



West Windsor-Plainsboro  
Regional School District

# Technology Program Evaluation

January, 2003



# Table of Contents

<b>Internal Team Report.....</b>	<b>1</b>
<b>District Mission, Technology Vision, Goals.....</b>	<b>2</b>
<b>K-12 Computer Technology Education Overview.....</b>	<b>12</b>
<b>Technology Program Assessment.....</b>	<b>15</b>
<b>External Team Report.....</b>	<b>19</b>
<b>Instructional Technology Assessment.....</b>	<b>23</b>
<b>Findings and Recommendations.....</b>	<b>28</b>
<b>Related Instructional Issues.....</b>	<b>39</b>
<b>Leadership, Governance and Effective Administration..</b>	<b>41</b>
<b>Governance and Leadership.....</b>	<b>41</b>
<b>Staffing, Organization and Administration.....</b>	<b>45</b>
<b>Related Technical Recommendations.....</b>	<b>59</b>
<b>Conclusions.....</b>	<b>63</b>
<b>Appendices and Bibliography.....</b>	<b>65</b>

Blank Page

# **West Windsor-Plainsboro Regional School District**

## **Technology Program Evaluation**

### **Internal Team Report**

**January, 2003**

#### **Internal Team Members**

Kevin Caruso - AV Engineer

Rick Cave - Interim Coordinator of  
K-12 Technology, former HSS Facili-  
tator

Rich Cherney - MIS Team Leader

Tom Connolly - HSN Facilitator

Sharon Feig - Middle School Facilita-  
tor

Sharon Merritt - Computer Teacher

Mindy Novis - Director of Institute of  
Professional Development

Lisa Pacifico - Computer Teacher

John Peraino - Director of Technology  
(retired)

Pat Polio - Computer Teacher

Debra Resch - Elementary School  
Facilitator

Mariam Robin - Middle School Super-  
visor of Science

Eileen Schwartz - Computer Teacher

Brian Stevens - Village School Princi-  
pal

Carl Wehmann - Middle School Tech-  
nician

Lynda Weston - District Technology  
Project Assistant

Mark Wise - Middle School Supervisor  
of Social Studies

Sharon Zubricky - Computer Teacher

# District Mission, Technology Vision and Goals

## **Executive Summary**

### **Preface**

The West Windsor-Plainsboro Regional School District (WW-P) is unique in New Jersey. This area of New Jersey has experienced, and continues to experience, much growth. The school district is within commuting distance to New York and Philadelphia, and several universities and colleges (Princeton University, Rider University, Rutgers University, The College of New Jersey, and other institutions in the metropolitan areas of New York and Philadelphia) are within close proximity. Financial services, organizations, and insurance and pharmaceutical firms have located or expanded operations in the area.

The West Windsor-Plainsboro Regional School District has a student population of approximately 9,000 students. The district is ethnically diverse with students from all over the world speaking 55 languages. It is a high-achieving district. Presently, ten schools serve Kindergarten through Grade 12. Four schools house grades K-3: John V.B. Wicoff School, Maurice Hawk School, Dutch Neck School, and Town Center at Plainsboro. The Village School and Millstone River serves Grades 4-5 and the two middle schools, Community and Thomas R. Grover, serve Grades 6-8. The district has two high schools, WW-P High School North and WW-P High School South.

The use of educational Technology is not new to the West Windsor-Plainsboro Regional School District. For the past 12 years, Technology has been a part of the school district. WW-P is proud of our electronic libraries, administrative network, computer literacy in Grades K-8, and an elective program in Grades 7-12. As a district, we feel a responsibility to provide all of our students with the very best learning tools available. As a result, all students will be able to use the tools of educational Technology effectively, holding in their hands the means to shape their own destinies, in accordance with New Jersey's action plan for Educational Technology and the Core Content Standards.

In 1993, the district developed a Strategic Plan, which included goals and objectives for Technology integration. The stakeholders, which included parents, students, teachers, administration, and members of the community, insisted that there be substantive educational reform, especially in the area of computer use in the classrooms. This reform must include earlier and more exposure to technologies, so that the use of Technology becomes "second nature" for students in their continuing education and the world of work.

In order to meet this challenge, the current WW-P Technology plan includes:

## **Technology Vision Statement**

The West Windsor-Plainsboro Regional School District will prepare students for a future characterized by change and an increasing dependence on Technology. Toward that end, the district will utilize appropriate information Technology to create a collaborative, hands-on, learning environment in which teachers and students routinely work with Technology.

## **Curriculum Integration Goals**

All students will use current technologies to develop skills and knowledge necessary to gather, analyze, and communicate information in a global society. West Windsor-Plainsboro Regional School District will continue to integrate Technology as appropriate to implement local, state, and national standards such as the New Jersey Core Curriculum Content Standards at all grade levels and in all curricular areas.

## **Community Goals**

West Windsor-Plainsboro Regional School District will continue its relationship with community-based groups, i.e. Educational Foundation, Cable Commission, MercerNet, Mercer County E.T.T.C., to expand the availability of district Technology.

West Windsor-Plainsboro Regional School District will provide the community with access to the district's technological resources to strengthen the link between home and school.

## **Infrastructure Goals**

All West Windsor-Plainsboro Schools will have equitable access to current information and communication technologies.

The West Windsor-Plainsboro Regional School District will diligently maintain data integrity and security.

All schools and district offices will be connected within and among a secure network infrastructure which will provide both information and communication services.

## **Staffing and Professional Development Goals**

The West Windsor-Plainsboro Regional School District will provide ongoing opportunities for all staff to develop the skills necessary to utilize current Technology.

The West Windsor-Plainsboro Regional School District will provide ongoing opportunities for instructional staff to develop the strategies necessary to integrate Technology into the curriculum.

The West Windsor-Plainsboro Regional School District will provide the necessary personnel to insure that assistance in the effective use of Technology is available in each building.

The West Windsor-Plainsboro Regional School District will provide the necessary personnel to maintain the Technology infrastructure in the district.

---

## **District Mission Statement**

The mission of the West Windsor-Plainsboro Regional School District is to ensure that all students acquire knowledge, skills, and attitudes necessary to realize their potential and become productive and responsible citizens of a changing world; this is accomplished by providing dynamic educational programs in partnership with parents and our entire diverse community within our unique academic, business, cultural, and scientific environment.

## **Technology Vision**

The West Windsor-Plainsboro Regional School District believes in preparing students for a future characterized by change and an increasing dependence on Technology. All students will develop the skills to gather, analyze, and communicate information using the same state-of-the-art Technology tools and resources used in the world outside of school. Our curriculum, in alignment with the New Jersey Core Curriculum Content Standards, will ensure that all students have continuous growth in utilizing Technology in their education. Integration of Technology will bring changes to our school district on many different levels from classroom to administration.

Our vision is to use appropriate classroom Technology to create a collaborative, hands-on, curriculum and learning environment. The plan presented herein describes our desired mechanisms for curriculum integration and the Technology required for each of the curriculum areas. It recommends training and competency goals for students, teachers, administrators and support staff.

Our district's administration will be able to conduct the business of education more efficiently and effectively with the use of Technology. The partnership and interaction between schools and community will be enhanced. The West Windsor-Plainsboro Regional School District is committed to giving all students, teachers, administrators, and the entire community access to the resources necessary to make this vision a reality.

### ***Why Technology?***

The world is changing rapidly. It is the district's charge to remain current and keep pace with this change. This Technology Plan is a comprehensive and important step in that direction. West Windsor-Plainsboro Regional Schools are dedicated both to providing quality education in all academic disciplines and to fulfilling educational needs of all students. It is evident that computer and technological mastery has moved to the forefront of society today. At this point in time, the ability to function in our society dictates that every student in the district becomes literate and functional in the use of Technology. The district is striving to make classroom Technology as natural as reading and writing. Today, the children from Kindergarten through Grade 12 use computers, interactive videodisks, CD-ROM, digital cameras, scanners, and other equipment as part of the instructional program in all subjects.

Technology can be used to provide learning experiences and help to access the abundance of information necessary to compete in today's world. The computer is a vital tool for students, teachers, and parents when used to enhance the education process.

New technologies will continue to be studied and to be integrated into our educational system wherever appropriate and useful. All students and teachers will be exposed to the many uses and applications of this tool, providing equity and uniformity throughout the district. Study skills, specifically organizing and outlining information, will be refined. The vast amount of material available through CD-ROM and on-line searching necessitates identifying main ideas and the development of thought processes to sort through relevant data.

---

## Summary of the Planning Process

In September 1997, the charge of the West Windsor-Plainsboro Regional Schools Technology Committee was to develop a five-year plan. This plan would communicate the district's vision and goals supporting the incorporation of Technology in the everyday lives of our students, teachers, administrators, and support staff. The plan stipulates that Technology can and should be integrated into the curriculum and employed with thoughtfulness and care.

Integration of Technology is not as easy as it might appear. The Committee did not begin with the attitude that Technology itself is the answer. Rather, the Committee began with an attitude that it must take a rational approach based upon what it is that students, teachers, staff, and other stakeholders already know about Technology and how it fits into the curriculum. Questions needed to be asked and answered, not just to initiate the planning, but asked and answered again and again in order to ensure the Committee was developing a plan that is the most effective and cost-effective way to meet the objective of providing students with the skills they need to succeed in a technological society.

The Committee consisted of stakeholders who shared the district's vision, and included members of the Technology staff, Technology support staff, building and central office administration, Board of Education, and parents. The committee was informed of the previous Technology plan and current status of district Technology.

The Center for Educational Leadership and Technology (CELT) assisted the district in the development of the five-year plan. Their expertise and support staff enabled the committee to evaluate the current status and identify the direction, which the district needs to move. The activities provided by the center enabled the committee to define Technology priorities prior to the development of a district-wide Technology plan.

A district-wide survey for teachers was administered in October 1997. The results of the survey helped the district in the successful development of a five-year plan, which reflects the needs of the instructional staff.

There is a need for specific goals and objectives, which support the overall planning and implementation of the desired course of action. The following action steps will assist the district in meeting these critical needs and priorities:

- Development of a Technology infrastructure.
- Implementation of a comprehensive professional development program.
- Coordination of the district's education Technology program with statewide Technology planning initiatives.
- Establishment of Technology standards for application software and network protocols to ensure that individual classroom and school-level initiatives are compatible and transferable across the district.

The district Technology plan was updated in 2001, reflecting progress made and updating Technology metrics and goals.

## **Administrative Technology**

The primary application of Technology in the area of administration focuses on continuing improvement in the areas of productivity, data management, data retrieval and the accurate creation of records and data sets. Recent enhancements in those areas include the final implementation of a Central Office system, which encompasses Fund Accounting, Payroll, and Human Resources. An automated system for securing substitute teachers now is in place. The effects of staff training, common operating systems and the application of standard software products have improved daily office tasks. Better understanding of the Internet as a business tool has sped communications and the transfer of data from building to building. Digital imaging is being tested in the areas of employee ID badges and student records archival. Web pages have been developed and are fully operational for all schools in the district.

Current and future projects include the initiation of resume scanning and the building of an accompanying database by the Human Resources Department. The student/school database currently in place at the high schools and middle schools will be expanded to replace the existing system at the elementary schools and provide a district wide standard student records system. Many systems are currently under review to determine where links can be created, between them, to eliminate redundancy and speed data flow. A district-wide, common, on-line purchase order system is currently in the design state.

The finalization of a district Wide Area Network (WAN) will present major opportunities to communize business operations in the areas of forms, databases, record updates, centralized student registration, and all central office systems.

## **Technology and Professional Development**

The Institute of Professional Development Computer lab has served 725 attendees since its inception in 1999. Workshops began on November 1, 2000 after a month of planning and coordinating with all involved. Workshops also are offered at each school for site-specific training. A full-time facilitator does the planning, scheduling, and most of the staff training in conjunction with support from Mercer County E.T.T.C. Both Macintosh and Windows platforms, along with appropriate software, are available in the training lab, supporting the structure of our district.

Most of the training sessions have been held during the school day with substitutes utilized to cover participants' classes. Sessions are scheduled for at least approximately 2 hours. All participants are required to complete a course evaluation form. The data collected from the evaluation forms has been utilized for ongoing analysis and renovation of current and future workshop offerings.

The computer lab maintains a membership with the Mercer County Educational Technology Training Center, (E.T.T.C.), located in Princeton. Staff from the E.T.T.C. comes to the district lab to supplement workshop offerings.

The training offered to support the district's investment in Technology has been welcomed and appreciated. Now that the training lab is established as an integral part

of our educational environment, the district plans to reevaluate and modify training strategies to better meet the needs of the staff.

## **Distance Learning Technology**

The district's current venture in the area of distance learning will continue to expand in the following three years. With the process well underway at both high schools, the number of classrooms involved will continue to grow. The district will increase the use of video conferencing as a business tool for supervisors and administrators throughout Mercer County. Current plans including having students from neighboring elementary and middle schools use these facilities to engage in distance learning with other students in their respective age brackets.

The World Language Department currently offers four classes that are shared between HSN and HSS through the use of the distance learning labs in each building as part of the MercerNet Network. The teachers in Chinese 1, Chinese 2, Chinese 4 Honors, and German 4 Honors alternate weekly between the schools. The students at the remote sites can see, hear, and communicate with the students and teacher at the originating classroom.

To ensure successful implementation of the plan, the Assistant Superintendent for Curriculum and Instruction, the Director of Technology, and K-8 Curriculum Supervisors must work cooperatively to continue to keep the district focused on the goals and objectives of the five-year plan. All district staff will assist in accomplishing the plan through proactive activities.

---

## **Educational Goals and Objectives**

**(effective July 1, 1997 - June 30, 2004)**

The West Windsor-Plainsboro Regional School District has established the following goals to support its vision. These goals align with the Core Curriculum Standards, emphasize the partnership of school and community, prioritize appropriate staffing and training, and support curriculum, community integration, infrastructure, and training.

### **Curriculum Integration**

The West Windsor-Plainsboro Regional School District will continue to integrate Technology as appropriate to implement local, state, and national standards such as the New Jersey Core Content Curriculum Standards (CCCS) and the National Educational Technology Standards (NETS) into all curricular areas.

- All students will understand important issues of a Technology-based society and will exhibit ethical behavior in the use of computer and other technologies.
- All students will demonstrate knowledge and skills in the use of the computer and related technologies.
- All students will use a variety of technologies to access, interpret, apply and communicate information.

The curriculum goals align with the district mission statement as well as the district Technology vision statement. Skill levels must be achieved in order to effectively use electronic resources, information and communication. The integration of Technology into all areas of curriculum will be implemented using state, local and national standards as guidelines.

### **Community**

- The West Windsor-Plainsboro Region School District will develop a consortium with community-based groups to expand the availability of district Technology.
- The West Windsor-Plainsboro Region School District will provide the community with access to the district's technological resources thereby strengthening the link between home and school.

The partnership of the community and schools in the area of Technology is crucial. Taxpayers need to get into schools and see how their money is being used to educate their children for a productive career in the 21<sup>st</sup> century. It also is helpful to involve local businesses and community groups to solicit equipment or funds to further the goals of Technology in the district.

### **Infrastructure**

Infrastructure is the backbone of any Technology plan, without which it could not function. It is, therefore, very important to achieve a well thought out design and implementation plan to ensure that the infrastructure will support the curriculum and any other needs the district may have now and in the future.

