observed that the role has suffered from a lack of clear definition, from being over-burdened by a wide variety of expectations, and by budget cuts. Most were concerned that the distance learning coordinator role lacked clear definition about duties and authority, and that it was insufficiently funded for the time and thought that was required for the post. For example, distance learning coordinators reported that they found they had to: manage substantial coordination and communication within and across schools; think how to showcase distance learning, and carry this out; identify and recruit students for the distance learning classes; and housekeep for the room; some reported they played the role of mediator with other suspicious staff, and others did staff training functions. Thus, all distance learning coordinators felt that the role was essential, and that it could not be merely a voluntary, unfunded duty. In light of the budget cuts, they are concerned that many of the mundane but essential functions distance learning coordinator which keep distance learning vibrant will not be possible.

> "The project really needs to have a distance learning coordinator. Somebody needs to keep an eye on that room — the APOs could never do that; they're too swamped. It is a big job, and the coordinators are not given any time off from their regular assignments. Before this semester, they all got breaks on their teaching assignments, but not this semester."

In a time when education reform has been moving toward devolving decision-making down to the school, the evident need for higher-level coordination for distance learning presents new challenges.

One of the "meta-issues" that seems endemic to the success of distance learning is the development of mutually beneficial partnerships among separate institutions with distinct missions, characters, cultures and needs. Finding common ground among institutions inevitably competing for scarce resources and protective of their own identities is clearly one of the serious challenges of making a cooperative distance learning network work.

Despite the generally favorable assessment of the distance learning program, co-ordination and cooperation between the high schools and BMCC has been problematic. Based on a review of the comments contained in the interviews with teachers and administrators, it seems there are a number of issues at play.

Administrators from BMCC feel they have been "cut out" of the picture by Board of Education and high school "ownership" of the network. Representatives from BMCC attributed this, in part, to the high schools' desire that BMCC host courses for college credit, something BMCC concluded was not possible given the high school students' lack of academic preparation. From BMCC's point of view, they were "penalized" for not offering college credit by being marginalized as less than useful to the network.

> "A lot of the high school students should have been screened out of the class. Many were not qualified, and they failed. This can lead to problems if they want to go to CUNY, because they'll already be on academic probation when they enter college."

> "There have been problems with the high schools. I felt this was originally a collaborative network, but now it's controlled by the high schools. And the high schools haven't offered us anything, so this doesn't do much for BMCC students besides the exposure to technology."

Conversely, high school administrators have been disappointed by the limited nature of BMCC's participation. From the Board's point of view, the schools are disappointed because access to courses for college credit was what they most had to gain from the collaboration with BMCC. The Board's distance learning administrator also felt that BMCC had behaved in a patronizing fashion toward the high schools...

"...BMCC seemed to be telling the high schools teachers, 'this is what we are going to do.' High school teachers are very sensitive about being talked down to."

High school administrators are critical that BMCC has only offered one course on the network. Many of them believe that other college or university partners should be pursued to participate in the network, one objective being to offer courses or other activities over the network that would interest more students in attending college.

Comments from the Board administrator, however, make it clear that, beyond the specifics of the experience with BMCC, there are problems inherent in partnering with a college.

"I hoped they would have done more. We have only had one course from them. I think the big disappointment has been with the college credit thing. The colleges all want to do it but money is always a problem. The New York Institute of Technology is willing to offer a course, but it would cost $150. It's not a lot of money, but again it is a lot of money for our kids. There are always issues of money. It has been very frustrating."

Despite problems between the high schools and BMCC, all parties continue to see great potential in being able to expose high school students to college classes. The BMCC respondent felt the course they had offered had been a good experience for the high schools students.

"It is good to expose students to college expectations — the levels of conduct, the need for preparedness, the reading. For the college students, it is a validation to remind them how far they have come. A lot of them come to BMCC with a negative self-image. Now they take on being a role model."

Some administrators within the public schools shared this assessment.

"The Critical Thinking class was a good one on its own merits, but it also gave students a better idea of what a college classroom is like, and maybe this makes them less apprehensive about going to college."

As we discuss in our Case Study section later in this document, the Board of Education representative, members of the Lincoln Center Institute administrative team, and teaching artists had concerns about how using technology would affect the LCI educational philosophy. Their interest in new ways of working with the Board of Education and curiosity about

how technology and performing arts could work together persuaded LCI to join the distance learning project.

2. Teachers

The teachers for the most part report that distance learning provides big benefits to their students. In addition, some report that it has given them the opportunity to adapt their teaching in new ways, to relinquish some control in favor of greater student participation. Most (78%) strongly agree that distance learning expands students' experiences, and that it helps them to grow professionally.

One immediate association many teachers have with the phrase "distance learning" is the idea of interactivity, of bringing people together across a distance. This is part of its potential and what makes it so exciting for many. Teachers within the New York City school system expressed hope that the distance learning network would open up both academic and social opportunities that their students would not otherwise enjoy.

> "What is positive is that so many of us from different places with different backgrounds can exchange ideas comfortably. That was a very pleasant experience."

> "Some of our kids don't leave their own neighborhoods, so to meet other students and see the similarities, that has been very positive."

However, not all initial reactions were positive and hopeful. Occasionally, teachers reported having negative initial feelings.

> "I thought, 'what is this, and why am I being asked to do it?' I had heard from a friend who had taught in a distance learning classroom that it was riddled with problems."

Perhaps more common was a blend of both excitement and fear.

> "It's hard to say what my expectations were, because I had no way of anticipating what it would be like. I had no idea of the enormity of it, I had no clue how it would all come together. I thought the project was exciting, but I did not feel prepared. A lot of times, I was very scared."

Teachers also reported a variety of other reactions, including skepticism regarding the technology, questions about how to adapt their teaching styles to this new medium, and excitement about working in a more creative, less structured way.

"I wasn't sure what to expect. I was worried about the technology not working, but I thought it would be a great chance to bring people together who might not otherwise get the chance to meet. I hoped the students might gain a broader knowledge by meeting students from other schools."

"I was leery of how I would teach my curriculum and of collaborating with other teachers. I'm not used to that. I'm used to being in control of my own class in my own space."

There was also significant resistance to distance learning from the teacher's union. This apparently took the forms both of generalized opposition and of filing specific grievances in particular cases. While most of the teachers who have actually been involved with distance learning do not credit the union's apprehension with much validity, they can understand why their colleagues feel wary and suspicious.

"I hadn't considered this until recently. Someone drew the analogy of using distance learning as a way of selling out the teacher. It could be used by an administration to cut teachers. The potential is more insidious than I had imagined".

Ultimately, teachers stress that they see great potential for distance learning as a wonderful teaching *tool*, but not something that can replace good teachers.

Teachers reported that distance learning challenged them to adapt their teaching styles. Many emphasized that distance learning required substantially more advanced preparation: in the survey, 56% reported that they needed more pre-planning for curriculum development, and 56% also said that more planning is required to develop teaching strategies that were suited to the distance learning circumstances. In interviews, teachers reported that they discovered a variety of tasks were needed that were not part of their experience with traditional classes: conferring with colleagues at other sites; planning for distribution of materials to distant sites; plotting how to enliven the material so that it adapts the on-line environment.

> *B. Format and pedagogy in classes*

"One of the differences [compared with traditional classrooms] is that the teacher has to be really on top of things and be well prepared. You have to overcompensate for the distance. You have to be much more animated. You might be able to get away with a lecture in a regular class, but that would be extremely boring in this environment."

> "The big challenge for me was, 'can I find a way to translate the way I teach in a classroom?' My teaching style is very interactive, and I wanted to find out if that could be done on-line. But I think you have to discover how to use the technology, not just stand there."

In light of the greater and different demands for preparation and cross-site coordination, these teachers emphasized that the paraprofessional plays a key role in distance learning classes. The courses that were jointly taught with the community college added an additional coordination factor that caused some tension: the classes were team taught by faculty from different institutions, with different views of appropriate pedagogy, and with different institutional cultures (minimally, high school and college instructors have different structures and different expectations of students, see above).

Teachers also believed that the particular pedagogy adopted for distance learning depends to a large extent on the subject matter, and on the particular preferences of individual teachers rather than demanding a specific, distance learning , approach. Since the Classnet project offered a substantial array of distance learning classes, there was a range of experience available in this regard. Language classes, for example, required different formats than did dance classes supported by the Lincoln Center Institute (see the case study report below for more detail about LCI). Most teachers interviewed expressed a belief in the importance of classroom interaction, valuing exchanges between teachers and students and students with each other. Few of these teachers thought that distance learning led them to perform more in lecture 'mode" (67% reported no; see Table 3).

The most frequently mentioned pedagogical problem concerned class size. 56% thought that larger classes (defined as more than 15 students) were too difficult to teach in distance learning . Likewise 78% disagreed with the statement: "there are too few students in my distance learning classes". The majority, however, did not think distance learning presented problems with maintaining class management or control at remote sites (56% reported this was not a problem, compared with 33% who thought it was). Most teachers did not think that the close association distance learning has with television reduces its pedagogical value (63% did not think so, and none strongly believed that this so).

Table 3
Teachers' Pedagogical Concerns
(N=9)

	A problem (%)	Indifferent (%)	Not a problem (%)
Larger class (15+) too difficult to teach with distance learning technology	56	22	22
Difficult to maintain classroom management and control at remote sites	33	11	56
Too few students in distance learning classes	22	0	78
Technology limits spontaneity on the part of teachers and students	22	22	56
Teacher must perform in lecture mode, rather than interactive class	0	33	67

The majority of teachers (56%) also thought distance learning had the advantage of encouraging students to be more focused and pay closer attention during classes (see Table 4). However, relatively few (33%) credited distance learning with increasing the quality of student learning.

Table 4
Teachers' Current Thinking about Distance Learning
(N=9)

	Strongly Agree (%)	Indifferent (%)	Strongly Disagree (%)
Distance learning enables students to study subjects that would not be available otherwise	89	11	0
Increases communication between teachers and administrators	78	11	11
Encourages students to be more focused, pay closer attention	56	33	11
Increases the quality of the students' learning	33	56	11
Provides opportunity to mainstream special education students	22	33	44
Families are generally excited about and supportive of distance learning	22	56	22
The technology works well and readily becomes invisible	11	56	33

But effects on learning can be more subtle. The teachers report that being in the distance learning classroom confers important benefits on their students. These advantages must also be recognized in an assessment of the educational and developmental impacts of distance learning. One teacher notes:

> "No other class asks them to write creatively, to act, no other class asks their opinions. They are exposed to professionals they would never have gotten access to. It has empowered students, and that is the secret."

Other teachers noted that the emphasis on verbal communication, classroom participation and visual presentation all add value to the distance learning classroom experience.

> "I think it has been a very validating experience for them to see themselves on the screen. Any experience that gives a person a creative voice will cause that person to take leaps."

Despite problems, teachers report that, overall, their assessment is that the distance learning experience is a uniquely valuable one for their students.

> "The costs are worth it. Students can really gain from the experience something they will never forget, skills that will be invaluable. They have to think about what they say, they may be criticized, they have to communicate in a sensitive and thoughtful way. There is a lot of social interaction and incidental learning."

C. Interactions and relationships in classes

We were interested in the amount and kind of interactions that take place in distance learning classes, and how this compared to traditional high school classes. To answer these questions, participants were interviewed about their experiences on these dimensions, written survey questions probed participants' experiences, and a subset of classes were systematically observed.

As noted above, many associated the idea of distance learning with interactivity, with bringing people together across distances. In the survey, few thought that distance learning limits *interactivity* between students and teachers, or between students (67% reported no, and none strongly agreed that distance learning is limiting in this regard). Provided the technology was working well, they believed that substantial interactivity could be maintained. The technology did, however, stiffen interactions in particular ways. For example, when the camera was focused on a single student, the

rest of the class was out of sight. People could feel left out if they were not on camera:

"...if you are not on camera, you do not exist. In the distance learning room, it you are not on-screen, you stop being."

Most of the teachers (88%) report that they develop participation strategies to encourage student involvement. Few believed that distance learning limited spontaneity (22% who believed it limited spontaneity vs. 56% who believed that it did not).

Analyses of classroom interactions over the course of the year reveals some interesting patterns. The following classes were systematically observed:

- Critical Thinking (with BMCC)
- Advanced Placement American History
- Theme and Variation (with LCI)
- American History, the non-distance learning comparison class

The distance learning AP History class, and the non-distance learning history class were taught by the same teacher. With the exception of the Critical Thinking class, all focal classes usually met five times a week for 40 minute periods. Since the Critical Thinking class was a joint college course, it met everyday for two periods in each school. However, only two of these days each week were on-line, distance learning classes. On the remaining days, each class met separately off the network.

Table 5
Teachers and Students:
Averages of Combined Questioning and Telling
(Class Period: 40 minutes)

	Teachers (Minutes)	Students (Minutes)
Critical Thinking	16:06	12:15
Theme & Variation (LCI)	15:04	9:01
AP American History	20:23	9:16
American History (non-DL)	21:40	3:54

Interestingly, the most teacher talk (including both "telling" and "questioning") overall occurred in the non-distance learning history class: 21:40 minutes per class on average. This was also the class in which the students talked the least: an average of 3:54 minutes per class.

This teacher spent slightly less time talking in his distance learning class (20:23 minutes on average per period), but the students in the distance learning class talked substantially more than they did in the non-distance learning class (9:16 minutes on average). The aide participated substantially in this class, considerably more so than in any of the other distance learning classes (4:46 minutes on average).

Critical Thinking had a somewhat more balanced relationship between teacher talk (average of 16.06 minutes per period) and student talk (average of 12:15 minutes per period).

Likewise, the Theme and Variation classes was characterized by interaction between teacher talk (15:04 minutes on average per period), and student talk (9:01 minutes on average). There was almost no verbal participation on the part of aides in either of these classes (:03 and :06 minutes respectively).

Given the seminar-like nature of Critical Thinking, and the emphasis on participation in arts-related activities of Theme and variation, an emphasis on student participation should be expected relative to the more traditional AP format. However, it is important to note that over the course of the year, the on-line nature of the classes did not appear to substantially inhibit student verbal participation, nor teachers' desires to use distance learning to support interactive classes.

There was remarkably little off-task activity recorded for any of the distance learning classes: less than 1 minute per period on average in any of the classes. Likewise social conversations were very rare (less than :10 seconds on average a period in any of the classes). Housekeeping matters (e.g. distributing papers, giving directions about the technology, and the like) were discussed occasionally and involved mainly the teachers. On average, teachers spent 1:24 minutes (Critical Thinking), :42 minutes (AP History), and 2:37 minutes (Theme and Variation) on housekeeping per period.

We also examined the extent to which students participated in curriculum activities that were local to their own site, as opposed to synchronous cross-site activity. The innovative classes involved substantially more local activity by students (3:30 minutes for Critical Thinking, and 5:42 minutes for Theme and Variation on average), than did the more traditional

class format (.28 minutes on average). Thus, in the AP History class, students spent the overwhelming amount of their time in whole group lecture or discussion; the other two distance learning classes had substantially more alteration between local site activity and whole class work.

Books were used most extensively in the history classes: in the non-distance learning class, students used books for an average of 13:42 minutes per period, and the teacher for 9:31 minutes; in the distance learning class, students used books for an average of 18:51 minutes and the teacher for 4:29 minutes. The only other class where books were used with some frequency was Critical Thinking, where students did so for an average of 12:07 minutes per period, and the teacher for 8:14 minutes.

Very little use of the document projection system was observed in these classes. The most commonly used technologies were the board in Critical Thinking (3:19 minutes on average), and in AP History (1:42 minutes on average), and the VCR in Theme and Variation (1:54 minutes on average).

Teachers felt that overall distance learning did not fundamentally restrict teacher/student or student/student exchanges. This is supported by the observational analyses in which the distance learning classes evidence more student verbal interaction than does the non-distance learning class. This is undoubtedly related to the subject focus of each class, and that two of them were structured by innovative arrangements. But the fact that distance learning does not apparently limit interactive exchange is noteworthy.

However, an important concern about the quality of interactions as part of distance learning arose for many. Many teachers, and students (see below), were concerned about the nature of *relationships* that were possible in these learning circumstances. Most teachers are concerned not simply that there be vibrant interactions in their classes, but that they know their students as people, and that the students know each other. The exchanges that lead to these personal relationships often take place before or after class, in the hallways, in individual requests for clarification or help, in moving around the class as students work individually or in groups and so forth. These are precisely the kinds of interactions that are truncated by distance learning.

In a sense, many teachers are saying that one of the paradoxes of distance learning is that it both brings people together and does *not* bring them together. It brings people together in the sense that individuals in physically separate locations can see and speak with one another; they can interact, but only to a point. The distance and the technological medium

erect a barrier to real personal contact. In order to minimize the effect of this barrier, many teachers conclude that students who will be taking a distance learning class together from separate locations should be brought together in one place early on.

When asked to identify the top problems with distance learning, half of the teachers indicated that they "find it difficult to form relationships with remote students because they have limited access to information they would normally have about students from being in the same room and school." 63% said that a key improvement would be increased personal contact between distance learning teachers and remote students; another 38% thought it would be a moderate improvement. None said it would not be an improvement. Most teachers reported that strategies to bring students into real contact with each other were needed: 86% wanted field trips or other out of class events; 86% wanted activities at the beginning of the term so students could get to know each other.

Thus, the patterns of interactions in classes appeared to be determined more by subject matter and teachers' habits than to be primarily determined by the distance technology. However the *experience* of the learning relationships appears to be altered by the technologies for many people. Teachers and students are accustomed to the less formal interactions that occur on the borders of class time, or the more subtle individualized exchanges as part of their relationships. When these exchanges are limited by the technologies, the gap is noticed.

Table 6
DL and Non-DL Class Comparison and Significance
(15 Classes)

		AP American History (distance learning)	American History (non - distance learning)	Significance
STUDENTS				
Tell	Time	8:26	3:01	p< .001
	Frequency	54.33	41.50	p=.005
Book	Frequency	.92	1.42	p=.05
Tell - Synchronous Talk	Time	3:26	2:27	
	Frequency	6.6	15.6	

Administrators report that the network was plagued with technical problems, especially at the outset of the program. The situation was perceived to improve over time. They reported that the loss of on-line connection was a frequent difficulty, and the most frustrating problem. But less "total" failures such as microphone and audio problems, non-functioning fax machines and copiers, the limitations of a stationary camera, and inadequate technical expertise for trouble-shooting (by faculty members) also created barriers.