- All schools will have equitable access to current information and communication technologies.
- The district will diligently maintain data integrity and security.
- All schools and district offices will be connected within and among a secure network infrastructure, which will provide information and communication services.

## **Staffing and Professional Development**

A Technology plan requires more than just the acquisition of equipment. There should be a support staff in place to encourage the use of Technology, to help maintain the Technology, and to provide timely assistance. Although appropriate staffing may sometimes require the establishment of new positions, it also requires constant assessment and redefinition of the responsibilities of the current staff members.

Professional Development workshops in the area of Technology began in the training lab in November 1999. One full-time person is responsible for the planning, scheduling and most of the training in conjunction with staff from the Mercer County E.T.T.C. The computer lab supports both the Mac and the Windows platforms with application software.

Sessions are held during school and after school, and run for approximately two hours. Substitutes are used to cover participants' classes. Each participant completes an evaluation form, which is kept on file.

The computer lab maintains a membership with the Mercer County Educational Technology Training Center, (E.T.T.C.), located in Princeton. Staff from the E.T.T.C. visits the district lab to train teachers and staff.

Site-based computer workshops also are offered at each school.

In addition, sufficient guidelines, training, and support are required for staff to develop a positive attitude and the skills necessary to use Technology. All district staff need opportunities for continuous growth in utilizing the changing Technology.

- The West Windsor-Plainsboro Regional School District will provide ongoing opportunities for all staff to develop the skills necessary to utilize current Technology.
- The West Windsor-Plainsboro Regional School District will provide ongoing opportunities for instructional staff to develop the strategies necessary to integrate Technology into the curriculum.
- The West Windsor-Plainsboro Regional School District will provide the necessary personnel to insure that assistance in the effective use of Technology is given in each building.
- The West Windsor-Plainsboro Regional School District will provide the necessary personnel to maintain the Technology infrastructure in the district.

# **K-12 Computer Technology Education Program Overview**

## **Grades K-5 Computer Technology Education Curriculum**

The K-5 Computer Technology Program shares the vision of the New Jersey Department of Education's Core Content Curriculum Standards including the Workplace Readiness Standards. Its goals are to provide all students with computer experiences that develop their capacity to understand important issues of a Technology-based society while exhibiting ethical behavior in the use of computer and other technologies. The students will participate in lessons that are based on a spiraling curriculum that includes keyboarding, communications, problem solving, curriculum integration, telecommunications, and multimedia. Faculty members encourage students to use the computer as a communication tool that will enhance their understanding of the global community. The use of age-appropriate software for each grade level enhances students' problem-solving skills. Throughout the curriculum, faculty encourage students to develop a positive attitude toward computer Technology, and to develop an understanding of the role of Technology in school, society, and the world.

## **Grades 6-8 Computer Technology Education Curriculum**

The Middle School Technology Program is designed to provide an exciting, stimulating and supportive learning environment in which students use Technology in all areas of school and community life. Middle school provides students with meaningful opportunities to gather and use informational resources and apply academic skills to solve real-world problems. Faculty actively engage students in activities that incorporate both educational Technology skills and relevant curricular materials. The course of study complies with the New Jersey State Curriculum Content Standards. The Computer Technology Education curriculum successfully addresses the issues of utilizing Computer Technology for the purposes of obtaining information, problem solving, thinking critically, and communicating effectively.

The overall curriculum goals and supporting objectives strive to prepare students to:

- Understand important issues of a Technology-based society and exhibit ethical behavior in the use of the computer and other technologies.
- Demonstrate knowledge and skills in the use of the computer and other technologies. These skills include keyboarding, word processing, designing multimedia presentations, Internet research, navigating and utilizing basic operating tools in the Windows environment using a fully integrated computer network.
- Use a variety of technologies to access, organize, analyze, interpret, synthesize, apply and communicate information effectively.
- Draw conclusions and make generalizations based on information gathered.
- Collaborate and cooperate in team efforts to optimize learning.
- Interact with others in ethical and appropriate ways to foster greater self-esteem.

The middle school Technology program is designed to promote self-directed learning and develop higher level thinking skills while preparing the student to deal more effec-

tively in an ever-changing technological society. The instructional approach is varied to include individualized learning, group learning, and teacher-directed lessons in order to accommodate the individual learning styles of all students.

The sixth grade computer cycle program meets on consecutive days for six weeks. This program introduces the students to a variety of computer applications and the Windows environment. Students are taught to utilize and navigate through the fully integrated computer network. Keyboarding skills are strongly emphasized along with basic word processing. Students are introduced to PowerPoint, which culminates in the development of a slide show.

The seventh grade computer cycle program meets on consecutive days for six weeks. The seventh grade cycle course begins with a review of typing skills, focusing on increasing speed and accuracy. Students utilize word processing while continuing to develop good typing habits and keyboarding skills. There is a unit on Internet research using a variety of search engines. At the end of this unit there is a multidisciplinary project involving an Internet scavenger hunt, word processing, and the use of proper MLA electronic source citation. Students then concentrate on designing and developing multimedia presentations based upon the information collected and analyzed from a variety of sources.

The eighth grade computer cycle program meets on consecutive days for six weeks. At the eighth grade level there is a review of word processing followed by an in-depth introduction to desktop publishing utilizing various formatting layouts, letterheads and brochures. Students are taught to design and develop electronic spreadsheets utilizing mathematical functions, sorting, charts and graphs.

The middle school computer elective program offers several different classes given on alternating days for an entire year. These include:

- Computer Applications (Programming Track) for the seventh and eighth grades. Students get an introduction to the world of programming through the use of Hyper Logo, HTML and web page design, and robotics.
- Computer Applications (Art/Photo and Video Editing Track) for the eighth grade. Through this course, students are introduced to the graphic world of computers. Painter 5, a powerful paint program, is explored. Then students then move on to still image editing (PhotoShop), followed by video editing (Adobe Premiere).
- TVFX (Television Production). In this course, students learn the various aspects of graphics for video, i.e. titles, transitions, backgrounds. They also become proficient with a wide variety of video editing skills, i.e. film capture, transitions, filters, clip motion, audio manipulation. The two areas are combined and the course culminates with the production of the End of Year Video presented at the Eighth Grade Salute ceremony.

## **Grades 9-12 Computer Technology Education Curriculum**

The study of Computer Science at the high school level consists of two separate curricular strands. First, is the application strand consisting of four semester courses (Computer Applications, Integrated Computer Applications, Graphic Computer Applica-

tions I, Graphic Computer Applications II) and one year long course (Digital Media). These courses provide work readiness and study skills in various computer applications: word processing, spreadsheet, database, Internet, web design, desktop publishing, graphic design, and digital video. The second strand is the computer-programming strand consisting of Introduction to Computer Programming, Artificial Intelligence & Robotics Honors, Advanced Placement Computer Science A, and Advanced Placement Computer Science B. These academic courses appeal to both students who plan to pursue a career in computer programming as well as those who wish to enhance their learning with programming experience.

In addition, students are exposed to many computer applications and activities in other disciplines. As teachers integrate Technology into the curriculum, students utilize digital research techniques, simulation software, productivity applications, problem-solving courseware, and computer communication skills in increasing levels.

---

# **Technology Program Assessment**

In reflecting upon the past 12 years, the continuous growth of the WW-P student population was most evident. Fifty percent of the district's schools were constructed during this period of time, resulting in an average construction of one new building every other year, not including additions to existing facilities. During this time of tremendous growth, there were many changes in the computing environment. We migrated from stand-alone machines to a fully integrated networked environment (WAN). Other changes included retrofitting the wiring within older buildings, providing Internet connectivity, and the implementation of a district-wide e-mail system. Also, the number of computers increased significantly to provide each classroom with a teacher station.

These initiatives required a concerted focus on hardware and software. Faculty, administrators, and support staff now view computers as critical tools for communication and work productivity. High expectations have impacted all Technology personnel, school administrators, and office staff, including technical support staff. With the launching of so many initiatives each year, we see that a tremendous bottleneck has been created preventing the district from reaching the curriculum and professional development goals of the district's Technology plan.

To enable WW-P to move forward with integrating Technology into all areas of curriculum, the Internal Team reviewed the district's current Technology plan and established a set of recommendations to bring the Technology Department to where it needs to be. We believe these recommendations will help the district achieve its goal of curriculum integration and will make current management operations in Technology more efficient and effective.

## **Technology Plan, Vision and Revisions**

In reviewing the Technology plan, the Internal Team agreed that the plan has not been well explained and understood. The plan now needs to be updated and revamped. We recommend that a Technology committee be created to develop a clearer vision statement and to make recommendations for decisions regarding future Technology issues. Members of this committee should include staff who wrote the original Technology plan as well as members of the Internal Team.

## **Curriculum**

The present organization allows the teaching of skills through the once a week computer classes at the K-5 level and six-week cycle classes at the 6-8 level. This structure needs to be validated and reinforced with additional application and practice through classroom integration. With no required computer classes at the high school level, there is the need to ensure a strong skill foundation in Grades 3-8. A student's ability to effectively gather, analyze, research, and communicate information through the use of Technology provides the framework for greater success in high school and college. Students and parents have expressed a desire to increase the opportunities for students to improve their Technology knowledge and skills.

- The Internal Team recommends the district revisit and update the 6-8 computer cycle program to support the classroom curriculum by introducing and expanding vital Technology skills.
- We recommend that K-2 students no longer attend scheduled computer class instruction. The lab and computer teacher, redefined as the computer resource teacher, should collaborate and assist with introductory and supplemental activities with K-2 teachers.
- We recommend that the scheduling of the Grades 3-5 computer programs be modified so that the classroom teacher is involved as an active participant in the computer class.
- We recommend that the district expand its Technology elective course offerings for Grades 7 through 12.

## **Computer Supervisors**

Skilled leadership is needed to support total curriculum integration. Technology faculty and support staff needs feedback and coaching from an individual who understands this content area. The position of computer supervisor also is needed to coordinate with building administrators and other supervisors to integrate meaningful and appropriate Technology into various curricula.

The Internal Team recommends creating the positions of K-5 computer supervisor and 6-12 computer supervisor. Along with the responsibility of providing leadership in the process of integrating Technology into the curriculum, the computer supervisor will supervise computer teachers, media specialists, computer resource teachers, and computer education facilitators.

## **Computer Education Facilitator**

The high schools and middle schools need dedicated computer education facilitators to act as liaisons to content departments, curriculum supervisors, and administrators in support of initiatives and programs to incorporate appropriate computer-related activities into the curriculum. With one computer education facilitator in each building, additional responsibilities would include developing and ensuring compliance with district policies in such areas as Internet usage, maintenance and safeguarding of district hardware and software, confidentiality and security of computer information, and assignment and disposition of district hardware and software. Also, these facilitators would perform an annual Technology needs assessment to determine hardware software, and maintenance requirements necessary to maintain an acceptable level of operability.

## **Computer Resource Teacher**

The Internal Team believes that the addition of a computer resource teacher for each K-5 building is essential. Many teachers have expressed an interest in increasing the impact of Technology in classrooms, but they do not have the necessary confidence, skills, or knowledge. The primary responsibility of the computer resource teacher would be to model Technology-based lessons, to provide teacher training, and to assist the

classroom teacher in designing and implementing lessons/activities that incorporate the use of Technology.

## **Replacement/Refresh Policy**

The Internal Team believes that a district-wide replacement and refresh policy is a key component of any Technology Plan. A mutually agreed upon replacement policy, developed by the administration, Board of Education, and Technology Committee needs to be devised and would cover hardware, software and operating systems. A companion piece should include a practical policy for the disposal, salvage, and/or sale of obsolete equipment.

## **Technical Support Staffing**

It is the true consensus of the Internal Team that the number of technical support personnel is inadequate. We recommend that each school building, the Special Services office, the Central Office, and the Transportation Office have a technician assigned to it based on number of users as well the amount and type of equipment within each building. The Technology Committee should develop an appropriate ratio of staff:technician to handle the needs of each facility.

Currently secretaries, computer facilitators, and the MIS Group contribute support to district systems and data collection. The coverage provided by MIS should be expanded beyond Special Services, Transportations and the Central Office. This focused coverage should include all K-12 administrative functions and SASI. The data management of the district and employee development in support of information systems should be an essential and ongoing component of future Technology Department discussions.

## **E-mail**

All faculty members and support staff members have a specific WW-P e-mail account. Yet, the current system is not centrally administered and is without technical support to enhance the system or solve individual problems. The Internal Team recommends that a newly created Technology Committee research and review potential e-mail software that might better fit the needs of WW-P faculty and staff. Specifically, the review should investigate the web-based e-mail component to ensure that it meets the needs of staff that do not have access to a dedicated computer.

## **District Web Technician**

As our district continues to grow, Technology provides us with the potential to share and collaborate through a variety of on-line resources. While various groups within the district have independently created a collection of web sites, it would better serve the district if a collaborative effort were made to combine and enhance all district-related sites. We strongly recommend that a district web technician position be created. Responsibilities of the district web technician would be to support the district's public information officer, and sustain the technical end of WW-P's electronic community. This

on-line community could include web sites, e-mail, file access via the web, bulletin boards, and related resources.

## **Computer Access**

We see a need for increased access of computers for students to better integrate Technology into curriculum at the 4 -12 levels. There is an inequity of access between grade levels and schools. In order for teachers to integrate Technology into the curriculum; they must have access to computers for all classes. Unless the computer lab is free all day, teachers cannot be guaranteed that they will have access. It is critical that the district provide access to computers throughout the day to provide equity among all students.

## **Professional Development**

The Internal Team took a deep and broad look at Technology professional development. We recognize that the emphasis on professional development has been to help faculty acquire entry-level skills. Workshop sessions offered through the Institute for Professional Development have served a purpose, by assisting staff to become comfortable and more confident in the area of basic computer skills. The Internal Team believes the district must create an in-depth and long-term professional development plan guided by the standards set by the National Staff Development Council. To lead this Technology initiative and make an effective systemic change, administrators and teachers must address two areas of professional development. First, we need to identify the acquired computer skills and those skills that will take us further in our understanding and ability to use Technology as an essential tool. The Internal Team recommends using the following resource to self-assess computer skills: “Professional Competency Continuum” produced by the Milken Foundation.

Secondly, Technology can promote the development of students’ higher order thinking skills through well-integrated classroom projects. A model that envisions this effective use of Technology can be developed through the use of Technology experts in devising professional development activities. This model for professional development for administration and faculty — similar to the coaching provided for with the Lenses of Instruction – could include long-range and ongoing training by experts who have led successful, technology-supported change initiatives in other school districts.

\*\*\*

The members of the Internal Team would like to extend its appreciation to the Board of Education for this opportunity. A detailed program review has energized us with rich discussions and provided an outstanding arena for reflection.

---

# **West Windsor-Plainsboro Regional School District**

## **Technology Program Evaluation**

### **External Team Report**

**January, 2003**

#### **Focus Management Group, Inc.**

**James (Jim) Crossett** (overall, governance, administrative, technical)

**Deeva Garel** (instruction and curriculum)

**Susan Malette** (project coordination)

**Carol Muscara** (research)

**Elaine (Lani) Seikaly** (instruction and curriculum)

## **Introduction**

The ongoing challenge for any leading school system, like the West Windsor-Plainsboro Regional School District (WW-P), is to effectively meet the demands for their children's education. As part of those demands, most districts are continuing to investigate, invest in and assess the impact of Technology in education.