"The technology was not flawless and there were endless breakdowns in the first couple of years. I think one of the biggest problems was the terrible frustration with a system that just didn't work all the time. You just didn't know when you walked into a class whether you were going to reach all the sites simultaneously."

"One of the teachers is not very adept with the technology, and I don't think she wants to be. She wants someone to come into the class and deal with it, but we don't have anybody. Yesterday the cameras at xxx froze — we have more technical problems there than anywhere else — and that teacher just feels it is not her job to have to deal with that type of problem.

"The technical aspects of the project are much more complicated than anyone could have predicted. But it's all new, so some leeway must be given."

"I think these technical problems, especially with the microphones, are larger than most people acknowledge. This is particularly an issue for students who are not native English speakers."

Table 7
Teachers' Technological Concerns

	N=	A problem (%)	Indifferent (%)	Not a problem (%)
Microphones or cameras transmitting students' talk and images	7	71	14	14
Sound equipment breakdown	9	67	11	22
Transmission problems	9	56	11	33
Failure of important ancillary systems	9	56	22	22

Few teachers (11%) reported on the survey that the technology worked well. In fact, the top barriers to distance learning reported by teachers were all related to technical aspects of the system:

> •71% reported that microphones or cameras transmitting student talk and images were a problem;
> •67% reported sound equipment breakdowns as a barrier;
> •56% reported transmission problems;
> •56% reported failure of ancillary systems.

Underlying all these perceptions is the inescapable reality that the success of distance learning as an educational tool is smoothly functioning technology. The other distance learning implementation that we have studied experienced considerably fewer technical problems, although they too were especially sensitive to the need for high quality and reliable audio.

Many participants feel that the technology quickly becomes "invisible" when it works. Few teachers (22%) thought it limited spontaneity in classes.

However, participants from Lincoln Center described a different way of thinking about incorporating the technology into teaching: they believe that the technology should not "disappear," but rather the curriculum and activities should be adapted to showcase it, to use it to advantage. Thus, a teaching artist describes how she created exercises to incorporate the technology rather than treat it as invisible or transparent:

> "I try to do a lot of exercises that focus on interaction between students. The camera becomes the element that you either work around or work with. I create exercises that use the camera and include distance. I might set up an improvisation that two students are involved in a phone conversation because it incorporates distance and technology."

Teachers generally agreed that they felt fairly comfortable with the technology when it worked well, and very frustrated and impatient when it didn't. Like the administrators, they reported problems with the stability of connectivity among sites, especially at the beginning; they also reported problems with ancillary equipment (e.g. fax, copiers). When this auxiliary equipment failed, it limited the functioning of the whole system.

> "The biggest difference between a traditional class and distance learning is the aggravation of the system when it is not working. It

is heaven when the system works, but it doesn't work so often, and that is very frustrating."

"I can drive a car, but I cannot fix one. It's the same with my relationship to technology. If anything goes wrong — which is very, very often — I don't know what to do."

The classroom observational data provided objective support that technical problems occurred with some frequency in the observed classes. While the technical glitches did not last long, they were observed to occur in approximately one-third of all class sessions observed: 30% of Critical thinking sessions (average of 44 seconds per period); 35% of Theme and variation (average of 1.42 minutes per period); 35% of AP History (49 seconds per period).

Likewise, when asked to identify improvements for the program, the three most frequent choices were technical: 88% wanted improvement in audio; 78% wanted cameras that panned faster to capture the roomful of students; 63% wanted increased personal contact between distance learning teachers and remote sites. 56% also requested better resolution of monitors. The visual movement and resolution suggestions, as well as the audio, seem related to the desire for better ways to establish relationships across the distance.

Table 8
Teachers' Suggested Improvements for Distance Learning

	N=	Important improvement (%)	Indifferent (%)	Not an important improvement (%)
Improved sound or audio	8	88	13	0
Cameras that can pan faster	9	78	22	0
Increased personal contact between distance learning teachers and remote sites	8	63	38	0
Better monitor resolution	9	56	22	22
More pre-planning for curriculum development	9	56	33	11
More pre-planning to develop strategies suited to distance learning	9	56	44	0
Teacher Training specifically designed for distance learning	8	50	50	0

In addition to technical reliability, some teachers raised issues of technical design, and the limits particular design choices impose. For example, one technically imposed feature by the system is that the camera only focuses on one person at a time. A teacher at one of the high schools noted that when students at the home site — in this case, BMCC, were interacting with the teacher, students at his school felt left out. This teacher felt that while the "gains" afforded by distance learning are substantial, the interaction on the network can sometimes be superficial. In his opinion:

> "...if you are not on camera, you do not exist. In the distance learning room, it you are not on-screen, you stop being."

The constraints of the technical design can thus affect the issues of establishing relationships across sites, noted above.

The technical problems were perceived to be substantially improved over time by both teachers and administrators.

E. Selection and recruitment of teachers

According to administrators, the ensemble of distance learning courses for each year were determined at the administrative level, and then teachers volunteered to teach particular ones. Once the course selections had been made, administrators 'put out feelers' to teachers. They felt they had to put some effort into finding teachers willing to take some risks and teach on the system. Some administrators suggested that even though teaching has been voluntary, they had specific individuals in mind.

> "All of us [administrators] are looking for the program to succeed, so, of course, we're going to pick our best teachers."

Teaching on-line requires some adjustment to traditional teaching methods; thus, some effort was made to tap those teachers who are willing to change and take risks. Some teachers have been eager, others reluctant.

> "I see more interest developing among teachers as the project goes on, but it's slow going."

Another issue that has arisen among teachers is the union's concern about potential job loss and contract infractions (e.g., the size of classes that teachers would be conducting on the network). Even if jobs are not immediately lost, the additional expense of a distance learning room in a context of shrinking budgets became a sore point for many faculty members.

"When you calculate the number of students together at both home and remote sites, do you go over the standard teaching load? Who will staff the rooms at the remote sites?"

Teachers reported that they were asked to teach distance learning courses based primarily on the subject administrators had decided would be offered, and secondarily on their effectiveness as teachers.

"Somebody asked me if I would teach Critical Thinking on-line. I said OK. Afterwards, I felt resentful because I put in so many hours, and I didn't get paid for it. But that is another story."

"I volunteered with very little knowledge about the program when someone else who was supposed to teach backed out at the last minute."

In interviews, many teachers reported initially feeling awkward and self-conscious in front of a camera but thought that they made the adjustment quickly and soon became accustomed to the camera and technology.

| *F. Professional development* |

Administrators largely concur that professional development is a priority for the future of the program. They believe that beyond the basics of operating the distance learning technology and importing standard pedagogy, teachers need to develop new teaching strategies appropriate to the specific conditions of distance learning. While doing this, they believe that teachers will need to work with each other to try things out, to consult and to adapt others' ideas and techniques.

There is a consensus on the part of both teachers and administrators that staff development should be a future priority. The training that has been done to date has been useful, but distance learning raises many teaching issues, and teachers benefit from structured training that helps them develop new teaching strategies along with their distance learning peers. Administrators identified two basic areas for staff development: <u>technical training</u> and <u>pedagogical strategies for using the network more effectively</u>. Most agreed that while the former is important, the latter is crucial and holds one of the keys to the ultimate success of distance learning .

"You need teachers who are going to re-think how the class is taught. You need a whole new way of teaching. New types of classes that bring in outside resources."

"Some of the most interesting and difficult issues have arisen for teachers who have a certain way of running their classes. In fact,

I've found that it's adult behavior which requires the most
modification. You're less in charge than in a traditional classroom.
In the distance learning setting, the teacher has to enter into
negotiations with other adults and may sometimes feel overly
scrutinized. "

Many teachers (78%) believe that distance learning offered an opportunity
to grow professionally. They also perceive (78%; see table 4) that it has
the side benefit of increasing communication and accessibility among
teachers and administrators by enabling them to meet more often without
travel. Some also report that more pre-planning is needed to develop
strategies suited to distance learning (56%; see table 8), and that additional
time is needed to coordinate with colleagues for planning (44%). 56%
strongly agree that distance learning as a potentially powerful tool for
teachers, but that it currently is not (another 33% moderately agree).

Many teachers also reported that additional staff development and training
in strategies for dealing with the differences between the distance learning
and traditional classrooms is essential (50% rate this as a key improvement
that is needed; the remaining 50% rate it a moderate improvement. No
teachers thought that this was not needed; see table 8.)

"I was given no staff development. I had no clue as to how to
present myself. Every day was trial and error. And it was like
teaching in a fishbowl — very high visibility."

"After I had started teaching, there was something on KNET, for
the first time I heard other teachers talking. I said to myself, 'well,
I wish I had known this before.' How to dress yourself, how to
talk, how to use your voice. In a regular classroom you don't see
yourself. You need training for this."

"The guy who gave technical training was impossible to follow.
People who were very good technologically got it in one second,
and people like myself didn't know what was going on. Then we
had a woman who was a waste of time and money. So I did
something simple. I asked one of my students who loves
technology. He sat with me and showed me how to do it. That was
my staff development."

"Anyone who participates should be prepared and even given the
opportunity to rehearse and see themselves on TV to overcome any
stage fright. The on-line experience can encourage passivity. In a
classroom I can be more tuned-in to who is listening. Now I plan

for an off-line break, I give the students an activity to do, and then we come back. I think this works."

G. Parents

Administrators report that parents were not much a part of the distance learning program. Some parents were aware of distance learning , and impressed by it.

"I think parents feel very impressed with the room. It has become a drawing card to attract students to the school."

A few have expressed some concerns about their children being taught by teachers from other schools. For the most part, however, administrators report that parents are not a central and active constituency group involved with and affecting how distance learning plays out in New York City.

Relatively few teachers strongly agree that "families are generally excited about and supportive of distance learning " (22%), whereas 56% moderately agree with this statement (see table 4).

Many students (44%) report that their parents/families like the idea of distance learning , with only 21% reporting that their families do not like it.

Thus, overall, with respect to parents, the picture that emerges is of a community generally unaware of or indifferent to distance learning , with a few enthusiasts.

H. Future of distance learning

As noted earlier, administrators reported that the future use of distance learning is that it can support innovative classwork that would otherwise be unavailable.

"The biggest plus is the ability to offer classes that the school would not have been able to offer itself. It also gives students access to the technological advancements they see in the world around them but never have real exposure to. As the technology becomes more affordable, being on the network will be worth its weight in platinum."

"I see tremendous possibilities to bring ideas and people into the building that the kids would never have otherwise been exposed to."

Despite the host of challenges to using distance learning more effectively, most teachers are optimistic about its future potential. 63% strongly agree that distance learning will change the way we teach in the future.

> "I think that this will be in some ways the future of teaching. Once the rooms are in, it can be very cost effective, and we can offer students classes that we wouldn't be able to do otherwise. It would be great to see connections with foreign countries. It would be great for language classes. It is a way to hook into the world."

The interactivity of the medium and the necessity to develop less teacher-centered and lecture-centered classroom environments are also seen as being highly beneficial to students. Obviously, this also requires teachers who are willing to play with and explore the technology.

> "It moves the curriculum toward a less teacher-dominated lesson, and toward more cooperative learning experiences for the kids and greater exchange. These are very important benefits. When it works, the kids love it, although there are problems. Not just the technology, it's very difficult when the home teacher is not dynamic."

Administrators and teachers agree that a number of challenges to this approach to education remain to be confronted. These include:

> • improvements in the coordination that is required of multiple and diverse institutions that have different institutional "cultures";
>
> • project leadership needed for this coordination, and for program expansion;
>
> • commitment to continued professional development for teachers;
>
> • budget needed for the program overall, and to support school-based distance learning coordinators;
>
> • wider use of the technology by the community.

Despite the array of problems, administrators and teachers remain overall optimistic about the future of distance learning , and emphasize its importance as a learning tool for students, and for the greater New York community. They are quite realistically articulate about the complexity of implementing this complex a program in New York City, and are thus encouraged about the success it has thus far enjoyed. Their focus on identifying and meeting future challenges underscores their belief in the importance of this venture.

Despite enthusiasm for and commitment to distance learning among school administrators, there is some pessimism regarding the Board's long-term commitment and the prospects for distance learning when NYNEX's corporate sponsorship ends.

The Board's project administrator, whose position ceases to exist when NYNEX's funding ends was clearly pessimistic about the future even a year ago.

> "The Board is not committed to this. [Board staff] are totally bogged down. They have fired so many people at the Board I can't believe that they still function. We've been looking for funding. I am writing PR letters. Hopefully, something will come of just getting people to know about it. I don't know where the funding is going to come from. Honestly, I think it will only last one more year after NYNEX pulls out."

> "The Board of Education has been the biggest frustration. The project is not allowed to use the room after school or during the summer. It's crazy. They are an obstacle. When you are involving a certain amount of teachers, students and physical space, you really start to see the limitations of the public school system."

Funding for the network and for staff positions dedicated to network coordination and planning are also universally voiced concerns. Budget cuts have already had an impact on the network, and many question the viability of the system when NYNEX's support ends. Virtually every administrator interviewed discussed the possibility of renting out the distance learning rooms to other community groups, to city cultural institutions, and to corporate clients as a way to make the project more self-supporting.

> "The Board decided to participate in CLIN, a Federal program designed to develop not-for-profit, community-based networks. Money is obtained from leasing out the network to other organizations to expand and maintain the network and pay for the cost of operations. Just before the program was to go into effect, however, the whole thing was scrapped in Washington."

> "We're looking to market the technology to the business community, leasing the room out, trying to make it an entrepreneurial enterprise. This would help to create funding for technological and infrastructure improvements."

> "We'd like to be able to rent the facilities out to businesses to enable the project to be self-funding."

> "Many schools are now pursuing their own funding in order to join the network. It would be easiest if it's all centrally controlled by the Board, and rented out to new schools joining the network, but I think it will be more effective if the schools involved feel some sense of ownership about the network. This could take longer and be a lot harder, but it could be worth it if they program really works. This would also probably require a new governance system, the creation of uniform scheduling and so forth."

Expanded use of the network is one issue that most administrators discussed at some length. They see such an expansion as both faithful to the concept and mission of distance learning (expanding educational and cultural opportunities for New Yorkers whose access is otherwise limited) and also possibly essentially to the survival of the network. Expanding applications of the network can increase its relevance and possibly also generate badly needed revenue.

Ideas for expanded use that administrators discussed included: parenting classes; mass media classes; providing interactive "mentors" to young students; work on violence prevention; after-school and summer school classes; more college preparatory work and local university participation; parents and community meetings; and, adult education (e.g., GED programs).

> "I see the most promising outgrowth of the project as connections to university systems, possibly beginning in the summer or fall of 1995. Also I'd like to see more 'upward' connections to cultural institutions in New York City like LCI. I'd like to see more teaching in the arts, let the technology make possible things we can't do right here in the building, giving more exposure to the cultural richness in New York City."

> "I'd like to expand the facilities to include a line into the auditorium and the dance studio. Maybe future teleconferencing projects, ESL classes before the start of our school day, 'town meetings' with classrooms from around the world

> "It could expand the range of people who access to education, without having to travel great distances."

"I thought the room would have been more integrated into the life of the school by now. It should be used all day long, by parents, for staff development, for college informational sessions."

The data concerning students and learning are summarized below according to six overall themes:

III. Students and Learning

- Students' expectations
- Students' experiences of distance learning classes
- Achievement
- Attendance
- Technology
- Relationships and interactions

Student sample

Questionnaires were distributed to all students in the distance learning classes. Of the 489 students enrolled in these classes, questionnaires were completed and returned by 286 of them (58.5% return rate). This sample consists of 41% boys and 57% girls (2% of the students did not report a gender or grade). 57% of these students are in the 12th grade, 24% in the 11th grade, 4% in the 10th grade, 11% in 9th grade, and 4% in college.

Table 9
distance learning Students' Grade Level by Gender

	9th Grade	10th Grade	11th Grade	12th Grade	College	Total
Male	14 13%	7 7%	31 29%	52 49%	3 3%	107 41%
Female	12 8%	4 3%	31 21%	95 63%	8 5%	150 57%
Total	28 11%	11 4%	62 24%	150 57%	12 5%	263

We asked the students to tell us how well they believe they are doing in school. 47% of them report that they are above average students (47% of girls, 45% of boys). 51% report that they are average students (52% of girls and 51% of boys). 2% of students report that they are below average.

Table 10
**distance learning Students' Self-reported Grade Average (for Math,
English, Social Studies, and Science) by Gender**

	Above Average	Average	Below Average
Male **n=47**	47 45%	54 51%	4 4%
Female **n=104**	69 47%	77 52%	2 1%
Total **n=258**	120 47%	132 51%	6 2%

When asked to judge themselves by subject, 86% report that they are
doing well in English (A's or B's), 85% report A's or B's in social studies,
72% in science, and 64% in mathematics.

Thus, these students by their own reports are performing quite well in
school. distance learning had not attracted a large number of students who
feel themselves to be having academic difficulties.

We were also interested in the amount of experience with various
technologies that these students have had. 85% report that they use
computers at school, and 79% report computer use in their personal lives.
Likewise, 84% report that they use video at home, compared with 55%
who report video use in school. Less than one third of these students
(30%) had used modems in schools, and even fewer reported such access
at home (23%).

In addition, 38% of them use CD-ROM in school, and 37% report they
have this technology at home. The proportions are similar for use of fax
machines (37% in school; 35% at home).

When examined by gender, computer use at home is similar for boys and
girls (77% and 81%, respectively). Other technologies show substantial
differences in use by gender, however. More boys (43%) than girls (29%)
report modem use at home. More boys (49%) than girls (29%) report CD-
ROM experience. And girls (87%) are somewhat more likely than boys
(81%) to report video use at home.

The majority of these students began to use computers within the last three
years at school (54%) and at home (53%). 25% of them have been using

this technology for between 4 and 6 years. But a number of them have had access to computers for more than 7 years at home (23%) and at school (21%).

These students represent experience with both home and remote perspectives on distance learning: 49% of the students are taking classes at the home site; 26% at a distant site; and, 25% have had experience at both home and remote sites.

In addition, qualitative in-depth interviews were conducted with seven small groups of students who represent the four high schools and the community college. These interviews explored students' involvement, expectations and experiences with their distance learning classes.

A. Students' expectations

It is important to note that the majority of students in this sample are in their first semester of distance learning (69%). The remaining students are in their second or third semesters in distance learning classes. This means that the expectations of the majority are still relatively fresh, but also that they are still discovering dimensions of the experience. They base their judgments on experience with only one type of class and one teacher or collaborating set of teachers.