### **Educational Technology**

The use, knowledge and understanding of Technology currently is viewed by many, i.e. parents, students, educators, businesses and professional organizations, as a primary requirement for a "good" education. Yet, some points of view [Cuban] claim that current educational Technology investments are underutilized and often misused. Still others are pointing out that students' Technology capabilities are often superior to their teachers [Pew Internet].

Not surprisingly, human contact is very highly valued in our children's educational experience. When people reminisce about their school days, teachers are mentioned far more frequently than textbooks or buildings. Future generations probably will not remember the use of a particular computer or Technology platform as part of their school days, but rather what they learned by having access to these tools.

If education were still a matter of teaching the three 'R's, the future of Technology in the classroom might be more easily discerned. In general, education is supposed to prepare a child for adult life, but we do not even have a clear model of how it does that preparation. With rapid global change, we are not even sure the type of adult life to prepare our children.

These factors make it highly unlikely that Technology can be a "silver bullet" for education. They also indicate that replacing elements of the educational experience by Technology is unlikely to diminish the human element provided by teachers. These conclusions lead us to focus on how Technology can be positioned to complement and extend the human educational element through innovative techniques and solutions in the daily classroom.

### **Administrative Technology**

Almost all school districts are asked to explore and leverage opportunities to do more with less. Meanwhile, the continual increase in required reports and assessments also drives a need for more effective processing and storage of student, school and district data. Technology has proved to be an efficient and cost-effective tool in the automation of various administrative and clerical tasks. These factors create a strong need for districts like WW-P to effectively utilize Technology in the daily administration of the district.

## **Technology Leadership and Governance**

The ultimate success for new initiatives in a school district usually depends on appropriate leadership and guidance by the administrators. An effective start toward that success is in the leadership provided through establishing a vision, which then is supported by goals and objectives. Those milestones then must be combined with effective implementation and administration to achieve the vision. Technology is no different. Direction must be set and then a focus must be given to achieve the desired results.

### **Report Focus Areas**

Given these challenges, WW-P continues to focus on Technology through three major and distinct areas:

- 1) Effectively integrating Technology as part of the K-12 educational experience.
- 2) Leveraging Technology to effectively and efficiently administrate district operations.
- 3) Providing leadership, governance and effective administration to articulate and implement a vision on how, when and where the WW-P district deploys and uses Technology to meet these education and administrative goals.

This report will look at these areas and make recommendations based on FMG's research and knowledge of best practices, our staff interviews of various district staff members and administrators, and the observations of classrooms and administrative processes.

---

Blank Page

# Instructional Technology Assessment

## What role should Technology play in K-12 education?

Technology is an integral part of the workplace and has become an integral part of home life for many families. More and more students have cell phones, computer games, and Internet access. However, schools are having trouble keeping pace and are finding that integrating Technology into their instructional program in ways that increase student achievement is a far slower and more complex process than expected.

Our understanding of how students learn underpins our understanding of how Technology can best be used in classrooms. Constructivism, based on recent research about the human brain and what is known about how learning occurs, is an approach to teaching and learning that believes students learn by fitting new information together with what they already know. According to a North Central Regional Education Lab (NCREL) article on *Constructivist Teaching and Learning Models*, “Research on classrooms that have put constructivist teaching and learning models into practice also indicates that Technology can enhance student engagement and productivity. More specifically, Technology increases the complexity of the tasks that students can perform successfully, raises student motivation, and leads to changes in classroom roles and organization (Baker, Gearhart, & Herman, 1994; Dwyer, Ringstaff, & Sandholtz, 1990; Means & Olson, 1995). These role changes—with students moving toward more self-reliance and peer coaching, and teachers functioning more as facilitators than as lecturers—support educational reform goals for all students.”

Barbara Means, an expert with SRI International in integrating Technology into instruction, has identified seven variables that, when present in the classroom, indicate that effective teaching and learning are occurring. These classroom variables are:

- Children are engaged in authentic and multidisciplinary tasks.
- Assessments are based on students’ performance of real tasks.
- Students participate in interactive modes of instruction.
- Students work collaboratively.
- Students are grouped heterogeneously.
- The teacher is a facilitator in learning.
- Students learn through exploration.

It is when these variables are in place that Technology can play a very important role. Engaged learning through Technology is best supported by changes in the structure of the school day, including longer class periods and more time for team teaching and interdisciplinary work. For example, when students are working on long-term research projects for which they are making use of on-line resources (such as artwork, scientific data sets, or historical documents), they may need more than a daily 30- or 40-minute period to find, explore, and synthesize these materials for their research.

According to an NCREL article entitled *Using Technology to Support Education Reform* (<http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te800.htm>), “The primary motivation for using technologies in education is the belief that they will

support superior forms of learning. For this reason, theory and research in learning provide an extremely important source of ideas.” The article goes on to say, “Evidence indicates that when used effectively, ‘Technology applications can support higher-order thinking by engaging students in authentic, complex tasks within collaborative learning contexts’ (Means, Blando, Olson, Middleton, Morocco, Remz, & Zorfass, 1993). Instead of focusing on isolated, skills-based uses of Technology, schools should promote the use of various technologies for sophisticated problem-solving and information-retrieving purposes (Means & Olson, 1995; Panel on Educational Technology, 1997).” Technology allows students to “work on authentic, meaningful, and challenging problems, similar to tasks performed by professionals in various disciplines; to interact with data in ways that allow student-directed learning; to build knowledge collaboratively; and to interact with professionals in the field. Technologies also can be used to promote the development of higher-order [thinking skills](#) and allow opportunities for teachers to act as facilitators or guides and often as a co-learner with the students.”

Since Computer Technology was introduced into schools, educators and policymakers have debated how to measure the effectiveness of the Technology. Early research efforts to measure effectiveness were designed to examine gains on standardized test scores, but many Technology advocates argued that the real value of Computer Technology is as a tool for problem-solving, communication, collaboration and engaged, meaningful learning. Among these advocates are North Central Regional Educational Lab (NCREL) who surveyed experts about traditional models of Technology effectiveness and reported on their premier Technology web site, “Plugging In,” that respondents said:

- “Effectiveness is not a function of the Technology, but rather of the learning environment and the capability to do things one could not do otherwise.”
- “Technology in support of outmoded educational systems is counterproductive.”
- “[The reliance on] standardized tests is ludicrous....Technology works in a school not because test scores increase, but because Technology empowers new solutions.”

[Appendix A](#) in this report summarizes research findings in a 1999 Milken Exchange on Education Technology document entitled, “The Impact of Education Technology on Student Achievement: What the Most Current Research has to say.”

---

## **How did FMG focus this review of the effectiveness of the WW-P Instructional Technology Program?**

Before an instructional Technology program in any school district can be assessed, instructional goals must be identified. Because we live in a standards-based reform era where every state has defined content standards for what students are expected to know and be able to do and because No Child Left Behind requires states to assess their content standards and hold schools and districts accountable for meeting adequate yearly progress (AYP), this study focuses on integrating Technology with those learning and student achievement goals that lead to adequate yearly progress. Student learning is measured against attainment of standards and the expectation is that educators take all students to proficiency. Therefore, an effective Technology program must support student achievement on those standards. New Jersey has developed content standards (<http://www.state.nj.us/njded/cccs/02/>) that should focus any study of how effective Technology is in meeting student achievement goals.

This FMG study of instructional Technology focused on five overarching questions:

- 1) Does the curriculum incorporate the use of Technology to support the student achievement goals?
- 2) Are teachers integrating Technology into their instructional program to support student achievement goals?
- 3) Are teachers adequately prepared to integrate Technology in their classrooms to support student achievement?
- 4) Are students using Technology to support their learning in school?
- 5) Do all students have equitable access to Technology at school?

The Milken Foundation's Seven Dimensions for Gauging Progress are thoughtful indicators for measuring an effective Technology program (see [Appendix B](#)). FMG used the National Educational Technology Standards for Student and Teacher competencies developed by the International Society for Technology in Education (ISTE) as benchmarks of effectiveness (see [Appendices C and D](#)).

The FMG team interviewed key district, union, and Technology leaders and facilitated focus groups with parents, teachers, school board, administrators, and curriculum supervisors across four days on September 18 – 19 and September 30 – October 1, 2002. FMG also observed classrooms in all ten WW-P schools and interviewed teachers, principals, and students with a focus on whether all students were given opportunities to use technologies for in-depth learning projects, for solving complex, authentic problems within a collaborative context and for the development of higher-order thinking skills.

It was clear from observations that the WW-P district is highly supportive of education. New school facilities were in very good condition and older school buildings were well maintained and attractive. It also was clear that the district had made a commitment to small class sizes. Schools were running smoothly and students were on task. Staff were professional, committed and reflective about their practice.

The district appeared to be off to a good start with instructional Technology when they developed a Strategic Plan in 1993 and updated it again in 1997 and in 2001. A sizable group of stakeholders who developed the plan insisted that there be substantive

educational reform in the area of computer use in classrooms so that the “use of Technology becomes ‘second nature’ for our students in their continuing education and the world of work.” They articulated the following vision and goals:

## **Technology Vision Statement**

The West Windsor-Plainsboro Regional School District will prepare students for a future characterized by change and an increasing dependence on Technology. Toward that end, the district will utilize appropriate information Technology to create a collaborative, hands-on, learning environment in which teachers and students routinely work with Technology.

## **Curriculum integration goals**

- All students will use current technologies to develop skills and knowledge necessary to gather, analyze, and communicate information in a global society.
- West Windsor-Plainsboro Regional School District will continue to integrate Technology as appropriate to implement local, state, and national standards such as the New Jersey Core Curriculum Content Standards at all grade levels and in all curricular areas.

## **Community goals**

- WW-P will continue a relationship with community-based groups, i.e. Educational Foundation, Cable Commission, MercerNet, Mercer County E.T.T.C., to expand the availability of district Technology.
- WW-P will provide the community with access to the district’s technological resources to strengthen the link between home and school.

## **Infrastructure goals**

- All WW-P schools will have equitable access to current information and communication technologies.
- The WW-P school district will diligently maintain data integrity and security.
- All WW-P schools and district offices will be connected within and among a secure network infrastructure that will provide both information and communication services.

## **Staffing and Professional Development Goals**

- The WW-P Regional School District will provide ongoing opportunities for all staff to develop the skills necessary to utilize current Technology.
- The WW-P Regional School District will provide ongoing opportunities for instructional staff to develop the strategies necessary to integrate Technology into the curriculum.
- The WW-P Regional School District will provide the necessary personnel to insure that assistance in the effective use of Technology is given in each building.
- The WW-P Regional School District will provide the necessary personnel to maintain the Technology infrastructure in the district.

Looking back on those forward-thinking goals, it is apparent that the district has made more progress on their infrastructure goals than they have on their curriculum integration and staffing goals. WW-P has not yet achieved the goal of using appropriate information Technology to create a collaborative, hands-on, learning environment in which teachers and students routinely work with Technology. The district made good progress in purchasing and installing an adequate base of computer equipment and placing it both in computer labs and classrooms. The district still is working to put in place an adequate support system or process for the ongoing maintenance of the infrastructure. Software purchasing, installation and upgrades are sometimes not adequately planned and tested prior to implementing in the schools. The district made good progress in training teachers on e-mail, slide presentations, and some of the software programs they would need to use for report cards and attendance. It has not focused sufficiently in developing an adequate professional development program to support teachers in integrating Technology into instruction. It has made slow progress in integrating Technology into its curriculum.

Consequently, classrooms do not reflect the vision of using appropriate information Technology to create a collaborative, hands-on, learning environment in which teachers and students routinely work with Technology. FMG did not observe Technology being used for academic instruction. In general, teachers we interviewed did not feel they had adequate support to integrate Technology into the instructional program. Other possible barriers to the integration of Technology mentioned by teachers and principals were the lack of clear expectations or accountability for using the Technology, the lack of Technology integration into the curricula, and the slow network speed that makes the use of Internet problematic.

Student use of computers was primarily observed in the computer electives and cycles classes or in the media centers. The secondary computer science curriculum is comprehensive and offers students multiple options. The flexibility incorporated into the Computer Programming sequence provides students options for completing the program while accommodating other demands. Consequently, FMG focused their recommendations on the more challenging issue of integrating the Technology into the academic curricula and classrooms.

Virtually all interviews or focus groups said they thought the district did not have a clearly articulated vision for how Technology was integrated into teaching and learning. They also agreed that two-way communication around Technology issues needed to be improved.

It is important to note that our elementary school visits came at a difficult time. Technology use that was happening last school year in elementary schools was not able to be observed during our visit this school year because computers, monitors and printers were not connected in many classrooms. This past summer, all elementary schools underwent computer station upgrades that were not completed by the end of September 2002 when we visited the classrooms. At the same time, several elementary schools were transferring from MacSchool to SASI. These transitions contributed to the low use of Technology in the classrooms during our visit.

## **Findings and Recommendations**

FMG shares the following findings and recommendations for the district in the areas of Technology: vision, communication, curriculum integration, building teacher capacity in the use of Technology, maintenance, and equity.

### **Vision**

**Recommendation 1: Engage key stakeholders in the process of creating a shared vision for how Technology is to be used in the instructional program.**

### **Findings**

In 1993, 1997, and 2001, the district had a clearly articulated vision for Technology. Teachers, curriculum supervisors, principals, and parents all expressed the need for a clear vision for instructional Technology. The observed practice and the directions the district appeared to be heading were not always in sync with the vision and goals. Consequently, people we interviewed who had served on the original Technology Advisory Group wondered what happened to the plan. Even though the original vision and goals were well-articulated, we recommend creating a new Technology Advisory Committee to re-create a shared vision and action plan. It would be advantageous to invite some of the original Committee members, particularly those who have a high level of interest in the district moving forward on integrating Technology into the instructional program. Parents were very clear in their focus groups that they want to be involved in helping the district integrate Technology as an instructional tool in their children's schools. The district needs to take advantage of such interest and expertise.

### **Communication**

**Recommendation 2: Communicate vision, goals, action plan steps, and roles of all staff involved in implementing the Technology plan.**

To aid in the need for improved communications, the district should consider the following:

- Appropriate Technology leaders should meet with principals and central office administrators once a month to discuss Technology issues and identify priority needs.
- The district should include Technology updates and showcase exemplary Technology use in their communications.

## **Findings**

Communication was the most frequently shared concern at the school level. Principals and teachers stated that they were not clear how Technology decisions were made and how and when they were being implemented. They felt their input should have been sought and used in planning. They were not clear how to obtain help with Technology problems or questions. In general, they were not clear on the instructional Technology vision or expectations.

## **Curriculum Integration**

### **Recommendation 3: Create a supervisor of Technology to work with the curriculum supervisors in integrating Technology into instruction.**

If the district is to ever attain its vision of having schools utilize appropriate information Technology to create a collaborative, hands-on, learning environment in which teachers and students routinely work with Technology, then the district needs to designate a person to coordinate the implementation of that vision. If Technology is to be integrated into the curriculum, it makes sense to have a supervisor of Technology working with the curriculum supervisors. If all Technology staff supporting the instructional integration of Technology are to be on the same page, it is important to have them supported and supervised by one office.