Virtually all students had quickly grown accustomed to the technology in the classroom and felt comfortable with it. They would all take distance learning classes again and would recommend these classes to their friends.

Many students were not fully aware of the type of class they had enrolled in: an interactive, on-line class. Their first reactions to the distance learning room (aside from the fact that it was generally more modern and much nicer than their other classrooms) included nervousness and self-consciousness about being on camera and the misconception that they were going to be watching television. It seems that interactivity was something they had to experience in order to conceptualize. Shyness and personal sensitivity about "being on TV" notwithstanding, most students said they quickly got used to seeing themselves on a screen and their self-consciousness faded.

> "I am a shy person and at first I didn't like talking over the network."

For these students, being part of something new was the most powerful reason for enrolling in distance learning, reported by 58%. They also wanted to experience the new technologies (58%), and were curious about the distance learning room. The same percentage of students (57%) also

report that they enrolled in distance learning to take a course that was not otherwise offered (57%), representing more girls, (62%), than boys (50%). A number of students also reported that they wanted to get acquainted with students from other schools (40%), echoing their teachers' hopes for distance learning .

Table 11
Students' Goals and Ideas about Distance Learning

	N=	Important Influence (%)	Indifferent (%)	Not an Influence (%)
Possibility of using and experience new technology	286	58	27	15
Possibility of doing and being part of something new and different	284	58	31	12
Possibility of taking courses not otherwise offered	282	57	27	16
Possibility getting acquainted with students from other schools	285	40	38	22

Thus, for these students in New York City, curiosity about new experiences, new technologies, and new peers were the primary motivators of their interest in distance learning.

B. Students' experiences

In interviews, students often reported that they initially felt shy in their distance learning classes, but most were quite positive about their distance learning experiences. They reported that they found these classes to be fun, rewarding, and gave them the opportunity to meet new students and teachers from around the city.

In some classes, students were especially enthusiastic about the opportunity to express their own opinions — likely a function of the class design and teachers rather than distance learning alone. They reported that they like to be more verbal and lively in class, and to engage in give-and-take with the teacher and other students that they felt was characteristic of these classes.

There did not appear to be substantial differences between home and remote-site students in the interviews, although some of the students at

home sites felt that the teacher paid less attention to the home class when he or she was responsible for remote sites.

Most of the interviewed students reported that distance learning requires more concentration and greater focus. 40% of the students believed that distance learning encourages them to pay more attention in class, compared with 21% who believe that it doesn't. They also reported that when others are watching, they want to appear mature and therefore make efforts to do so.

When asked about the advantages (see table 12) of distance learning on the survey, 66% reported that that the room was more attractive than regular classrooms, and 65% found that is provides access to unique courses. In addition, a large number of students (56%) found that it increased their involvement with technology, and 53% thought it provided richer course content. Interestingly, many students (58%) also reported that learning was more personal because classes were smaller and more focused.

Table 12
Students' Perceived Advantages about Distance Learning

	N=	Important Advantage (%)	Indifferent (%)	Not an Advantage (%)
Room is more attractive than regular classrooms	285	66	19	15
Gives access to unique courses	284	65	24	11
Makes learning more personal because classes are smaller	285	58	27	15
Increases involvement with new technology	284	56	36	8
Gives access to richer course content	284	53	31	16
Enables you to get to know others from different schools	283	46	37	16
Parents or families like the idea of distance learning	280	44	35	21
Encourages you to pay closer attention in class	285	40	36	24
Seeing yourself on camera helps you know how others see you	284	33	30	37

By the time they were completing the questionnaire, many students were no longer feeling camera shy (only 31% felt so). In addition, few students (33%) saw 'being on camera so you know how others see you' as an advantage of distance learning . This item was the lowest ranked of all.

| C. Achievement |

In order to assess achievement in distance learning classes, we collected students' grades in all of the distance learning classes, and all participating students' grade point averages. We also examined the relationship between performance in the focal AP history distance learning class compared with the traditional comparison class taught by the same teacher (non-AP).

With respect to comparisons between distance learning achievement and overall grade point averages, we examined performances in 16 classes (8 in the fall semester and 8 in the spring semester). In 3 of these distance learning classes, students' grades were better than their grade point averages, in 6 classes they were worse, while in 7 classes distance learning grades were the same as overall grade point averages. Thus, in 10 of the 16 classes students performed either better, or the same as their cumulative achievement measure. In these data, distance learning thus appears to be complexly related to student performance rather than directly related to better or worse achievement.

We could also detect no systematic bias in students' achievement when we examined how students at home and remote sites in each class performed relative to each other.

When we examined achievement for the distance learning and non-distance learning comparison classes, there was no significant difference for either class between students' grades in each class and their grade point averages — in both distance learning and non-distance learning, they essentially performed consistently with their overall school performances. While non-significant, in both classes students' grades were slightly better than their overall averages.

We also found that performance in special education classes was, in these data, not systematically related to distance learning. In one class (special education math), students performed significantly better than their grade point averages, and in another they performed significantly worse (special education biology).

One interesting note relative to class type, in both semesters of distance learning pre-calculus, students' grades were substantially lower than their grade point averages. An important variable in this class is likely the

difficulty of the material; it might be useful to further probe whether the distance learning presentation is more challenging in courses such as this that are known to be especially difficult for students.

Finally, it is also interesting to note that in the course which was especially novel with respect to format — Theme and Variation — students performed as well as or significantly better than (in one semester) their grade point averages.

D. Attendance

We examined the attendance in distance learning classes by comparing student class attendance records with their overall school attendance during the year. These latter data were taken during the general attendance recording period (equivalent of "home room"). It was not possible to compare distance learning class attendance with students' attendance in specific traditional classes.

In 8 of the distance learning classes, student attendance was substantially worse than their overall attendance rate. In 6 of the distance learning classes, there was no significant difference in attendance. (Data are missing for one of the remaining classes, and the student numbers are too small for a meaningful comparison in the remaining class).

It should also be noted that attendance was substantially worse for students in the non-distance learning comparison class (American History) than their overall attendance.

E. Technology

One of the main reasons students cited in both interviews and the survey for choosing distance learning was an interest in technology. For 72% of students, this was one of the important reasons they enrolled in a distance learning class, with a slight bias toward boys (78% of the boys, compared with 68% of the girls). Many also thought that an advantage of participation in distance learning was that it increased their personal involvement with technologies (56%; see table 12). Many (50%) also wanted to increase their involvement with the technology in these classes, by playing more substantial technical roles.

For the most part, students said they quickly felt at home with the technology and were only really aware of it when it failed. Unfortunately, this happened often enough to register as a problem.

> "Sometimes you'd be on-line, and everything would go wrong, and it would be really frustrating."

Students overall noted the same kinds of technical difficulties as did their teachers. When asked to identify problems and barriers to distance learning , the five most frequently cited problems involved some aspect of technology. The most frequently cited problem was audio: 36% of students reported that malfunctioning sound equipment was a major problem, and another 31% reported it was somewhat a problem. The second most frequently cited problem with distance learning was "hearing and being heard" (33% thought this was a major problem and additional 40% thought it moderate problem). In addition, 32% of students reported that transmission and static was a major problem, and another 33% found it to be somewhat of a problem. Many would also like to see improvements in the visual flexibility (cameras moving faster — 25% said this was a major problem). The least frequently cited problem, it is interesting, was the telephone (74% of students said this was not a problem). The elmo and the fax also were reported to function reasonably well by most (63% and 62%, respectively, reported that neither of these was a problem).

Table 13
Students' Concerns with distance learning

	N=	Major Problem(%)	Indifferent (%)	Not a Problem (%)
Problems with sound or microphone equipment	281	36	31	33
Problems with hearing and being heard	282	33	40	27
Problems with cameras not moving fast enough	283	25	24	50
Problems getting to know students at remote sites	281	24	31	45
Not enough time or ways to ask questions or discuss	280	21	30	48
Difficulty getting individual attention	281	19	20	60
Problems with document projection system	275	16	21	63
Problems getting to know teacher	281	16	22	62
Problems with FAX	277	15	19	66
Problems with telephone	275	9	17	74

Likewise, the six highest rated suggestions for improvement in distance learning focused on technology: audio (54%); use of multimedia for projects and instruction (54%); improving how cameras pan and focus (47%); access to computers to facilitate communication (51%); better resolution on monitors (46%).

Students also expressed their enthusiasm for becoming involved with technologies. As noted above, the innovative technology and curiosity about the distance learning room were among the most frequently cited reasons for choosing distance learning classes. A number of students would like to play more substantial technical roles in relation to distance learning .

F. Relationships and interactions

Students felt that initially it was a little hard to conceive of the dispersed locations as one classroom. They even said that occasionally there was competition and mistrust between the sites. However, most interviewed students indicated that a "group feeling" coalesced between sites fairly readily as students got to know each others' names, voices, and personalities. (The one exception to this was the Critical Thinking class at Humanities high school; they seemed somewhat critical of the entire class, including their fellow students at other locations.) Certainly, this process was assisted by field trips and visits. All students agreed it was helpful for the class to meet face-to-face at least once, and the earlier in the semester, the better.

> "In the end, we felt like one class. At first, I think there was competition between the sites, but then we realized that we had something to accomplish together. It helps to go see plays together and stuff to help you get to know each other."

> "It didn't take long for the students here and at BMCC and at Humanities to get to know each others' names and voices."

However, students acknowledged that the early days of the distance learning classes were not always easy. Some discussed feelings of competition and mistrust between sites.