The supervisor of Technology would be responsible for supporting school and district efforts in the integration of Technology into instruction. The new position would include the following responsibilities:

- Support and coordinate professional development for the Technology resource teachers, computer teachers, TV production teachers and media specialists.
- Coordinate the work of and supervise the Technology specialists and technicians.
- Work collaboratively with the other curriculum supervisors to integrate Technology into their revised curricula.
- Work collaboratively with the professional development director to develop training to integrate Technology into teaching and learning.
- Coordinate elementary, middle, and high school committees to select appropriate software and applications programs.
- Co-chair an advisory group of stakeholders to create/communicate the shared vision for the use of Technology in teaching and learning.
- Expand the instructional web presence.
- Manage E-Rate.
- Collect, analyze, and use student achievement data on state standards to inform Technology program needs and focus.

## Findings

Currently, the director of Technology is responsible for coordinating and maintaining the Technology infrastructure, the purchasing, installation, and maintenance of equipment, the construction of new computer and television facilities, information management systems, hosting the district web site, and the integration of Technology into the instructional program including the training of staff. Not only is the workload unmanageable, but the assignment of responsibilities does not take advantage of the critical relationship between the content curriculum supervisors and instructional Technology. It isolates Technology. Over the last several years, and most likely because of the overload and fast growth of the district, the director of Technology focused time and energy on putting the infrastructure in place. Though that was critically important, it left a large gap between the available Technology and the staff capacity to integrate Technology into the curriculum.

When we interviewed curriculum supervisors, they felt support from Technology experts to write curriculum that integrated Technology was needed. The director of the Institute for Professional Development also shared the need for Technology experts to train teachers. Currently, no curriculum supervisor is responsible for the media specialists, computer teachers, or the television production teachers. Media specialists have been overlooked as an important resource in helping the district to meet the educational Technology vision.

### **Recommendation 4: Develop an action plan to broaden curriculum supervisors' knowledge of good instructional Technology use and update the curriculum to take advantage of Technology.**

The action plan should include professional development and national conferences for supervisors to broaden their knowledge and experience with using Technology to improve learning. The director of the Institute for Professional Development would be the natural person to create and implement this plan along with curriculum and Technology leaders under the supervision of the assistant superintendent for Curriculum and Instruction. The timeframe needs to be aggressive so that curriculum supervisors can start to enhance their curricula next summer. Though the revision of curriculum might take several years, it is important that some Technology-integrated or supported activities be initiated in the next school year. Curriculum supervisors need to integrate the use of Technology for meaningful and challenging problem-solving, information-retrieving, data analysis, and authentic tasks similar to those performed by professionals in various disciplines. Curriculum supervisors also should initiate a district-wide effort to identify best-of-class content related software that directly supports the curriculum and incorporates it into curriculum revisions and staff development. State standards for use of Technology, modeled after the ISTE Technology Standards for Students should be addressed as part to the curricula updates. The district should consider developing a scope and sequence for the integration of the Technology skills into the K-12 content curricula and an ongoing assessment strategy for determining student proficiency against those standards.

## Findings

Both the recent Science and Mathematics external reviews recommended utilizing Technology as a tool to support Science and Mathematics teaching and learning. Two of the recommendations from the Science review state: Expand Technology use to include nontraditional options such as imaging, real-data use, and long-term projects in all schools and provide selected software for all levels that correlate with curriculum and standards. The Science report recommended exploring the electronic resources suggested by the New Jersey State Systemic Initiative (<http://njssi.rutgers.edu>).

The Mathematics review advocated for the mathematics program to prescribe and, therefore, provide computer use. The report illustrates how several software programs support learning mathematics, including Geometer Sketchpad, Mathematica, and Excel.

High school and middle school Science supervisors have initiated strategies to integrate Technology into the program. The revised Biology curriculum is a good model and other curricula need to be updated to take advantage of Technology.

School Technology leaders and teachers who quickly adopt Technology for learning need opportunities to expand their knowledge of new educational software and effective strategies for using Technology to support student learning. National and state Technology conferences are an easy way to broaden a leader's knowledge of Technology use in instruction. Two excellent annual conferences to consider are National School Board Association's Technology + Learning Conference and Florida's Educational Technology Conference.

### **Recommendation 5: Replace the computer cycles classes with a curriculum integrated model.**

## Findings

Though the computer cycles class provides all students with some instruction about computers, it had the unintended consequence of isolating computer instruction from academic instruction in a number of ways.

- The computer curriculum is not driven by academic content curriculum or standards.
- Used as a preparation period, content teachers did not participate in what their students were learning, and most often, did not build upon such learning in their classrooms.
- The cycle classes tied up the computer labs on a regular basis so that academic teachers had difficulty scheduling time in the lab.
- As the most Technology literate teachers were teaching the computer cycles classes, they were not available to train or model lessons for content teachers.

Because the computer cycle classes provide teachers with one of their preparation periods as guaranteed them in the negotiated contract, the unintended result is that while computer teachers taught computer applications, academic teachers would not be

benefiting from the instruction their students were receiving. Students were placed in cycles classes across teams so that a computer teacher was even more challenged to try to anchor computer class assignments around content activities going on in a team's classes. Consequently, students do not have an authentic context in which to apply the information learned.

Parents who participated in the focus group were critical of the cycles classes and felt that the concept that all students should have the same course on basic computer skills did not take into consideration the computer literacy of students. For all of these reasons, computer cycles classes should be replaced with a curriculum-integrated model.

## **Building Teacher Capacity to Integrate Technology in Teaching and Learning**

“Teacher quality is the factor that matters most for student learning,” note Darling-Hammond and Berry (1998). Therefore, professional development for teachers becomes the key issue in using Technology to improve the quality of learning in the classroom. Other experts agree. The role of the classroom teacher is the crucial factor in the full development and use of Technology in the schools (Office of Technology Assessment, 1995). “The transformation of classroom Technology from hardware, software, and connections into tools for teaching and learning depends on knowledgeable and enthusiastic teachers who are motivated and prepared to put Technology to work on behalf of their students,” notes the CEO Forum on Education and Technology (1999). The National Staff Development Council charges schools with “providing teachers with abundant opportunities to become fluent in using Technology to bolster instruction and help students develop higher-order thinking and problem-solving skills.”

Recent surveys have shown that teachers are not receiving the kind of training they need from teacher preparation programs to be “proficient and comfortable integrating Technology with their teaching,” according to a national study commissioned by the Milken Exchange and conducted by the International Society for Technology in Education (ISTE). This means that school districts will need to provide the training needed. Teachers need to develop the knowledge and expertise to design and implement projects in which students work together on inquiry, design, and development supported by Technology tools.

Traditional sit-and-get training sessions or one-time-only workshops have not been effective in making teachers comfortable with using Technology or adept at integrating it into lesson plans. A good professional development program is job embedded and tied to learning goals, and provides activities in the context of teacher's classrooms. Teachers need time to practice and reflect on the experience, constructive feedback, and ongoing support. For most districts, this kind of professional development is very different from traditional one-time teacher workshops. Research indicates that teachers, like students, learn and incorporate new information best when it is presented over a long timeframe instead of a single session.

The challenge that WW-P faces is similar to the one described by Cathy Grant in *Professional Development in a Technological Age: New Definitions, Old Challenges, New Resources*: “With schools increasingly investing in technologies for the classroom, there has been a growing realization that these expensive resources will never be used to their fullest unless teachers are provided professional development to guide their use. Many schools systems have approached this challenge in the same way that they have approached other learning needs of teachers: by sending them to training sessions on the use of specific new technologies. Yet, too often the results of these sessions have fallen short of hopes: there has been little carryover into the classroom, and new technologies have remained on the periphery of school life and been used only sporadically by teachers, despite the high expectations of trainers, reformers, and the teachers themselves.”

### **Recommendation 6: Create a Technology resource teacher for each elementary and middle school to provide content teachers ongoing support in integrating Technology in the classrooms.**

To fill the original and ongoing need to build teacher capacity to integrate Technology in teaching and learning, we recommend the creation of a new position — a Technology resource teacher — that would report to the principal but be supported and trained by the Technology specialists and be responsible for the following:

- Support content teachers in integrating Technology in the classroom.
- Model Technology lessons.
- Team teach Technology integrated lessons with content teachers.
- Provide staff development during team meeting times, planning times, and before and after school.
- Support teacher web pages.

### **Findings**

Though this district provided a good deal of training on applications, they have focused less time on how to integrate Technology into teaching and learning academic content. The training provided became single event staff development without the critical ongoing support to help teachers implement and integrate their new skills. In recognition of this need and of the national standards for staff development that clearly articulate criteria for effective staff development, we propose creating Technology resource positions in each of the schools. The new position would be a non-teaching support position for teachers.

At the elementary school level, we propose realigning one computer teacher position to a Technology Resource teacher position. The new position requires a teacher that is knowledgeable about adult learners and we do not assume that the current computer teacher is the best person to assume the new role. However, in many schools, the Computer teacher may be the person needed. This also will mean the elimination of the computer one-day-a-week pull-out program to free up a teacher and the lab. This pull-out program provided elementary teachers with one of their preparation periods, hence alternative ways to provide that preparation period will need to be explored.

Some suggestions include: expanding the world language program that provides 2<sup>nd</sup> and 3<sup>rd</sup> graders with 80 minutes of instruction per week or expanding Physical Education or Health. Computer skills currently taught in the computer cycles class would need to be incorporated into the regular classroom instruction.

At the middle school level, we propose realigning one Computer teacher position at each middle school to a Technology Resource teacher position. This also would have the advantage of freeing up one computer lab in each middle school for academic class use.

### **Recommendation 7: Create three Technology specialists, one specialist for grade level : K-3, 4-5, and 6-8.**

These Technology specialists would be coordinated by the supervisor of Technology and would be responsible for the following activities:

- Support professional development for the Technology resource teachers, computer teachers, television production teachers and media specialists.
- Support academic content specialists in integrating Technology into their revised curricula.
- Work collaboratively with the staff development director to develop professional development programs to integrate Technology into teaching and learning.
- Chair district committees to select appropriate software and applications programs.
- Support the development of an enhanced instructional web presence ([www.wvprsd.org](http://www.wvprsd.org)).
- Collect, analyze, and use student achievement data on state standards to inform Technology program needs and focus.

### **Findings**

The district created facilitator positions to provide support for the use of Technology in schools. In many cases, as reflected in the job description, the facilitators spent much time on technical support for hardware, software, scheduling and administrative databases. In order to meet the district's Technology integration goal, schools need a Technology specialist whose chief responsibility is to support Technology integration across the curriculum through such activities as just-in-time training, new teacher orientation, content-specific training, and model teaching.

High School North and High School South have computer facilitators dedicated to each school. High School South was in the process of hiring a replacement for their previous facilitator. The middle school facilitator splits time between two schools and the elementary facilitator is responsible for six schools.

In addition to serving multiple schools, the elementary and middle school facilitators were asked to meet district Technology needs including E-Rate and web site development. The middle school and high school facilitators were absorbed by the many demands of the scheduling and report card processes and other ongoing start-up and maintenance needs. Though there is no question that these are critical operations for

schools, we feel that these tasks are better assigned to others, allowing the facilitators to be assigned to integration needs.

Principals and teachers in the two high schools felt they received adequate support from the full-time computer facilitators assigned to their schools. However, principals and teachers at the eight middle and elementary schools, who did not have full time support, felt they needed more support. They articulated their need to have someone in their building full time devoted to supporting the faculty. If FMG recommends adding a computer facilitator at each school, it would mean adding six new 12-month positions. This would not be a realistic proposition and it is difficult to determine if the current overload of the elementary and middle school facilitators could be reversed when so many people counted on them to perform so many tasks. It appears more realistic if the facilitator position is eliminated and the district and school needs were separated. Consequently, FMG recommends realigning school staff to create Technology Resource teachers at the elementary schools and middle schools to meet school needs and re-aligning two computer facilitators and adding one position to create three Technology specialists, one for each level: K-3, 4-5 and 6-8.

### **Recommendation 8: Realign the two high school facilitators to high school Technology integration specialists.**

These Technology specialists would be coordinated by the supervisor of Technology and would be responsible for the following activities at their school or, when appropriate, for both high schools:

- Support content teachers in integrating Technology in the classroom.
- Model Technology lessons.
- Team teach Technology integrated lessons with content teachers .
- Provide staff development during team meeting times, planning times, and before and after school.
- Support teacher web pages.
- Provide staff development for the computer teachers, TV production teachers and media specialists.
- Support curriculum supervisors in integrating Technology into their revised curricula.
- Chair district committees to expand and sequence the high school Technology curriculum, look at and select appropriate high school software and applications programs.

### **Findings**

The WW-P Computer facilitator job description reviewed by FMG does not have as its primary focus the building of teacher capacity to integrate Technology into the instructional program. In order to meet the district's Technology integration goal, each school needs a person whose chief responsibility is to support Technology integration across the curriculum through such activities as just-in-time training, new teacher orientation, content-specific trainings, and model teaching. Consequently, we recommend that the two high school computer facilitator positions be realigned as high

school Technology integration specialists whose primary job will be to support teachers in building capacity to integrate Technology in their classrooms. The Technology integration specialists will work closely with the academic content specialists to ensure that support is in alignment with the Technology integrated activities recommended by the academic content specialists. Each Technology integration specialist will be assigned to one high school four days a week to meet school needs and be assigned to the district office one day a week to meet district needs at the high school level.

## **Equity**

NCREL and other educational organizations advocate Technology as a tool that gives everyone an equal chance to learn (<http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te400.htm>). Given its significance in national and local policy, a critical issue concerns equity within WW-P.

### **Recommendation 9: Broaden the definition of equity and set clear expectations.**

Though we have addressed building teacher capacity to use Technology in learning and revising curricula to include more activities that benefit from Technology in earlier recommendations, we have not yet addressed the critical importance of the district to set expectations for how teachers include Technology as a tool for learning and how frequently students have access to Technology for their learning. One can measure the effectiveness of technology integration by the following.

- All students have opportunities to use a variety of modern technologies—including a range of software applications, telecommunications, and video—to support their work on challenging, authentic tasks.
- Teachers have the knowledge and expertise to design and implement projects in which students work together on inquiry, design, and development supported by Technology tools.

## **Findings**

Equity may start with a baseline of hardware, software and connectivity, but ultimately, it needs to address the access each student has to the Technology tools appropriate for learning. Criteria that affect this accessibility include the following:

- Availability of Technology tools and software in classrooms.
- Available times the teachers allow students to use Technology.
- How the teacher incorporates Technology into the learning activities and assignments.

The district's current strategic plan talks about equity of accessibility as a goal. To date, this equity has focused on equity of hardware. Having three computers in the room does not automatically provide equity of student access. The discussion of equity needs to include the accessibility of computers for teaching, as well as the amount of access students are given to the Technology. Having computers available does not ensure that they are well maintained, have appropriate software, are readily accessible

to teachers and are available to students. The district should re-examine how best to place computers in schools to integrate Technology into teaching and learning.

The district has sought to provide some equity in computer Technology learning through their elementary pull-out and middle school cycles classes. All elementary students have 40 minutes per week of computer instruction and all middle school students take six weeks of computer skills in grades 6, 7, and 8. However, this has created other equity issues. Three well-equipped labs in the middle school are used more than fifty percent of the time by three computer teachers which limits the lab access for the Mathematics, Science, English, Social Studies, and World Languages teachers.

Another issue around equity is the concept that everybody should have an equal amount of Technology. Once the district has established the baseline for equity, then individual teachers and or schools who are ready to demonstrate how Technology can further the learning of the content areas with added Technology should be supported. The district should not continue to use equal numbers of computers as the guiding principle for making decisions about additional expenditures that would give one classroom or school more Technology than another once the baseline is reached. At that point, the criteria for adding additional resources should be based on the merit and replicability of the Technology use in relationship to the district's learning goals and how well it models effective use Technology.