> "In the beginning, the high school students had an attitude. They seemed to think they needed to prove something in a college class."

> "At first the differences between Hale and Humanities were rough. At first, when I said 'my' class, I meant Humanities. But now when I say 'my' class, it's all inclusive. So I guess the barriers fell down."

"I thought that the college students probably would make us look stupid. I was afraid of coming here actually. But that has changed a lot."

Other students felt that this experience of achieving a sense of group identity proved out one of the great benefits of distance learning .

"Sara J. Hale and Humanities are just at two opposite poles, and we came together. It has the potential to bring people together. The fact that we could communicate was amazing."

In addition, many of the interviewed students discussed what they experienced as the more interactive and participatory character of the learning in these classes. These were students who were taking the more innovative classes (Theme and Variation and Critical Thinking). One student, for example, contrasted a distance learning with a traditional class by comparing watching a live musical performance with listening to a record. This student was very focused on having actually written and performed plays in class, as well as having attended a professional performance in this class. The 'mix' of media (distance learning , within site, and performance attendance) appeared to be an important feature in the design of these classes for the positive experience of students.

Thus, it appears that the subject matter of these particular classes, the exposure to other students and teachers, and the novelty of the technological medium all infused students with a high degree of enthusiasm and motivation for their distance learning class experience. Students commented that they enjoyed sharing their perspectives and opinions with others and that they were stimulated by the opportunity to participate more.

"In another class you get tired of seeing the same teacher, hearing the same voice, but here you get all these different teachers and you don't get tired."

"I look forward to this class [Critical Thinking] not just because of the subject, but because of the interaction. All the students have different outlooks so you become more insightful and open-minded."

"This is the only class that I have where you can really express your own views. The rest of the time you just listen, but here you can talk."

"In other classes, they make you write from the books. But here, it is exploring yourself and it's more creative. The teachers never say that you're wrong. There's no right or wrong in this class."

"Speaking to another school at first intimidated me. After a while, I got into it and started speaking a lot and started to participate a lot. I got so much more comfortable, it helps me relate to other people outside also. It really has helped my personal life."

Overall on the survey, many students thought that an advantage of distance learning was getting to know students from other schools (46% thought this a major advantage, vs. 12% who said it was not). A substantial number of students (60%) did not feel that they had difficulty getting to know the teacher of the class, although 39% thought that getting individual attention was either a major or moderate problem, and 21% reported that there was not enough time to ask questions or discuss. A majority (55%) thought that it was also a major or moderate problem to get to know students at other sites.

With respect to improvements in distance learning , 49% believe an important improvement would be more in person contact with teachers and remote students, and another 30% thought it a moderate improvement.

Thus, from these data overall, distance learning presents particular challenges to interaction and relationships between students and teachers, and students and each other. As we see in students' enthusiasm for the innovative classes, however, it appears to be possible through thoughtful design of the distance learning experiences to take advantage of the access to content and people that distance learning can offer to students.

Student selection

Some administrators reported that they aimed for broad participation on the part of students, inviting as many as possible to take part in distance learning . Many thought it worth the effort it takes to give more students access because of the potential of distance learning to energize students, and "open up their worlds". Other administrators thought that students should be screened, trying to identify students who would function well in the circumstances of distance learning .

Few of the teachers, however (22%) thought that distance learning is especially appropriate for mainstreaming special education students. Many believe that distance learning is best suited for highly motivated students (56%), and most thought distance learning requires more maturity and discipline on the part of students (75%).

With respect to the student perspective, relatively few were guided to distance learning through encouragement by their guidance counselors (25%). The remainder seem to have found their way to the classes through personal interest, curiosity, or the need to take particular courses.

IV. Case Study: *The Lincoln Center Institute Story*

Providing school systems with the capacity to make new, expensive, or rare resources available to students and teachers is one of the primary justifications for distance learning technologies. Classes taught by uniquely talented teachers, artists, scientists, humanists, or public officials, are usually limited to the geographic home bases of these rare resources or to those times when they can move to different locations. With distance technology, the same resources can move simultaneously out to remote sites and can be shared among several classrooms. There are, of course, gradations of scarcity, as we have seen in the NYClassnet program, ranging from traditional subjects that are eliminated by budget cuts, to AP courses for a small number of advanced students, to traditional courses taught by teachers with specialized knowledge, and to courses such as those described in this case study that are presented by other institutions whose governance, funding, and purposes differ from those of the school system. Many of the design and implementation issues remain the same for these different courses, but they may be expanded and made more complicated when the institutions differ.

The New York City course developed in cooperation with The Lincoln Center Institute (LCI) represents several of the principal characteristics of a rare or unique instructional resource. The story of how the course was developed, its distinctive elements, the problems associated with its implementation, the adjustments and compromises it requires on the part of LCI and the schools, and the extent to which the course succeeded are instructive for all who would consider developing and delivering unique instructional programs to high schools.

Lincoln Center Institute participation

Before the course could be developed a series of initial meetings and conversations had to occur between the Board of Education and the LCI administration. "Institutional" memories of this period and its ultimate consequences are not completely consistent, but descriptions of the general tone of the negotiations and the major policy issues are in agreement. A Board of Education representative believes that its administration went to great lengths to entice a somewhat reluctant Lincoln Center Institute to join the project. Her perception was that LCI, "believes only in live performance, and so they are hesitant about this."

Members of the Lincoln Center team had concerns about not sacrificing their educational philosophy to the imperatives of technology, but said they were interested in new ways of working with the Board of Education. The executive director of LCI described LCI as willing participants, curious to discover how distance learning would affect what they do. He says that it was a struggle to figure out how the course could fit into the program and the philosophy of Lincoln Center. "We were adamant that it had to enhance what we do rather than replace what we do." The LCI staff insisted that their motivation for joining the initiative was not simply to develop a cheaper, more expedient way to get the arts into the school. They asked several central questions of themselves in the beginning:

How will it affect our program?

Should the technology be visible?

Should the technology be part of the process?

How useful is technology in a program that features "live performance?"

There were also questions about the distance learning initiative itself and the role of the Board of Education in the process.

Who was in control?

What vision does the leadership have?

Who will give LCI feedback on the implementation of the course?

The teaching-artists from LCI had their own reservations about participating in a Distance Learning project. They were particularly worried about how the use of technology would change the live performance character of their work. They did not want distance learning to entirely replace face-to-face contact with the students. One teacher noted:

"I thought, 'what is this, and why am I being asked to do it?' I had heard from a friend who had taught in a distance learning classroom that it was riddled with problems."

Another of the LCI teaching-artists explained that his initial reservations were tempered by a three-week training program with the equipment and by his own prior experience with the use of technology in his teaching. As a musician, he was used to using mixers, CD players and graphics in his presentations. The key to success in the distance learning initiative, for him, was to find ways to be creative with the technology and to look for new ways to teach that took advantage of the technology's strengths. He

felt that a traditional class, at least in the sense of a traditional LCI class, should not be taught over the network.

> "In retrospect, we had an expectation that we could just go in and do what we do at the Institute, make a few adjustments, put it on-line and deal with the technology as a support system. I think one of the important things that we found out is that in the beginning there needs to be a partnership between the goals of the Institute and how technology is going to help us meet those goals."

The theme of "partnership" introduced in the preceding comment is one that we find echoed, with all its complexity, throughout discussion of the development of courses with outside institutions. We also noted that as solutions were found to some start-up problems, as teachers became more engaged and accustomed to the program, and as both groups saw signs of success, attitudes became more positive. In the beginning, the LCI staff and administration raised several questions about the project's lack of definition of a specific mission and goals for the network; they felt that the lack of a defined sense of shared purpose was detrimental to the success of the project. The LCI executive director captured the sense of apprehension in the early days of the initiative:

> "We went into this in the spirit of experimentation. In that sense, no false promises were made. The unmet expectation that I still have is that I'm not sure who is masterminding the concepts, [who is] helping all of us get a sense of how to keep pushing this, how to keep exploring. We are all off in our own little places chipping away at something, and we are not even sure that anyone wants us to chip in that area, and if it has already been done a hundred times, or if it is brand new. I still don't know what the Board of Education and New York Telephone really want to achieve in this three year project. Is it just to play in the sandbox for a while, or are there are real things we are trying to achieve?"

The Lincoln Center Class

The class offered by the Lincoln Center Institute was called **Theme and Variation,** and it was designed to connect two NYC schools in the fall and three in the spring to newly installed distance learning facilities at LCI where various artists, from playwrights to musicians, explored multiple forms of art with the students. The central design problems for the course were how to preserve the integrity of a traditional Lincoln Center Institute residency with its emphasis on live performance and how to integrate technology into the instruction and performance components of the course. In the fall, there were 13 students at Humanities and 20 students at Sarah J. Hale participating in the project. In the Spring, three schools

participated: Washington Irving had 17 students enrolled, Humanities had 12, and Hale had 19. For both semesters there was an even mixture of seniors and juniors in these classes, with a couple of sophomores at one of the sites.

The major change in thinking about collaboration with LCI for the distance learning network was to make the LCI experience a regularly scheduled class. In the beginning the LCI staff came into the schools only three times without that much input from the HS teachers. Once the decision was made to make it a class, offered every day with visits from the teaching-artist, the teachers took ownership over the class and really worked extensively with the TAs in developing a new curriculum. They judged the new class to be very successful.