### **Instructional Technology Support and Maintenance**

**Recommendation 10: Provide schools with a single point of contact for all technical support including hardware repairs, software, and network management.**

**Recommendation 11: Establish an upgrade and replacement program for the infrastructure.**

**Recommendation 12: Standardize desktop configuration across schools by level.**

Successful integration of Technology across the curriculum assumes availability and accessibility of hardware, software, and networking. Dependability of an installed base of Technology is key to successful curriculum integration. An established, scheduled upgrade and replacement program for this infrastructure should be established based on user input, industry standards, and available budget. Television as well as computer hardware should be included in the program. Adequate technical support is necessary to ensure minimal downtime of the hardware and network. (These recommendations are addressed in more detail in the Information Management Technology side of this report).

## Findings

Currently, administration and staff are not always clear on whom to call for computer problems. A single point of contact for initiating and monitoring progress on maintenance requests and software problems would be more efficient and allow the district to collect important data to inform resource allocation and district needs.

Other maintenance recommendations that are addressed more fully on the Information Management Technology side of this report include the following:

- Realign a clerical position at each school to be a data entry person for the SASI system and provide ongoing training and support.
  - Gather stakeholder requirements before design and implementation of new solutions.
  - Clarify and communicate Technology maintenance personnel roles.
  - Develop a tracking system of maintenance requests and turnaround time.
  - Based on data collected, decide if outsourcing or adjustment of resources is needed.
-

## Related Instructional Issues

There are two additional observations noted but not explored in this study that the district should examine. These observations are outside the immediate scope of this engagement but can have direct impact on the district's success with technology and learning. FMG understands that the areas observed are being studied by other district committees.

The nine period schedule results in shortened instructional periods of about 40 minutes. Blocks of instructional time this short make it difficult to get students involved in problem solving, extended labs, engaged learning, and Technology integrated lessons. In an ERIC Digest article (ED393156) entitled, "What's wrong with the traditional six-or seven period day?" author K. Irmsher quotes Joseph Carroll, "It produces a hectic, impersonal, inefficient instructional environment, provides inadequate time for probing ideas in depth, and tends to discourage using a variety of learning activities." It may also explain in part why most secondary classes observed were taught as a whole group with no observed use of cluster grouping or cooperative learning groups within the class. The new contractual agreement for schools to add instructional time to the school day is an excellent opportunity for schools to reexamine their schedule and address the short class periods.

Current best practices would include longer blocks of instructional time, regular collaborative team planning time, a focus on student work and learning rather than teacher behaviors, and the use of flexible cluster grouping to differentiation instruction to meet a variety of needs. It was not clear how regularly grade level or interdisciplinary teams planned collaboratively. Good instructional planning, including planning for Technology integration, is not done in isolation. The district might want to examine whether the language, or the spirit, of the individual teacher contractual preparation time has in practice become a barrier to collaborative planning.

---

Blank Page

# Leadership, Governance and Effective Administration

The other two areas of focus for WW-P Technology is in leadership and governance, and the effective use of administrative Technology. FMG made four on-site visits to the district from June through September 2002 to review the infrastructure design and Technology support practices, interview Board members, administrators, parents and the Technology support staff, and understand current staffing levels and reporting structures. The following recommendations focus on these areas.

## Governance and Leadership

**Recommendation 13: Create a Technology governance system that fosters new ideas and proposals, provides clear avenues for two-way communication and is the means for the ongoing, consistent review and evaluation of Technology investments or initiatives.**

### Findings

Lack of communication and understanding of Technology direction and decisions was a key theme arising from interactions within the district. As the district has grown and become more organizationally complex, a regular meeting of key stakeholders and decision makers will allow the district to understand the technological opportunities and concerns within the district.

WW-P continues to provide strong leadership in becoming a better education institution by regularly inviting outside resources to assess their present environment, whether in the areas of curriculum, Technology or business office practices. In this Technology evaluation, we have seen a positive and proactive involvement of all major district stakeholders who have a genuine interest at what is being done well, combined with a desire to learn how to do things better.

Education leadership in the “Information Age” requires ongoing focus and involvement with Technology, not just an initial effort to understand the issues and evaluation recommendations. Although the full performance impact of new practices, processes, or realigned positions may not be visible for a period of time, it is possible — indeed, essential — that senior administrators establish a series of performance-focused milestones that can measure progress toward the goal, not just the level of activity along the way.

Board members and senior administrators can measure Technology integration and implementation progress by asking specific questions like: Did the new Technology integration staff development occur in a timely fashion? Were new Technology needs identified and piloted? Is Technology adequately being supported and utilized with students that have unique educational needs? Have the new administrative system users had the proper amount of training? Is the district sharing and using its data across the organization effectively? One can answer “yes” to these types of questions

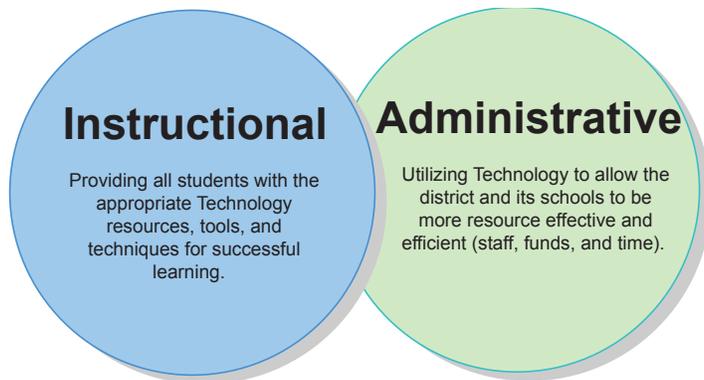
without knowing if there has been tangible progress in improving educational achievement or administrative performance in the short term.

**Purpose of Governance System:**

The ultimate aim in developing a Technology leadership and governance system is to turn district Technology talk into concerted, focused action. In some cases, this may require the district to focus on a single information system or equivalent instructional centerpiece initiative. In others, it may be best to develop a more comprehensive agenda of solutions. The trade-offs between these two ends of the continuum will be driven by available district staff and funding, combined with the clear understanding of the benefits of any Technology initiative.

Because the uses and benefits of Technology for instruction and administration are very different, FMG recommends two different governing bodies to focus on the district’s Technology. One governing body would focus on the instructional element of Technology while the other focuses on Technology’s role in the administrative and operational processes.

Here is an illustration of governance responsibilities:



**Instructional Technology Committee Membership**

The membership of the Instructional Technology Committee would include: director of Technology and Instructional Technology in charge of Curriculum and Instruction (the titles of these people are dependent on the future Technology organization structure), assistant superintendent of Instruction and Curriculum, assistant superintendent of Finance and Support Services, school principals, director of Institute for Professional Development, curriculum supervisors, Technology specialists, Technology integration specialists, Special Services representative, Athletics Department representative, and a representative from the Board Curriculum Committee.

**Administrative Technology Committee Membership**

The membership of the Administrative Technology Committee would include: director of Technology and Instructional Technology supervisor in charge of Administration Technology (the titles of this people are dependent on future Technology organization

structure), assistant superintendent of Finance and Support Services, assistant superintendent of Pupil Personnel, business office administrator, Transportation Department Coordinator, Payroll Department supervisor, Human Resources supervisor, Guidance Department supervisor, Special Services representative, an administrative representative from each school, appropriate administrative Technology staff and a member of the Board Finance Committee.

### **Technology Planning**

These governing bodies would each establish a Technology vision and plan. They would initiate, review, and propose Technology projects or Technology-based initiatives based on their Technology plan. If the district desires to merge these two Technology plans into a single plan, the Technology staff would be responsible for pulling both plans together into a single district document.

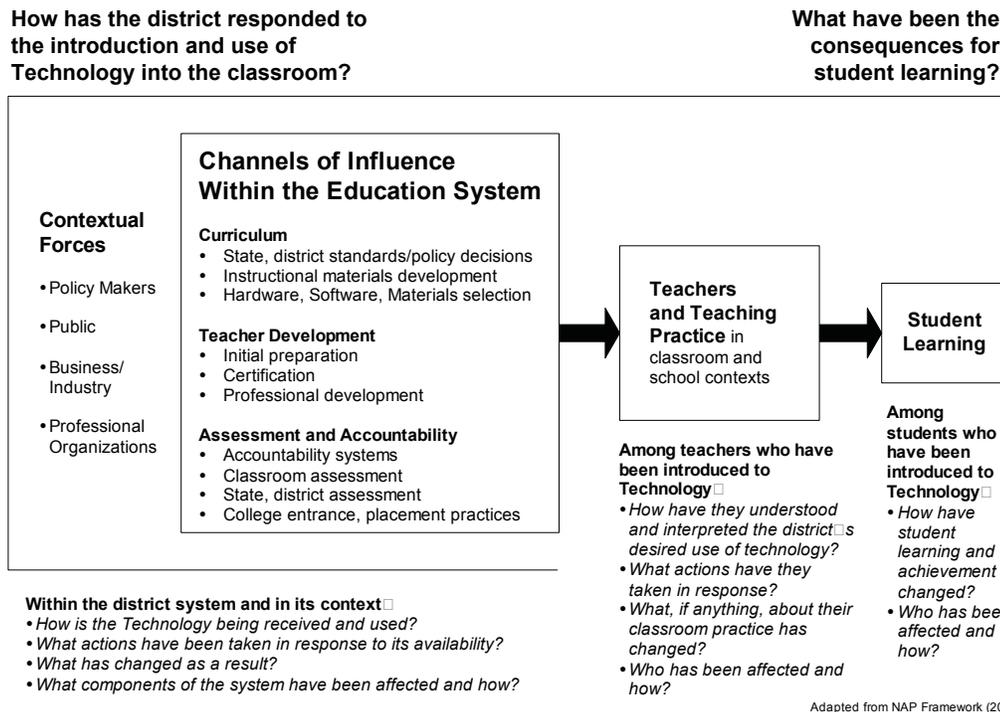
### **Technology Implementation**

The Administrative Technology Committee would develop and implement a Technology plan on how Technology should support the overall administration and operations of the district. Projects brought forward would be evaluated against the administrative Technology plan and also via financial and qualitative factors, e.g. cost reduction or cost avoidance, return on investment, total cost of Technology ownership over the active life of the equipment or software purchased, cost of losing data/files, improving data quality of submissions to overseeing agencies/governing bodies, etc.

Many of the Technology evaluation criteria that could be used for administrative Technology projects are not well suited for instructional Technology decisions. For the Instructional Technology Committee, we suggest that an overall valuation framework that allows district leaders to ask key questions as they look at the instructional Technol-

...continued on next page

ogy plan, and the associated projects within the district. Examples of key questions are shown the figure below.



Determining the answers to these questions while reviewing Instructional Technology proposals will allow projects to be selected and evaluated on a more consistent and clear basis. It will also allow post-implementation evaluation and assessment to more readily performed. This framework could also be used in identifying and piloting small scale Technology projects in a particular classroom or school. This would give the district a context that allows creative uses of Technology on a pilot basis, an identified means to evaluate the results of that pilot and the criteria to be met before a district-wide program would be approved.

## Administrative Leadership

Another key factor in the success of governance is to ensure that all levels of administrators “walk the talk.” Our experience in other districts shows circumstances where Technology integration and support is “talked up” by the district administrators, but the daily school pressures and other pressing priorities often mean that the administrator talk doesn’t translate into a sufficient level of proactive support and action within the school. A district’s senior administrators must be willing to put forth the time and effort to have the district succeed in this area.

## Governance and Leadership Summary

Having two committees in place would allow much of the analysis, vetting, and discussion to be done prior to any formal submissions to the Board of Education. If Board members have an active interest in the details coming from these Committees, then a Board member could also be appointed to each Committee.

Some first reactions to this structure may view it as bureaucratic and time consuming. Our view is that the amount of time spent discussing, planning, and managing Technology is significant. A formal structure allows the time currently being taken up by informal processes and communications to be replaced by planned, focused, and more comprehensive alternatives. The formal meetings of these committees can be expanded or contracted depending on the amount of activity underway for a particular area.

The formal meetings must then be followed up by the central office and school administrative staff to ensure that the projects receive the time, focus, and support for successful implementation.

---

## Staffing, Organization and Administration

**Recommendation 14: Establish best practice Technology projects that allow students and their families, staff, and the public to easily and effectively interact with the district and the individual schools.**

### Findings

Computer networks allow the production and distribution of information and services to be organized in dramatically new ways. Everything from registering children into kindergarten or high school courses have the potential to be handled with greater ease and effectiveness, often at lower costs. If designed or managed poorly, however, production and distribution via on-line systems may merely entrench outmoded and unproductive work processes. The enormous potential benefits of Information Technology are often compromised if it is not used to fundamentally redesign them.

The district should push for some strategic tenfold improvements, and not merely for 10 percent increases. We challenge the district to design an e-school vision with wide opportunities for “anytime, anyplace” service. Explore service integration across program

and organizational boundaries; look to develop rich and flexible technology-based options for self-service.

### **Student Self-Service Example**

One compelling example is a focus on allowing students to access most, if not all, of their school resources from home. Other high-performing districts are aggressively moving into “Connect to Home” Technology strategies that allow students to have access to their programs, data, and files used at school, 24 hours a day, seven days per week (see *A Fantastic Use of Technology* article and video located at [www.glef.org](http://www.glef.org)).

For example, Technology available today allows families of children who utilize Apple computers at school to directly and safely connect from home with the school from practically any hardware platform ([www.citrix.com/education/](http://www.citrix.com/education/)). This allows the student to review or complete the work that was started during the school day; or even utilize a specific school-based software application from home. This same Technology also allows the exploration of creative ways to lengthen the Technology refresh cycle.

### **Additional District and School Communication**

We strongly recommend that more sharing of district communications and infrastructure can be done via the Internet. The district has shown great leadership in providing the Technology to allow 100 percent of the teaching and administrative staff with e-mail addresses. The next step is to compliment the centralized district web site (<http://www.wv-p.org>) and the staff resource site (<http://www.wvprsd.org/>) with enhancements and school specific sites.

An example of a district that is effectively managing this powerful, distributed communication resource is at <http://www.highlands.k12.fl.us/>. A middle school site from the same district is located at <http://www.highlands.k12.fl.us/~sms/> and offers the school perspective for students, parents and teachers. Many school forms are available on-line and printable via the Internet.

Another district example of web site use is at <http://www.chccs.k12.nc.us/> with a high school site from the same district located at <http://www.echhs.org/>. The school web site has a link on its home page for their “connect 2 school” offering, allowing the students to access their files and applications while working away from the school building.

The high school web site is also utilized for staff communication. The high school’s Technology specialist has a web page at <http://echhs.chccs.k12.nc.us/~tweeks/index.htm/>. The specialist’s site includes links to the school’s key applications, clip art sites, on-line staff development sites, and more.

An elementary web site example for this district (<http://www.chccs.k12.nc.us/scroggs/>) shows that most teachers have web pages that communicate homework expectations, assignments and links to on-line resources. The Media Center has an on-line media web page for research and exploration.

The key to success in this area is managing what information is school specific and what information can be publicly published while protecting privacy and establishing

proper permissions. Links between the school and district sites should allow hyper-linking and easy access to the information needed by the student, parent or staff member.

School and district websites can help busy parents who want class specific information, e.g. permission forms, homework due dates, or when a particular group is meeting, for example.

## **Staff Position Recommended**

To effectively implement this recommendation, FMG recommends an additional staff position that is responsible for WW-P's information and web design. Although this position ideally reports directly to a Technology administrator, this person should work closely and take content and policy direction from the district's public information officer.

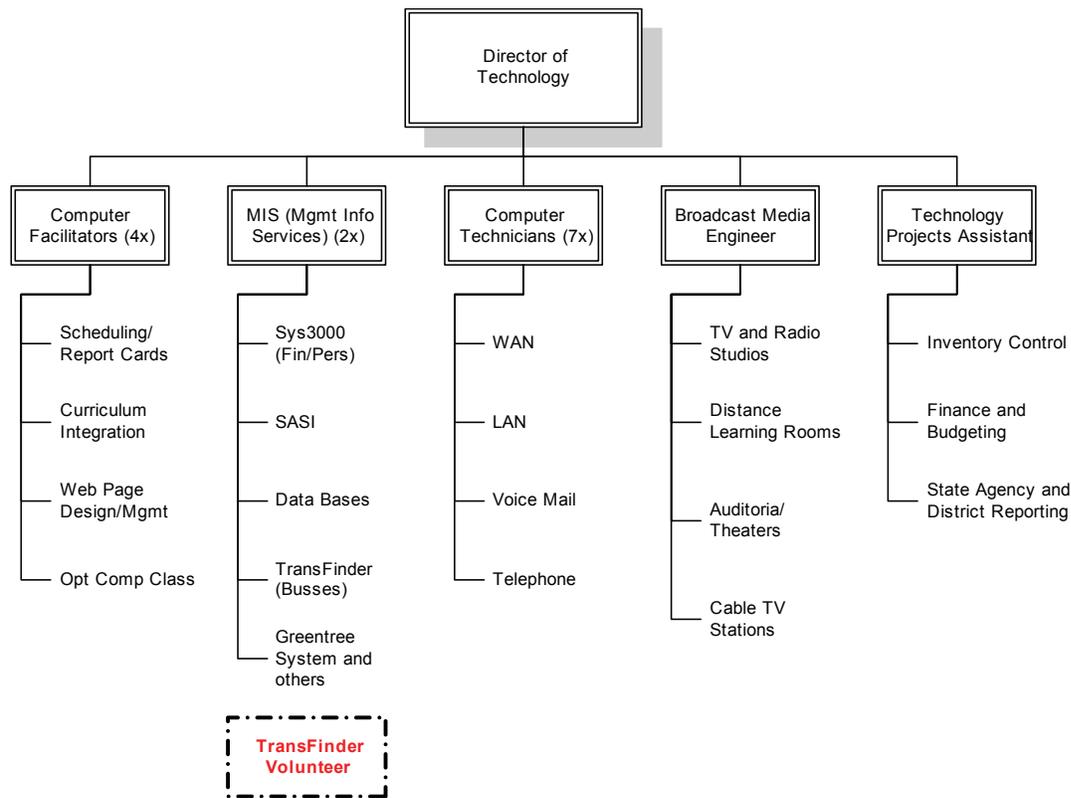
---

**Recommendation 15: Augment and restructure the Technology support staff to effectively maintain and support a flexible, reliable, and secure information infrastructure.**

**Findings**

Our observations on both the administrative and instructional Technology areas, led us to conclude that the effectiveness of district Technology is hampered by lack of human resources with proper time, skills, authority, and/or ownership.

Technology staffing at WW-P is currently organized in the following manner:



Note: The volunteer for the TransFinder software currently takes technical direction from the coordinator for Transportation. This volunteer is doing work that needs to be performed by WW-P employees.

# Organizational analysis and proposed changes

The organization analysis focused on two major functional areas that use Technology in the district: instruction and administration. Key responsibilities would be assigned between these two areas, which we initially called Office of Administrative Technology and Office of Instructional Media and Technology.

Technical skill levels required also were assessed in this phase of analysis. No initial work was done on any formal titles, supervisory issues, or full-time equivalent evaluations.

## Areas of Responsibility

After interviews and discussions with WW-P staff and review of other school districts, we concluded that Instructional Technology staff should be responsible for the following areas:

- Instructional Technology integration into the curriculum.
- Instructional Technology design and evaluation for all students.
- Instructional Technology Training Program, which is utilized and delivered by the Institute of Professional Development to district staff.
- Unique Instructional Technology hardware and software, as appropriate, for Special Services and other students with unique educational needs.
- District WAN design, acquisition, installation, testing and administration.
- District LAN and server design, acquisition, installation, testing and administration (including administrative servers).
- Coordination and Support of Television, Distance Learning and Production Services.
- Full instruction Technology hardware maintenance and software support for the classrooms,
- Basic technology hardware maintenance and software support for the school administrative offices.
- Administrative technology hardware maintenance for middle and high schools.
- Technical and budgetary coordination of Library and Media Services and AV Production equipment.

The Administrative Technology staff would then be responsible for the following areas:

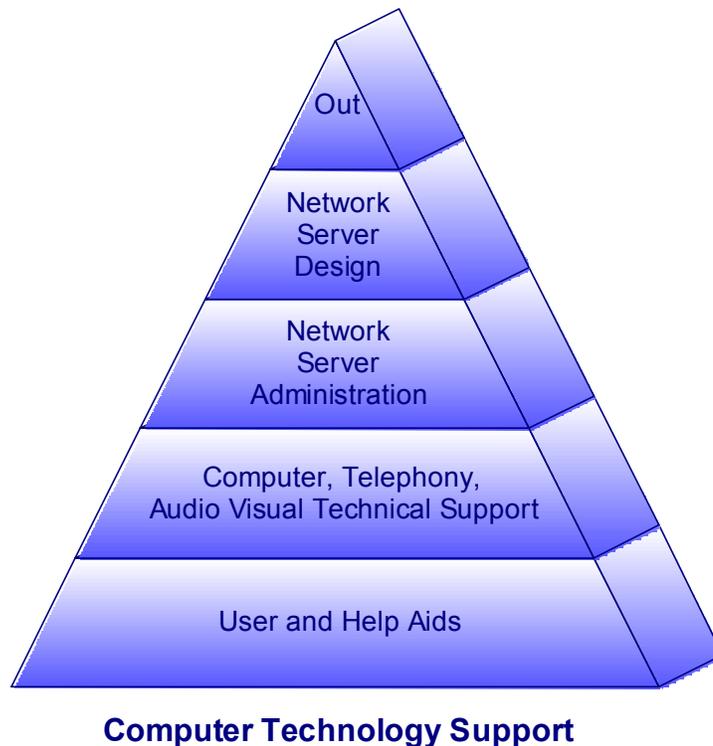
- System and data analysis of administrative automation requirements and the solution design to meet those requirements, including workstations.

- District data acquisition, ownership, management, sharing and integrity, which includes identification of data linkage, consolidation and uses.
- Ongoing “level 2” support of major administrative applications, e.g. SASI, Transfinder, System 3000, IEPs. Level 2 support includes supporting administrative users with any new requirements, the analysis and resolutions of SASI issues that can not be handled by the user, and problems requiring support from the software company.
- Administrative Technology hardware maintenance and software support for administration Technology. Administrative hardware maintenance at the schools would be handled by the school building technician, e.g. replace or fix hardware related desktop/laptop/AV items. Any issues not resolved through hardware maintenance or basic software troubleshooting, would be referred to Administrative Technology Technicians.
- Technical coordination, planning, acquisition and support of district telephony and telephony services.
- Administrative Technology training program, including office productivity suites and major administrative programs that can be delivered to district staff. (An alternative option would have the training delivered by the Institute of Professional Development).

## **Varied Technical Skills Are Required**

Because the district’s Technology infrastructure has grown to be much larger and more complex, the need for further differentiating job tasks is required. This differentiation leads to a need for different levels of focus, expertise, and professional certification.

An illustration of the levels of support required for the district's infrastructure is shown below:



### **User and Help Aids**

Many users can solve their own technical problems if there are user help aids available. One example is the ongoing need for staff members to be able to update their phone mailbox or utilize some of the phone-mail features. An on-line procedure or help aid on the basic phone-mail tasks would allow the telephone technician to address more complex administration and support needs. A good example of on-line computer and software self-help can be seen at <http://www.fgcu.edu/support/>.

### **Computer, Telephony, and AV Tech Support**

The servicing of nonworking Technology hardware and the solutions of basic application problems is required at the schools and in the administrative offices, often working directly with the user. An example of a typical task would be replacing a nonworking component in a classroom machine. A professional certification for this type of work is called "A+ Certification." (<http://www.comptia.com/certification/a/default.asp>)

### **Network and Server Administration**

The administration of the district's servers and networking hardware/software adds another significant level of complexity and is usually done in the "back closets" or remotely. This complexity requires a more in-depth knowledge of how networks and servers work together and how the overall infrastructure design has been implemented.

Often, the daily tasks include debugging hardware, software, database, and networking issues all at the same time. Professional certifications for this type of work include “Server + Certification”, “MCSA” “ACDT” and “CCNP” (CompTIA, Microsoft, Apple, Cisco Internet Sites).

### **Network /Server Design and Outsourcing**

The planning, design and acquisition of the districts servers and networking hardware/software is yet another level of complexity and additional skill required. The overall district infrastructure design includes over 25 servers, a powerful WAN, and a significant number of virtual LANs. Although much of this work can and should be done by outside companies for major work, the district needs to have the proper skill to interact with, technically review, and make various trade-offs during the design and bidding process. Professional certifications of this type of work include “MCSE”, “ACSA” and “CCIE” (Microsoft, Apple, Cisco Sites).

### **Technical Support Staff Summary**

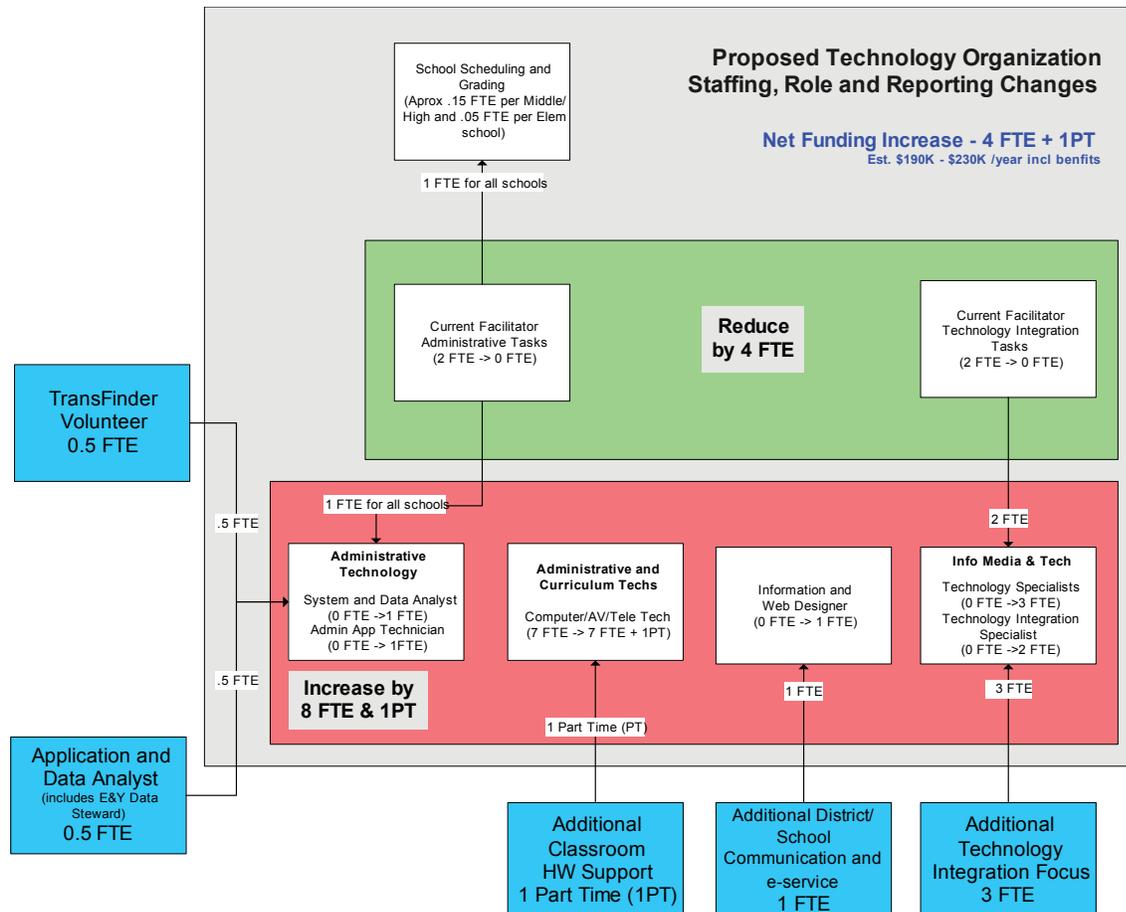
The growth and sophistication of the district’s infrastructure does not allow the Technology staff to have everyone do everything. Restructuring the assigned roles to specific knowledge and tasks will make the organization more effective and more efficient. Technology staff should be encouraged to become certified and continue to develop more advanced skills.

The Technology staff should also have a strong set of evaluation factors from their supervisor which emphasizes customer service and quality deliverables, e.g. defect free on-time completion against a commitment, strong communication with users.

A high level of interaction with the teaching and administrative staff, coupled with strong communication skills, is key in helping the district Technology consumers to successfully utilize the investment in Technology.

# Recommended position changes and additional positions

To achieve the Technology responsibilities and skills as outlined, FMG proposes the following changes to staffing:



## Restructuring Administrative and Technology Activities

The curriculum portion of this report details the need for the district to increase its focus on Technology and curriculum integration. This can be accomplished by moving the administrative responsibilities currently being performed by computer facilitators to appropriate administrative Technology and school administrative staff. Scheduling and grade report cards would be completed by the school administrative staffs who are supported by the administrative Technology staff.

As mentioned in the curriculum section of the report, the focus of curriculum integration support would be with the new Technology specialists and Technology integration specialists positions. These new positions would not be responsible for administrative or repair responsibilities.

## **Administrative Activities Currently Not Covered by WW-P Staff**

We also recommend that 0.5 additional FTE would be required to pick up the Transfinder SW responsibilities currently being done by a volunteer. As that work involves the use and reporting of WW-P student data, privacy and knowledge backup issues are present until the current volunteer activities are transferred to a paid staff member.

A need for an additional 0.5 FTE has been identified for a district-wide systems and data analyst. This position is responsible for working with the various district departments to ensure proper and consistent data acquisition, ownership, management, sharing and integrity. This position also is responsible for working with the various district departments on which district administrative system performs the various district transactions and reports. Earlier analysis of this need by other groups has called this position a data steward.