The high school teachers who were involved in this class participated in training sessions at LCI to prepare them for integrating the arts into their regular classroom curriculum. The high school teachers worked extensively with the teaching-artists before the two semesters, scheduling, planning and designing the content of the course. In interviews, the teaching-artists both praised the extensive work done and ownership taken by the teachers and indicated that they rarely found this level of participation in their work with other teachers in traditional classes. This level of involvement may be a reflection of the selection and recruitment of teachers. It may also be a result of the fact that in the distance learning design, the LCI teaching-artists visited the classes more often than they usually do the classes of their LCI live performance program.

Most of the LCI classes were designed to be student-centered. The students worked on various class projects, both individually and in groups, and they worked directly with the teaching artists. Students commented on how they appreciated working with the teams of teachers.

> "I felt important because we were the students and they were the teachers, but everything we said and everything we did counted and was respected. There were no limitations put on us at all. You could really be yourself and really let your imagination go."

Another student described the empowering aspect of the learner-centered approach:

> "I would love it if the students could take over the class. We could be the teachers. I loved when I was the conductor for the Lincoln Center orchestra and from that time on I wanted to take over the class."

The high school teachers took on full responsibility for many of the classes at the end of the semester. A teacher from Washington Irving taught a segment on dance which was very innovative. The students were constantly choreographing and rarely sat at their desks. She and the students figured out how to move in the space that they had in the distance learning room. During one segment of the class on Jazz, the Irving dance students who had performed at Lincoln Center performed in a representation of different instruments in a quintet. A very lively discussion ensued between the dancers and the students at other sites and the lesson integrated dance and improvisational jazz in a stimulating way. The high school teacher at Hale, who taught the segment on theater, used more video and gave a fact-based lecture with a question and answer period. That section of the class was stimulated less active student participation than we saw during the earlier music, dance or drama sections.

At different times during the LCI class, we observed such class activities as: translating Hamlet into street language; an introduction to the Blues; dance choreography using student-composed music; student-composed improvisational jazz; performance and discussion led by music composer Roy Hargrove; the Director from True West discussing play direction; and students viewing a live performance of a play at Lincoln Center. Class activity included both watching actors from True West performing and students from different sites improvising their own scenes across sites. Two field trips to the theater to see a music performance and play provided a way for the distance learning students to have a question and answer session with the performers and for students from different sites to meet one another face-to-face and allowed the LCI live performance principle to have a place in the distance learning program.

Students and instructors indicated that they found the class to be very exciting and highly motivating. Students said that they were very excited, not only with the content, but also with all the different professionals (other teachers, teaching-artists, directors, actors, and musicians) that they were able to be in contact with. They were also very engaged with the different types of work that they were asked to do. Several students noted in interviews that this was the first time in their school experience when they felt their opinions and feelings mattered and that they were really listened to. Such had not always been the case. One of the LCI teaching artists said in a December 1993 group discussion at Lincoln Center, that she had thought that the high school teachers would be more involved and interested in the LCI classes. This teaching artist also said she felt that the kids at the various sites were not communicating any enthusiasm in the class that she could discern. That we can see dramatic changes in feelings about the quality of the class speak not only to the normal changes that

innovations experience with the passage of time and the removal of bugs and problems, but of the quality of a partnership that sustains and encourages involvement and interest despite problems.

All the enthusiasm and excitement was not untrammeled, however. At the end of the semester, when a teacher from Hale was teaching the theater segment, one of the "remote" high school sites decided to go off-line to work on their own plays. The students at Washington Irving, the third high school site, were upset and felt that the class was "breaking up." The issues related to partnership extended beyond the relationship between LCI and the schools to the kinds of contracts the individual classes felt had been established.

For the LCI teaching artists, the issues of face-to-face contact and live performance, while ameliorated, are not erased. The impact of the distance learning technology on their ability to get to know and relate to the students is one of their biggest concerns. They believe their ability to know and relate to their students is integral to good teaching, and so this becomes a key issue for them in thinking through the long-term viability for distance learning as an educational medium. They have spent significant time and thought devising strategies to "compensate" for the distance and are eager for more discussion with their peers on this subject.

> "In the spring semester, I had three schools rather than two and I had a very difficult time getting the names of all the kids. I feel I don't know them at all, especially with Irving where I've not been able to go often. I feel really lousy that I didn't learn these names because it is very necessary for me to learn the names in order to connect. That's what I need to feel comfortable in the classroom. There is no way to get around the fact that you can't make the same connection on-line that you can make in-person."

Another LCI teaching artist commented on the impact of the class on the students by noting that the schools were culturally worlds apart and that the project had helped the students open up to each other. Students from one school, for example, commented that they had never taken classes with white or Asian students prior to the LCI class. The teaching artists saw his students becoming more positive about the experience as time passed.

The LCI class was seen as very innovative by the participating schools. The teachers were allowed to write their own curriculum with support from the schools administrations. The teachers at each of the sites were responsible for grading the students in their site. The teaching-artist had no input on the grades. There were two short quizzes given by the high

school teachers on musical instruments and the structure of a dramatic performance. Students were encouraged to keep journals of their class experiences and were asked to write "their feelings" about particular curriculum units such as "Jazz." Classroom participation was also considered as part of student assessment.

In January 1994, a Board administrator commented that she thought Lincoln Center had erred in not seeing all of the schools on the network as part of a unit. LCI dealt with each of the schools independently, which led to representatives from the different schools attending different meetings and a lot of confusion. However, by the second year LCI began treating all schools as one unit, which the Board administrator noted "went more smoothly." No other respondents seemed to feel this was a problem. As a the result of the second year success, one high school principal sees the program as a model of how other such partnerships should be developed.

> "I see the most promising outgrowth of the project as connections to university systems, possibly beginning in the summer or fall of 1995. Also I'd like to see more 'upward' connections to cultural institutions in New York City like LCI. I'd like to see more teaching in the arts, let the technology make possible things we can't do right here in the building, giving more exposure to the cultural richness in New York City."

The Washington Irving dance class and the responses of the teacher to the program are illustrative. She indicated that she thought that other classes taught in the distance learning classroom were mundane and traditional, not taking advantage of the potential for interaction and experimentation. She was initially leery of collaborating with other teachers. She is used to being in control of her class and her own space. She had never developed a curriculum with other teachers. She reported that she was much less intimidated by the technology than she expected and that she has adjusted to the space limitations, though she continues to wonder about how the students in the remote classes see and respond to her teaching. She had been warned by other teachers that she should expect all sorts of technology problems and that it would be "miserable." "That just wasn't the case. I was over prepared." Staff development was a weak point in the program, for this teacher. She feels that the school is still unsure about how distance learning can be developed and accommodate all the teachers, all the disciplines, and all the programs that might make good use of the space.

> "I think that this will be in some ways the future of teaching. Once the rooms are in it can be very cost effective, and we can offer classes to students that we wouldn't be able to do otherwise. It

would be great to see connections with foreign countries. It would
be great for language classes. It is a way to hook into the world."

She commented on the good relationships that developed among her
students and those from Sarah J. Hale. She also commented on her own
disappointment with the Humanities class for dropping out. "I was upset;
I felt, 'Oh well Humanities has something to do by themselves something
special.' I was put off by it." One of her students commented on the same
incident, "I thought it was rude. Why would they want to leave the class.
I didn't think it was right." The students from her class also expressed
some jealousy about how their teacher had to direct a lot of her attention to
students in other sites. "She didn't really have the time to pay attention to
us. You had to be quiet when she was talking." The teachers often found
that, in the beginning, they overcompensated and focused on the distant
sites, almost exclusively.

Since the primary goal of the NYClassnet project was to expand the social
and psychological experience and capacities of inner city youth, the
relationships that did or did not develop among the students are key
indicators of the success of the project. During one session exploring a
scene between Ophelia and Hamlet, Humanities students expressed
interest in the Hale students' translations and remarked at how different
they were from their own. The Humanities students commented on the
different slang used by the Hale students and how it made understanding
them difficult. Such a small incident points to the gulfs that can exist
between schools and students even when they reside in the same city.
Distance can be variously defined, and Distance Learning can bridge
subtle chasms.

Technology: As we noted in the list of primary questions for the LCD
administration, one of the most challenging aspects of this class for the
Lincoln Center Institute and its teaching-artists was to figure out how to
integrate their philosophy with the distance learning technology. The
constraints most often noted were the stationary placement of the furniture
including the cameras and some of the audio difficulties. The active and
dynamic set of activities described above require student movement, open
or flexible spaces, and cameras that can accurately present subtle gesture,
facial expressions, and group interaction. The audio system would seem
to be particularly important for a curriculum that features music. The fact
that the teaching artists for the music sessions had extensive experience
with sound technology was used by the program. The artists sometimes
worked from the control booth and treated the system like a radio system,
playing the role of a disc jockey with the tapes. The students seemed to
like this variation.