## **Additional Communication and Internet Self-service Requirements for the District**

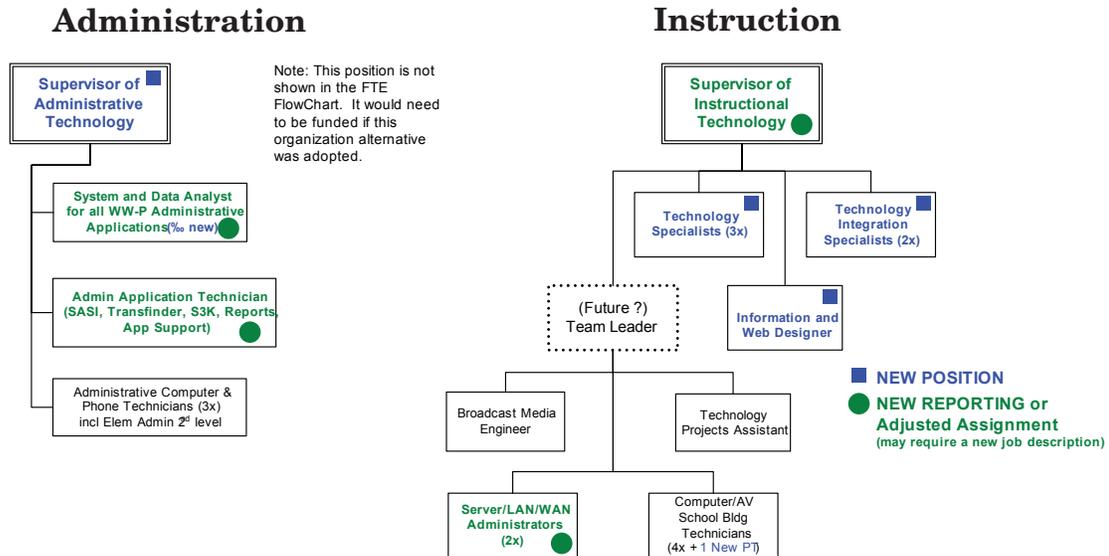
This position was explained in recommendation #14. It generates the need for one additional FTE for that identified work.

## **Additional Classroom Technology Support**

Because of the need to ensure that classrooms have consistent working access to Technology, we recommend that one part-time (PT) position be added to support servicing issues in the classroom.

# Initial Technology Staff Organizational Proposal

Given the new responsibilities outlined and the differentiated skills identified, an initial organizational structure was envisioned as below:



In this proposal, the Technology Department has been separated into two separate stands: Instruction and Administration.

In the Instructional strand, the Technology specialists and the Technology integration specialists are created, and two computer technicians have been specifically assigned to server/LAN/WAN administration.

The information and web designer position is also reporting directly to the Supervisor of Instructional Technology.

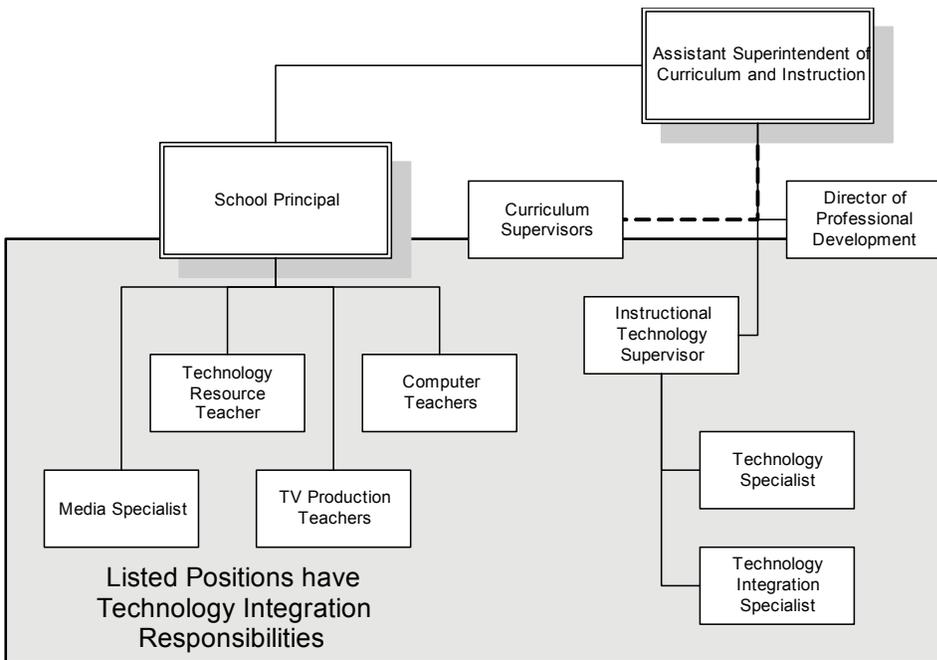
The dotted box, called “Future(?) Team Leader,” is an optional position and could be filled by an existing technician at some point in the future.

The Administration strand includes a supervisor, who also serves as the technical leader for all administrative Technology. This position also has picked up responsibility for overall administrative Technology system analysis and user support, e.g. SASI, S3K, TransFinder, IEP Reporting.

## Site Technology Staff

To meet the district's Technology integration goal, our curriculum recommendations include a Technology resource teacher, whose chief responsibility is to support Technology integration across the curriculum. In order to integrate the teaching of computer skills with academic content, a commitment is needed from principals to realign staff to meet this requirement.

Technology-related positions assigned to each school and their relationships to the other positions are shown below:



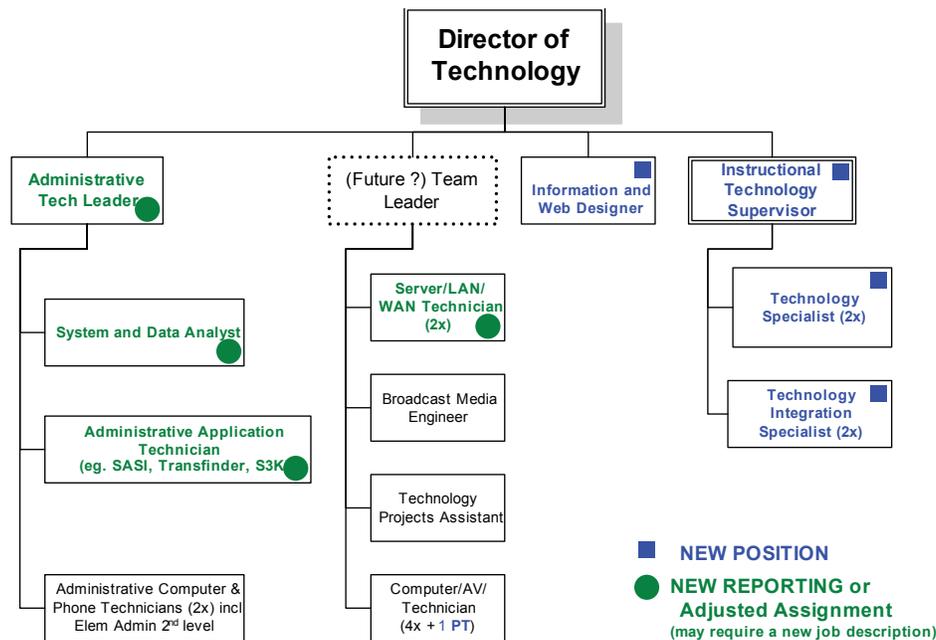
## Organizational Design Benefits

The result of these organizational additions and changes provide significant benefits to the district:

- Focus of instructional resource to help the teaching staff integrate the Technology within the district. This action, combined with the refocus of some computer teachers to Technology resource teachers, will allow the district to successfully integrate Technology into each classroom.
- Additional leverage of the administrative Technology that is currently installed. These positions will allow the district to properly support and maintain the administrative applications while also having enough resource to identify further productivity options within the district.

# Alternative Organizational Design

As FMG studied the supervisory and functional factors, we realized that the proposed organizational alternative allows better augmentation of the support to required areas, and also focuses current resources. Yet, the proposal does not sufficiently consider the supervisory and organizational reporting issues. After taking those factors into account within the district, an alternative organizational proposal emerged:



The overall supervisory size of this organization proposal is large, a potential weakness for this alternative. It also requires the Director of Technology to be proficient in three key areas:

- Having vision and leadership to sell complex and high investment proposals to all stakeholders (Board of Education, other administrators, schools and teachers, staff and the public).
- Utilization of management skills and time to effectively develop, coach and evaluate approximately 20 staff.
- Administrative operational savvy to ensure that key daily support measures are put in place and being able to properly assign resources to achieve those measures.

It also should be noted that this organization proposal does require that one of the Technology specialist positions become the Technology supervisor and one of the Administrative positions to become a working team leader.

This organizational design has several strengths. This alternative eliminates the need for an administrative Technology supervisor and keeps a better “critical mass” of technical people within one organization. Having two Technology organizations, as proposed in the previous alternative, in a district this size inevitably causes some “organizational breakage,” requiring future trade-offs. This particular proposal also allows

the district to have one senior administrator to continue be responsible for all Technology projects and support.

### **Reporting of Technology to the other Senior Administrators**

Various alternatives of director of Technology reporting within the WW-P organization have been considered, including making the Technology director a position reporting directly to the superintendent or reporting to any one of the three assistant superintendents.

If the Technology organization is split, then the Office of Instructional Media and Technology should report to the Assistant Superintendent of Instruction and Curriculum, while the Office of Administrative Technology could report to the Assistant Superintendent of Finance or Pupil Personnel. The placement of that organization should take into account the interest and time available of the assistant superintendent being considered for the organizational responsibility.

We recommend that any final reporting decisions be made after the new superintendent is interviewed and selected. Expertise, administrative style and interest of the new superintendent will likely play a key role in the final reporting structure.

### **Risks in Selecting Parts of the Recommendation**

FMG has made recommendations taking into account all the technical, administrative process, and organizational factors. As WW-P considers trade-offs or making choices to partially implement the recommendations, the alternatives should be fully analyzed and discussed. This will help the district to understand any negative impacts caused by partially implementing the organization structure.

As an example, moving school administrative technology support to an administrative Technology organization without providing the additional staff would likely reduce the quality of that support.

## **Related Technical Recommendations**

We are including the following recommendations for follow-up and tracking purposes. We also assume that the recent Technology Network consultant's report, "Acentra 2001 recommendations," to WW-P will be prioritized and implemented as well.

### **Recommendation 16: Explicitly plan and implement an ongoing Technology refresh program for every budget year.**

#### **Findings**

Our review indicates that the district makes significant yearly investments in Technology. We believe that this should become a more proactive, pre-planned, annual process. Investments should be made on district-wide standardized desktop and server configurations. Policies should be put in place for refresh cycles for the identified configurations. Current FMG calculations estimate this budget item to be approximately \$500,000 per year.

### **Recommendation 17: Upgrade all servers over the next two years to Windows 2000.**

#### **Findings**

Upgrading to the latest level of server software will allow WW-P to implement more effective e-mail systems, implement more effective security procedures, and better utilize Technology support staff. It also is a preferred prerequisite to installing the next generation of e-mail server software.

### **Recommendation 18: Perform an overall service continuity analysis for the mission critical elements of the district's infrastructure.**

#### **Findings**

Our review determined that there is a limited understanding of where there are weak links that can seriously degrade service to district schools and administrative organizations. Redundancy analysis allows the district to understand and make targeted investments in weak link areas of the infrastructure to minimize downtime, disruptions, and bottlenecks. This analysis would include all key servers and network connections. The Acentra report recommendations are an excellent start in this area. The district should implement a plan to mitigate any areas of concern.

**Recommendation 19: Establish a Technology spare equipment inventory for unexpected failures.**

**Findings**

Because the district has become very dependent on e-mail and other LAN/WAN applications (e.g. on-line procurement forms), downtime while waiting on replacement components has become a mission-critical issue. Spare equipment purchased would be based on the redundancy analysis report.

**Recommendation 20: Establish appropriate security and access policies and practices; utilize appropriate hardware, software and human protection strategies to implement those strategies, e.g. virus software, password rules, server access.**

**Findings**

Investigations have found levels of vulnerability in the WW-P infrastructure. Although our review did not include analysis in this area, best industry practices demonstrate that a formal set of policies and associated practices will minimize and largely eliminate exposures to viruses, intrusion and misuse.

**Recommendation 21: Institute a formal network support strategy for the district's WAN infrastructure.**

**Findings**

Current planning, administration, and support of the network is decentralized. Hence, WW-P is without an overall view of how best to utilize and support this key investment. Previous organizational recommendations dealt with a reallocation of resources to focus on the network and associated servers. Resource(s) assigned to this area then would be responsible for developing the network support strategy.

**Recommendation 22: Investigate the expansion of telephone IP use in future telephone investments.**

**Findings**

WW-P has made an initial investment in IP telephony. Industry trends that show a medium to long term savings of telephone infrastructure costs makes this a strong candidate for future expansion. This Technology also allows further effective utilization of the WW-P WAN ([www.cisco.com](http://www.cisco.com)).

## **Recommendation 23: Investigate opportunities for server consolidation across the district.**

### **Findings**

Current industry trends in networked storage and rack servers allow the management of servers to be controlled from a central location. A consolidation allows better sharing of existing servers while also allowing advanced technical support to minimize travel across the district. WW-P North High School has much of the investment needed to allow many of the district servers to be consolidated into one “server farm.”

## **Recommendation 24: Focus on establishing/supplementing current technical administrative processes on user access to key data and systems.**

### **Findings**

Current administrative processes do not adequately protect sensitive and confidential data in the district. Volunteers and various district staff have access to data, often without a clear set off of processes established to ensure confidentiality and security. Formal administrative approval should be implemented across the district on the who, what, when, where, and how of accessing key data and systems. This should be started immediately and be completed within the next fiscal year.

## **Recommendation 25: Focus on Information System management excellence.**

### **Findings**

Information System management would include focusing on the following operational areas: Technology planning, acquisition, implementation, testing, training, user support, software updates, problem tracking, disaster recovery (backup and off-site storage), emergency procedures, and system administration calendar management. Given the current level of staffing and the ongoing tasks required, this would be a long-term project. It is recommended that a variety of resources, including web sites, reference books, and external resources be utilized to put this plan together.

---

Blank Page

## Conclusions

The West Windsor-Plainsboro Regional School District has made major investments in Technology hardware and software during the past decade. As student enrollment growth slows, WW-P has an opportunity to further leverage its Technology investment by focusing its efforts on curriculum integration, adjusting, balancing and realigning staffing levels, and implementing a new model of Technology project governance. Continued emphasis on staff development for Technology and a reemphasis on instituting best-in-class Technology policies, practices, and daily operations is possible as well.

FMG has made recommendations that affect both current Technology offerings and staffing positions. Implementation of the recommendations should be done thoughtfully and carefully to ensure that all participants and stakeholders in the district understand the nature and timing of the changes proposed. Those cautions stated, we feel that WW-P has the capability to make these changes, moving the district to the next level of educational and administrative Technology use.

During this engagement, we were impressed and appreciative about the candid and open dialogue from all members of the District. As part of the review of FMG's findings and recommendations, some task force members expressed varying viewpoints about certain topics. Areas of discussion included: the elimination of computer cycle classes, the replacement of computer facilitators with new Technology integration positions, the importance of formal training in keyboarding skills, the desire for more school site granularity in the findings and recommendations, the importance and size of Special Services Technology needs, workload levels for Technology support personnel, and the reporting structure for Computer teachers. We hope that those dialogues will continue and positively influence the district's response to this report.

In addition, FMG would like to call attention to the district that:

- These recommendations and the district's response to them should be actively considered as input to WW-P's strategic planning process.
- The current transitions at key administrative positions pose a risk to short-term progress being made on implementing the recommendations.
- Budgetary constraints against the proposed staffing increases mentioned in the report would limit the progress of implementing these recommendations significantly.
- Interest and desired involvement is high within a segment of WW-P's parents who met with FMG during the focus groups; they represent an untapped resource for the District in the implementation of some recommendations.

Finally, FMG would like to express its heartfelt thanks to the WW-P Internal Team, the Technology support staff and Technology teachers and facilitators. We are particularly grateful for their time and candor. We hope that this report will help them advance the Technology program.

Blank Page

# **West Windsor-Plainsboro Regional School District**

## **Technology Program Evaluation**

### **External Team Report Appendices & Bibliography**

**January, 2003**

## **Appendix A: What does research say about the impact of technology on student achievement?**

The Milken Exchange on Education Technology published a briefing document in June of 1999 entitled, “The Impact of Education Technology on Student Achievement: What the Most Current Research has to say.” In order to provide legislators, governors and other policy makers information on the impact of education technology for their decision making, they analyzed 5 large scale and 2 smaller scale studies of education technology. “The first study we analyze employed a statistical technique called meta-analysis to aggregate the results of over 500 individual studies to draw a single conclusion. The second reviewed hundreds of individual studies whereby the authors shed light on consistent patterns that emerged across studies. The third reviewed a partnership between Apple and five schools across the nation. The fourth study reported the results of West Virginia’s 10-year statewide education technology initiative. The fifth assessed a national sample of fourth- and eighth-grade students using newer simulation and higher order thinking technologies. The sixth and seventh reviewed two smaller scale studies that show the promise of newer emerging technologies on student learning.”

The full report can be found on the Milken Exchange Web site at <http://www.milkenexchange.org>. Their overall conclusion on impact and effectiveness is reported below:

“These studies show that in over 700 empirical research studies, in the study of the entire state of West Virginia, in a national sample of fourth-and eighth-grade students, and in an analysis of newer educational technologies that students with access to:

- a) computer assisted instruction, or
- b) integrated learning systems technology, or
- c) simulations and software that teaches higher order thinking, or
- d) collaborative networked technologies, or
- e) design and programming technologies,

show positive gains in achievement on researcher constructed tests, standardized tests, and national tests.”

## **Appendix B: Seven Dimensions for Gauging Progress**

### **What are the indicators of an effective technology program?**

Though there are numerous organizations that have identified criteria for evaluating an education technology program, the Milken Foundation has developed an exceptional framework that clearly articulates a focus on systems thinking and systemic change. The framework called The Seven Dimensions of Progress identifies seven “essential conditions that must be working together if schools are to bring technology-enriched learning opportunities to students, systematically and equitably.” It is intended to be used by policymakers and educators as a road map for “how schools can begin to measure their own progress in transforming classrooms into active, stimulating and academically sound learning environments that use technology” through sets of questions and stages of progress.

### **Seven Dimensions for Gauging Progress**

#### **1)Learners**

Are students using technology in ways that deepen their understanding of academic content and advance their knowledge of the world around them?

#### **2)Learning Environments**

Is the learning environment designed to achieve high academic performance by students?

#### **3)Professional Competency**

Are educators fluent with technology and do they effectively use technology to the learning advantage of students?

#### **4)System Capacity**

Is the entire education system reengineering itself to meet the needs of students in this knowledge-based, global society?

#### **5)Community Connections**

Is the school-community relationship one of trust and respect, and is this translating into beneficial, sustainable partnerships in learning technology?

#### **6)Technology Capacity**

Are there adequate technologies, networks, electronic resources and support to reach the education system’s learning goals?

#### **7)Accountability**

Is there agreement on what success with technology looks like? Are there measures in place to track progress and report results?

The Seven Dimensions have been used as a framework in the **Virginia Report** (<http://www.mff.org/publications/publications.taf?page=150>) and the **State-by-State Policy Survey Project**.

## **Appendix C: ISTE National Technology Standards for All Students**

The International Society for Technology in Education ([ISTE - www.iste.org](http://www.iste.org)) developed the National Technology Standards for All Students which are divided into six broad categories. Standards within each category are to be introduced, reinforced, and mastered by students. These categories provide a framework for linking performance indicators within the Profiles for Technology Literate Students to the standards. Teachers can use these standards and profiles as guidelines for planning technology-based activities in which students achieve success in learning, communication, and life skills.

### **Technology Foundation Standards for Students**

#### **Basic operations and concepts**

- a) Students demonstrate a sound understanding of the nature and operation of technology systems.
- b) Students are proficient in the use of technology.

#### **Social, ethical, and human issues**

- a) Students understand the ethical, cultural, and societal issues related to technology.
- b) Students practice responsible use of technology systems, information, and software.
- c) Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.

#### **Technology productivity tools**

- a) Students use technology tools to enhance learning, increase productivity, and promote creativity.
- b) Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.

#### **Technology communications tools**

- a) Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
- b) Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

#### **Technology research tools**

- a) Students use technology to locate, evaluate, and collect information from a variety of sources.
- b) Students use technology tools to process data and report results.
- c) Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.

#### **Technology problem-solving and decision-making tools**

- a) Students use technology resources for solving problems and making informed decisions.
- b) Students employ technology in the development of strategies for solving problems in the real world.

## **Appendix D: ISTE Educational Technology Foundations for All Teachers**

### **Technology Operations and Concepts**

Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:

- a) demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Education Technology Standards for Students).
- b) demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

### **Planning and Designing Learning Environments and Experiences**

Teachers plan and design effective learning environments and experiences supported by technology. Teachers:

- a) design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.
- b) apply current research on teaching and learning with technology when planning learning environments and experiences.
- c) identify and locate technology resources and evaluate them for accuracy and suitability.
- d) plan for the management of technology resources within the context of learning activities.
- e) plan strategies to manage student learning in a technology-enhanced environment.

### **Teaching, Learning, and the Curriculum**

Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers:

- a) facilitate technology-enhanced experiences that address content standards and student technology standards.
- b) use technology to support learner-centered strategies that address the diverse needs of students.
- c) apply technology to develop students' higher order skills and creativity.
- d) manage student learning activities in a technology-enhanced environment.

### **Assessment and Evaluation**

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

- a) apply technology in assessing student learning of subject matter using a variety of assessment techniques.
- b) use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.

- c) apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

### **Productivity and Professional Practice**

Teachers use technology to enhance their productivity and professional practice.

Teachers:

- a) use technology resources to engage in ongoing professional development and lifelong learning.
- b) continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
- c) apply technology to increase productivity.
- d) use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

### **Social, Ethical, Legal, and Human Issues**

Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice. Teachers:

- a) model and teach legal and ethical practice related to technology use.
  - b) apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
  - c) identify and use technology resources that affirm diversity.
  - d) promote safe and healthy use of technology resources.
  - e) facilitate equitable access to technology resources for all students.
-

## **Appendix E: New Jersey Cross-Content Workplace Readiness Standards and Progress Indicators**



### **New Jersey Core Curriculum Content Standards**

**May 1996**

#### **Cross-Content Workplace Readiness Standards And Progress Indicators**

#### **Standard 2:**

#### **All Students Will Use Information, Technology, And Other Tools**

**Descriptive Statement:** Students will be expected to develop skills in the use of information, up-to-date educational technology, and other tools to improve learning, achieve goals, and produce products and presentations. They will learn to develop, locate, summarize, organize, synthesize, and evaluate information. Students will be expected to use technological tools, such as telecommunications networking, for problem-solving, writing, and research.

#### **Cumulative Progress Indicators**

All students will be able to:

- 1) Understand how technological systems function.
- 2) Select appropriate tools and technology for specific activities.
- 3) Demonstrate skills needed to effectively access and use technology-based materials through keyboarding, troubleshooting, and retrieving and managing information.
- 4) Develop, search, and manipulate databases.
- 5) Access technology-based communication and information systems.
- 6) Access and assess information on specific topics using both technological (e.g., computer, telephone, satellite) and print resources available in libraries or media centers.
- 7) Use technology and other tools to solve problems, collect data, and make decisions.
- 8) Use technology and other tools, including word-processing, spreadsheet and presentation programs, and print or graphic utilities, to produce products.
- 9) Use technology to present designs and results of investigations.
- 10) Discuss problems related to the increasing use of technologies.

The content of this appendix is located at:

**<http://www.state.nj.us/njded/cccs/05ccwrstan2.html>**

# Technology Evaluation Report Bibliography

Apple Computer, Inc. Apple Training Web Site. 2002. World Wide Web. <http://www.apple.com/training/> (6/2002).

Baker, E. L., M. Gearhart, and J. L. Hermann. "Evaluating the Apple Classrooms of Tomorrow(SM)" Technology Assessment in Education and Training 1994: 173-98.

Chapel Hill-Carrboro City Schools. Chapel Hill-Carrboro City Schools Web Site. 2002. World Wide Web. <http://www.chccs.k12.nc.us/> (6/2002).

Chapel Hill-Carrboro City Schools. East Chapel Hill High School Web Site. 2002. World Wide Web. <http://www.echhs.org/> (6/2002).

Chapel Hill-Carrboro City Schools. East Chapel Hill High School Instructional Technology Web Site. 2002. World Wide Web. <http://echhs.chccs.k12.nc.us/~tweeks/index.htm> (6/2002).

Chapel Hill-Carrboro City Schools. Mary Scroggs Elementary School Web Site. 2002. World Wide Web. <http://www.chccs.k12.nc.us/scroggs/> (6/2002).

Cisco Systems, Inc. Cisco Certification Resources Web Site. 2002. World Wide Web. [http://www.cisco.com/en/US/learning/le3/le11/learning\\_certification\\_resources\\_home.html](http://www.cisco.com/en/US/learning/le3/le11/learning_certification_resources_home.html) (6/2002).

Citrix Systems, Inc. Citrix Solutions in Education Web Site. 2002. World Wide Web. <http://www.citrix.com/education/default.asp> (6/2002).

Computing Technology Industry Association, The. CompTIA A+ Certification Web Site. 2002. World Wide Web. <http://www.comptia.com/certification/a/default.asp> (6/2002).

Cuban, Larry. Oversold and Underused Computers in the Classroom. 2001. Harvard University Press. World Wide Web. <http://www.hup.harvard.edu/pdf/CUBOVE.pdf> (6/2002).

Curtis, Diane. A 'Fantastic Super' Use of Technology. 2002. George Lucas Foundation. World Wide Web. <http://www.glef.org/> (11/2002).

Darling-Hammond, Linda and Berry, Barnett. Education Week: Investing in Teaching. 2002. World Wide Web. <http://www.edweek.org/ew/ewstory.cfm?slug=37darlin.h17&keywords=investing%20in%20teaching#author> (6/2002).

Dwyer, David C. Ph. D., Ringstaff, Cathy Ph. D., Sandholtz, Judith Haymore Ph. D., and Apple Computer, Inc. Teacher Beliefs and Practices - Part I: Patterns of Change The Evolution of Teachers' Instructional Beliefs and Practices in High-Access-to-Technology Classrooms. 2002. Apple Computer, Inc. World Wide Web. <http://www.apple.com/education/k12/leadership/acot/pdf/rpt08.pdf> (8/2002).

Florida Gulf Coast University. Florida Gulf Coast University Technology Skills Orientation Web Site. 2002. World Wide Web. <http://www.fgcu.edu/support/> (6/2002).

Grant, Cathy Miles. Professional Development in a Technological Age: New Definitions, Old Challenges, New Resources. 2002. World Wide Web. [http://ra.terc.edu/publications/TERC\\_pubs/tech-infusion/prof\\_dev/prof\\_dev\\_intro.html](http://ra.terc.edu/publications/TERC_pubs/tech-infusion/prof_dev/prof_dev_intro.html) (8/2002).

Highland County School System. Highlands County Schools Web Site. 2002. World Wide Web. <http://www.highlands.k12.fl.us/> (8/2 A.D.).

Highland County School System. Sebring Middle School Web Site. 2002. World Wide Web. <http://www.highlands.k12.fl.us/~sms/> (8/2 A.D.).

International Society for Technology in Education (ISTE). Technology Foundation Standards for All Students. 2002. World Wide Web. [http://cnets.iste.org/students/s\\_stands.html](http://cnets.iste.org/students/s_stands.html) (9/2002).

International Society for Technology in Education (ISTE). Educational Technology Standards and Performance Indicators for All Teachers. 2002. World Wide Web. [http://cnets.iste.org/teachers/t\\_stands.html](http://cnets.iste.org/teachers/t_stands.html) (9/2002).

Lemke, Cheryl and Coughlin, Edward. Technology in American Schools: Seven Dimensions for Gauging Progress. 1998. Milken Family Foundation. World Wide Web. <http://www.mff.org/publications/publications.taf?page=158> (9/2002).

Levin, Douglas and Arafeh, Dr. Sousan. The Digital Disconnect: The widening gap between Internet-savvy students and their schools. 2002. The Pew Internet & American Life Project. World Wide Web. <http://www.pewinternet.org/reports/toc.asp?Report=67> (8/2002).

Means, Barbara and Kerry Olsen. "The Link Between Technology and Authentic Learning." Educational Leadership 2003: 7-15.

Means, Barbara, Blando, John, Olsen, Kerry, Middleton, Teresa, SRI International, Morocco, Catherine Cobb, Remz, Arlene R., Zorfass, Judith, and Education Development Corporation. Using Technology to Support Education Reform. 2003. World Wide Web. <http://www.ed.gov/pubs/EdReformStudies/TechReforms/> (6/2002).

Microsoft Corporation. Microsoft Training & Certification Web Site. 2002. World Wide Web. <http://www.microsoft.com/traincert/default.asp> (6/2002).

Milken Exchange, The. State-by-State Policy Survey. 2000. World Wide Web. [http://www.mff.org/edtech/projects.taf?\\_function=detail&Content\\_uid1=160](http://www.mff.org/edtech/projects.taf?_function=detail&Content_uid1=160) (6/2002).

New Jersey Department of Education. New Jersey Core Curriculum Content Standards. 2002. World Wide Web. <http://www.state.nj.us/njded/cccs/02/> (9/2002).

New Jersey Department of Education. New Jersey Core Curriculum Content Standards: Cross-Content Workplace Readiness Standards and Progress Indicators - Standard 2. 2002. World Wide Web. <http://www.state.nj.us/njded/cccs/05ccwrstan2.html> (8/2002).

New Jersey Statewide Systemic Initiative. New Jersey Statewide Systemic Initiative (NJ SSI) Web Site. 2002. World Wide Web. <http://njssi.rutgers.edu/> (9/2002).

North Central Regional Education Lab (NCREL), The Milken Exchange, and SRI International. Report to the Commonwealth of Virginia. 1999. World Wide Web. [http://www.mff.org/edtech/projects.taf?\\_function=detail&Content\\_uid1=150](http://www.mff.org/edtech/projects.taf?_function=detail&Content_uid1=150) (9/2002).

North Central Regional Education Lab (NCREL). Using Technology to Support Education Reform. 2002. World Wide Web. <http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te800.htm> (6/2002).

Schacter, Dr. John. The Impact of Education Technology on Student Achievement: What the Most Current Research Has to Say. 2-1-1999. Milken Family Foundation. World Wide Web. <http://www.mff.org/publications/publications.taf?page=161> (9/2002).

West Windsor-Plainsboro School District. WW-P RSD Staff Resource Site. 2002. World Wide Web. <http://www.wwprsd.org/> (8/2002).

West Windsor-Plainsboro School District. West Windsor-Plainsboro Regional School System Web Site. 2002. World Wide Web. <http://www.ww-p.org/> (6/2002).

---

**Blank Page**