In a design insight that is not unusual for artists, who often admit of "no mistakes that can't be turned into expressive opportunities," the LCI teaching artists sought ways to incorporate the characteristics of the technologies into their course. Rather than making the technology "invisible," teaching-artists experimented with ways to incorporate the existing equipment and furniture into their dramatic and choreographed expressions. The teaching artist for the theater sessions had more difficulty finding ways to use the technology than the musicians, because their own art form's technology is more remote from the performers — lights, sound amplification, stage apparatuses. They had to think more like film or television artists than stage performers. They found new ways to use the camera and the document camera during this class, for example — kids using the elmo to "orchestrate" the artists playing the instruments. During a few classes, LCI had two cameras film students' improvisation and scenes, sometimes violating the rules of the distance learning program by disconnecting the fixed cameras and using them as moving cameras. One of the Lincoln Center teaching-artists explained how she had adapted exercises to incorporate technology:

> "I try to do a lot of exercises that focus on interaction between students. The camera becomes the element that you either work around or work with. I create exercises that use the camera and include distance. I might set up an improvisation that two students are involved in a phone conversation because it incorporates distance and technology."

The LCI administration bargained with NYNEX to make sure that the distance learning installation at Lincoln Center was designed to support the different nature of their program. This design allowed cameras to move from the theater to an office, to a classroom setting where they could be plugged into wall outlets connected to central control facilities. Thus, the LCI facility could move flexibly from setting to setting, even during the same class, and could incorporate work in different physical environments. For instance, students were encouraged to think about different camera angles while they were staging and performing their scenes.

There were many technical problems noted with the audio system. However, many of the artists seemed to work around these problems, albeit with some frustration. For example, when a jazz musician could not hear the remote sites, he and the students developed hand signals to differentiate the musical phrases.

At a certain point, Lincoln Center did retain the services of a consultant to help adapt their program to the distance learning medium. They felt that such a position should have been built into the project at the beginning. In hindsight, they realized that they had not initially grappled with how to "push the technology or the instruction" and had instead been more focused on concrete details (e.g., how is the room set up, who will monitor the room). The LCI administration felt that this should have been discussed in the first six months, not a year and a half into a three-year project. The decision to bring in an outside consultant was a departure from the practice of others involved in the New York City distance learning project and had its own consequences for the LCI component.

The consultant described his work as a three stage effort to help the LCI artists and administration to accommodate the technology, maintain their own program principles, and find new ways of engaging students in the use of distance learning technology. The three stages were: planning; professional development with LCI artists in 3 schools; working as director and producer of LCI on-line presentations from Lincoln Center facilities. The professional development work with the LCI teaching artists was designed to help them become more comfortable with the use of distance learning technology by having them complete practice exercises in the distance learning classroom that encouraged them to extend their understanding of how the cameras, recorders, and sound systems could be used. The exercises also gave them new ideas about how to allow students to take control of the cameras and use them in more student-centered activities. He had the teaching artists practice television performing techniques such as looking into the camera but attending to the monitor in an unobtrusive way. He saw his mission as finding ways to bring out the potential capabilities of the students.

Working as a Director and Producer proved to be somewhat controversial in that the teaching artists indicated that they sometimes felt that the consultant overstepped his responsibilities. He himself described sessions in which individuals struggled with one another over their ideas, though he says that he did not produce what the teaching artists did in their classes because they knew better than he the intricacies of the LCI program and their students. One of the teaching artists indicated that her main "job" in teaching in the distance learning room was to make sure that the educational philosophy of LCI was not lost. This, in her view, involved keeping personal contact with the students, keeping them on their feet and active, working in small groups, and having lots of spontaneous work. Her adjustments to the technology were to create new exercises that incorporated the technology and that focused on interaction between students. As she put it, "The camera becomes the element that you either work around or you work with."

The consultant saw the group as collaborators. Among the things that LCI did to support the work of the consultant was to install a full production control station that was far more elaborate than that of any of the participating schools. The equipment at the consultant's disposal allowed him to exercise great control over the production and the production values of each class. LCI distance learning facilities ultimately included an office, a theater, and a small classroom, all capable of supporting broadcasts onto the network and all managed through the director's control booth. The consultant said that, though it was not their primary aim to make the classes like television, these facilities made the LCI classes more like television shows, except that the students are participants in the show. He indicated that this arrangement helped students establish a sense of their own importance. He would like to see the entire distance learning project make such use of the technology and to see students increasingly make use of the equipment, making tapes to share on-line as part of their classwork.

The Board project administrator, in an illustration of the differences in perception that existed within the partnership, said that LCI had no idea how to use the technology. For their part, members of the LCI team said they were surprised that the technological fluency and sophistication of teachers and students in the distance learning rooms was so limited.

While the objective members of teleconferencing is to facilitate communication over distance, some of the LCI team noted that aspects of the distance learning technology make it more difficult to communicate. They noted that the sensitivity of the microphones seemed more suited to a "corporate board situation" where everyone sits quietly and speaks in turn.

> "But this is an inner city high school, and that's not how people talk."

V. Recommendations

As noted repeatedly in this report, it takes a long time to develop, implement, refine and stabilize an innovation in education. Research over the last decade suggests that 3 to 5 years is generally required for substantial technology-enhanced innovation. The importance of this cannot be overemphasized. Program managers need to recognize this need for time and need to encourage those in the midst of technology project work to persevere. We also aim to underscore that innovations are not simply designed and executed, but must be monitored, nurtured, and refined as the technology, the educational goals, and the context of the project change. Distance learning in New York City is still young, and the findings from this research can help to guide modifications in its next stage.

Based on the research, we recommend that the following issues be considered:

1. The primary goals of the project have been to enhance the courses and content available to students, and to expand their cultural horizons beyond their own neighborhoods by enabling them to experience environments through the use of the technology. The project has also experimented with some innovative distance learning formats, including working with institutions outside of the K-12 public education system. The project is still in a state of tension about some features of the system-wide partnership that is needed to maintain it. Special attention needs to be paid to the problems that appear to be chronic, such as scheduling and planning — a problem across the participating schools. When outside institutions are invited to participate, some of these problems are emphasized. For example, when partnering with a college, problems of grades, teacher collaboration, expectations for student performances, and credit arise. Review of project structure to resolve such problems and achieve a balance in partnership for continued coordination is likely needed as distance learning moves from implementation to stabilization.

2. Issues of establishing relationships across distances are of primary concern to teachers, and also to students, especially those involved in the more traditional distance learning classes. Students in the more innovative classes appeared to be quite excited about the opportunities to participate more in class that these innovative designs offered, and to 'meet' other people through them. We recommend that the design of these classes be carefully considered in relation to all of the distance learning classes. Can some of their features be used to guide the design of other classes to enhance student participation and perceived interactivity?

   Many participants are especially sensitive to perceptions that they don't really know each other when this knowledge is completely mediated by the technology. This issue of relationship needs to be more thoroughly explored, both for the success of project, and also because any creative solutions will be of value nationally. A combination of strategies for getting classes together physically, for teacher visits, and for experiments with the technologies for both in-class interaction and for more individual interactions outside of classes should be explored.

3. A third goal for the project was involving the schools in the future of education. The meaning of this is somewhat vague for many,

but the conviction of being engaged with new strategies for education has supported perseverance through some of the more vexing problems. In light of the success of the distance learning teachers using traditional pedagogy in the distance learning classes, the project is well-poised to experiment with more innovative uses of the technologies, especially those linked to other desired changes in teaching and learning in the city and across the country. Therefore, experiments in innovative format and pedagogy should be encouraged.

4. There was a relatively high level of student interaction in the innovative distance learning classes, especially when compared with the non-distance learning class, and with other studies of interaction in high school classes. Consider the evidence of quite low levels of student participation in the traditional classes — it is likely the norm. In addition, continue to focus on and emphasize the type and quality of interaction that is best supported in these media.

5. The innovative classes involved a mix of media and activities, including more time spent in local activities (rather than overall lecture mode), more explicit experimentation with the available technologies, and a variety of interactions between students, teachers, and teaching artists. Students and teachers were most reflective and enthusiastic about these innovative classes, including students' enjoyment of the degree of participation they experienced in these classes. This kind of experimentation with mixed media course design — using the different aspects of the course to advantage — should be encouraged.

6. Teachers would like more opportunities for professional development for distance learning. While they feel comfortable with the basic operation of the system, and with transferring their familiar teaching style to this context, most would like to learn more advanced instructional techniques for the system, to integrate the supplementary technologies like multimedia, to experiment with innovative pedagogy.

7. There were substantial problems with the technology, especially in the beginning years of the project. These appear to now be largely resolved, which enhances the experience of distance learning for all participants. Audio remains an irritant on infrequent occasion, and it is necessary to remain vigilant to possible improvements. With respect to refinements, the most frequently heard concerned refinements to the visual components of the system, especially those that may strengthen the nature of relationships across distances. Teachers and students

would like, for example, larger and sharper monitors; they also want more flexible cameras — movement that allows them to more 'naturally' follow the interactions. Experiment with these refinements. Also, students would like larger roles in the operation of the classes and network, and this may be used to advantage to improve the overall flexibility of the system.

Endnotes

[1]   Bette Kalash, Sandra Sollod Poster, and Joan Jarvis, "NYClassnet,"
     <u>Faculty Focus</u>. New York: Borough of Manhattan Community
     College, p. 2.

[2]   Terrence E. Deal, "Educational Change: Revival Tent, Tinkertoys,
     Jungle, or Carnival?" in Ann Lieberman, Ed. <u>Rethinking School
     Improvement: Research, Craft, and Concept</u>. New York: Teachers
     College Press, 1986, p. 115.

[3]   Shelia Cassidy and Carla Lane, "Planned Change and the Adoption of
     Distance Learning," Distance Learning Resource Network, U.S.
     Department of Education, p. 1.

[4]   Linda Roberts, in Cassidy and Lane, p. 2.